

MATHEMATICS

for year

5

second edition

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Haese & Harris Publications

MATHEMATICS FOR YEAR 5

SECOND EDITION

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PREFACE

Mathematics for Year 5 (second edition) presents a comprehensive and rigorous course in mathematics at Year 5 level. The book provides students with the structure and content to work efficiently at their own rate, with the help of worked examples, exercises, activities and answers, and the support of the interactive Student CD.

The topics do not have to be addressed in the same order as they are listed. However, Numeracy chapters should be covered before Fractions and Decimals. Fractions, Decimals and Money should be addressed in that order. Measurement is reliant on the Decimals chapter.

The book and CD package can supplement classroom practice and give teachers time to explore other creative strategies, according to the needs of their students. It is not the Year 5 Mathematics Curriculum, nor does it proclaim to provide the most effective teaching program.

The knowledge, skills and understandings summarised at the beginning of each chapter reflect the descriptors used in the R-7 SACSA Mathematics Teaching Resource for Primary Years. We hope that this will be a helpful guide for Year 5 teachers who may wish to use the book to support their teaching practice.

This second edition is a general revision and updating of the original text, with some reorganisation of chapters. Changes include:

- a new chapter on Money
- a new chapter on Time & Temperature
- a new chapter on Transformations
- a new chapter Data Collection and Graphing which incorporates the old chapter ‘Reading charts, tables and graphs’ and includes a new section Using Technology to Graph Data
- the inclusion of an interactive Student CD

In the table of contents, page numbers for corresponding sections in the first edition are given in brackets. This is intended as a guide for teachers who may wish to use the first and second editions within the same classroom. A glance at the contents pages will show how both books correlate (the absence of a page number in brackets denotes the introduction of a new section).

The interactive Student CD contains the text of the book. Students can leave the textbook at school and keep the CD at home, to save carrying a heavy textbook to and from school each day. But more than that, by clicking on the ‘active icons’ within the text, students can access a range of interactive features: graphing and geometry packages, video clips, computer demonstrations and simulations, and worksheets.

The CD is ideal for independent study. Students can revisit concepts taught in class and explore new ideas for themselves. It is fantastic for teachers to use for demonstrations and simulations in the classroom. In summary, the book offers structure and rigour, and the CD makes maths come alive. We have endeavoured to provide as broad a base of activity and learning styles as we can, but we also caution that no single book should be the sole resource for any classroom teacher.

We welcome your feedback.

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ACTIVE ICONS – FOR USE WITH THE INTERACTIVE STUDENT CD

CD LINK



Click on the 'CD LINK' icon to access computer demonstrations, printable templates, worksheets and video clips.

Examples:



OTHER ICONS USED IN THIS BOOK



Activity



Discussion



Investigation

Chapter 1

Adding and subtracting

In this chapter you should learn to:

KANGA'S MOTOR INN
BREAKFAST MENU

Name Suite No

No. of Guests PLEASE RETURN TO OFFICE BY 8 PM
TIME REQUIRED (please tick)

7.00 - 7.15 7.30 - 7.45 8.00 - 8.30
 7.15 - 7.30 7.45 - 8.00 8.30 - 8.45

KANGA'S SPECIAL per person \$13.00

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LOW CHOLESTEROL BREAKFAST

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 Fresh Fruit \$4.00
 Freshly Squeezed Orange Juice \$3.00
 Natural Muesli \$2.00
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Cornflakes Fibrebit Toasted Muesli
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Served with HOT MILK COLD MILK

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 Scrambled Eggs
 Baked Beans and Bacon
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 Spaghetti and Hash Browns
 Sausages and Eggs Extra \$1 per item

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Wholemeal Bread (2 slices) \$2.00
 White Bread (2 slices)
 Wholegrain Bread (2 slices)
 Marmalade Jam Vegemite Honey \$4.00
 2 Warm Croissants with Butter and Jam

BEVERAGES

White Tea Black Tea Herbal Tea \$2.00
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 Milk Coffee Milk Milo \$3.00
 Freshly Brewed Coffee (2 cup plunger) \$5.00
 Freshly Brewed Coffee (4 cup plunger) \$7.00

MINIMUM CHARGE PER ROOM \$7 TOTAL

- add and subtract whole numbers in the Roman system of numbers
- tell what place value means
- convert numbers given in words to symbols
- arrange numbers in order of size
- round off numbers
- estimate answers when adding and subtracting
- add and subtract whole numbers up to thousands
- solve everyday problems using adding and subtracting
- use the symbols $>$, $<$, $=$ and \neq
- check answers using an electronic calculator

A

NUMBER SYSTEMS

OUR NUMBER SYSTEM

We use the digits 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. All numbers can be made using only these digits. When we combine digits, we form a **numeral**. For example, 53 is a numeral.

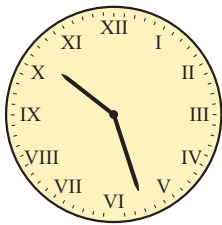
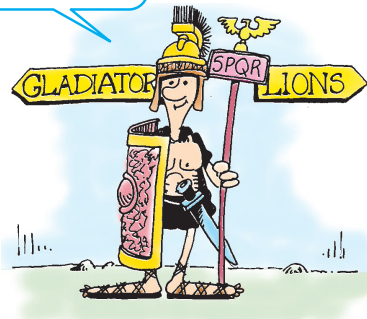
Our number system is based on the **Hindu-Arabic System**.

THE ROMAN SYSTEM

The Ancient Romans used these symbols.

- I to represent one (1)
- V to represent five (5)
- X to represent ten (10)
- L to represent fifty (50)
- C to represent a hundred (100)
- D to represent five hundred (500)
- M to represent one thousand (1000).

I am a Centurion
I am in charge of C men.



Clocks and watches can still be bought with Roman numerals on their faces.

Notice that the '4' is **IV** which is "one before five" and that the '6' is **VI** which is "one after five".

EXERCISE 1A

- 1 Look at the clock face above. What do these Roman numerals mean?
 - a V
 - b VII
 - c IX
 - d XI
- 2 What Roman numeral would you use for
 - a 3
 - b 6
 - c 8
 - d 12?

ANTONIO IS TELLING YOU THE RULES

If a **smaller** number is **before** a larger one, **subtract** it.

- VII reads $5 + 1 + 1 = 7$
- IX reads $10 - 1 = 9$
- XXIV reads $10 + 10 + (5 - 1) = 24$
- LXXI reads $50 + 10 + 10 + 1 = 71$
- XCII reads $(100 - 10) + 2 = 92$

If a **smaller** number is **after** a larger one, **add** it.

No symbol is used more than three times.



- 3 Notice that 23 079 can also be
 23 thousands and 79 units
 230 hundreds and 79 units
 2307 tens and 9 units

Write these numbers in thousands, hundreds, tens and units like the example above.

- a 35 068 b 42 107 c 52 179 d 18 006

- 4 In the number 3742, the value of the 3 is 3000.
 What is the value of the 5 in these numbers?

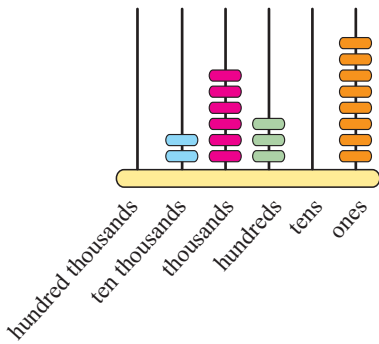
- a 5672 b 8517 c 6315 d 9251 e 63 205
 f 11 562 g 58 831 h 25 617 i 739 950 j 487 775

- 5 What is the value of the 2 in these numbers?

- a 2078 b 10 253 c 26 491 d 254 449 e 120 000

THE ABACUS

An abacus is made from a set of spikes on a base. It has disks on the spikes. If six disks are on a spike this represents the digit 6.

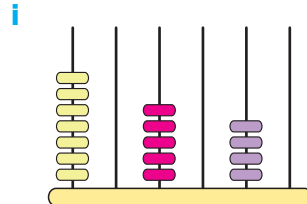
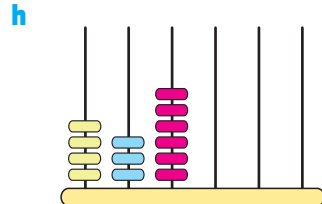
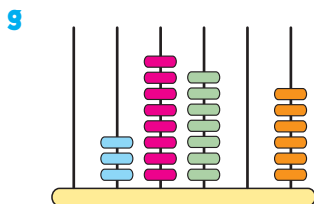
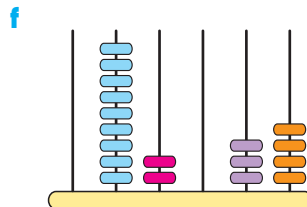
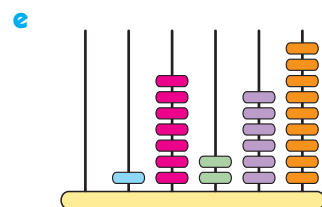
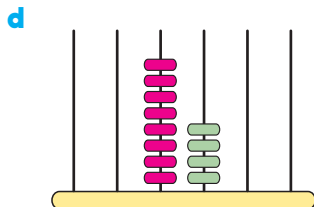
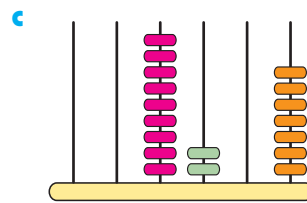
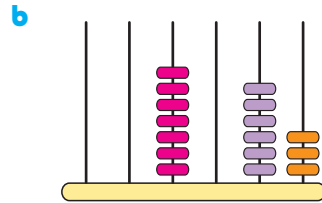
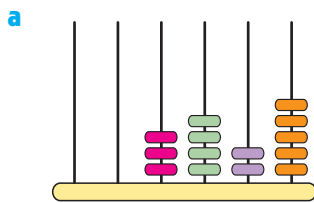


This abacus shows the number 26 308.



The written number is easier to read if we leave a small gap between the hundreds and thousands. That is 26|308

- 6 What number does each abacus show?



- 7** Draw quick sketches of abacii showing the numbers
- a** 3617 **b** 5088 **c** 13 621 **d** 527 013
- 8** Arrange these numbers in order from smallest to largest (ascending).
- a** 39, 93, 19, 31, 91
b 308, 301, 207, 109, 208
c 2710, 2071, 2701, 2017, 2170
d 47 913, 31 749, 91 347, 17 394, 47 193
- 9** Arrange these numbers in order from largest to smallest (descending).
- a** 27, 72, 57, 35, 53
b 432, 324, 342, 234, 423
c 2789, 2987, 7892, 9782, 8279
d 912 533, 932 512, 925 312, 832 215, 852 312



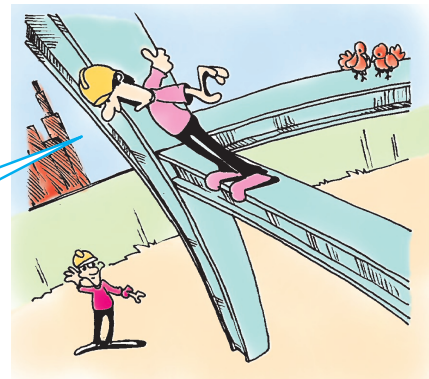
It may be useful to use a place value table.



C NUMBERS IN WORDS

Sometimes numbers are given to us in word form and we have to write them in digit form.

I need “three hundred and eighty five bolts”.



It is often useful to write numbers on a **place value chart** like this one.

hundred thousands	ten thousands	thousands	hundreds	tens	ones
5	3	7	4	1	6
	:				

This row shows the number 537 416

$$537\,416 = 500\,000 + 30\,000 + 7\,000 + 400 + 10 + 6$$

EXERCISE 1C

- 1** Write these numbers on a place value chart like the one above.
- a** five thousand, seven hundred and forty four
b two thousand, nine hundred and eleven
c eight thousand and eight
d fifteen thousand, two hundred and thirty seven
e twenty four thousand, six hundred and one
f eighty eight thousand, eight hundred

- g** one hundred and fifty nine thousand and sixty six
h four hundred and seventy two thousand, six hundred and seventeen

2 7405 can be written as seven thousand four hundred and five. Write these numbers in words.

- a** 680 **b** 1029 **c** 7990 **d** 2000
e 8406 **f** 30 501 **g** 54 002 **h** 176 497

3 For the digits 2, 3, 8, 1, 6 the *largest* number we can make is 86 321
and the *smallest* number we can make is 12 368.

What are the largest and smallest numbers we can make using

- a** 4, 2, 9 and 3 **b** 8, 3, 5, 2 and 9 **c** 3, 8, 0, 7 and 4

4 People still talk in hundreds, saying things like

“I earned eighteen hundred dollars last fortnight”.

18 hundred dollars is 18 lots of \$100 or \$1800.

Write as numbers in digit form.

- a** six hundred **b** thirteen hundred **c** forty three hundred

5 Jock is not very clear about how to say numbers. What number does Jock actually mean when he says

- a** “I have two thousand, twenty four hundred and sixty three dollars.”
b “I have four thousand, eighteen hundred and forty dollars.”
c “That car will cost me three thousand, sixty eight hundred dollars.”

6 Arrange these numbers in order from smallest to largest (ascending).

- a** sixty four, forty, sixteen, forty six, sixty, fourteen
b one thousand and fifty three, 1503, fifteen hundred and thirty, 1305.

7 Arrange these numbers in order from largest to smallest (descending).

- a** seventeen, seventy, fifty seven, seventy five, fifteen
b two thousand and forty seven, 2407, 247, seven hundred and twenty four.

D

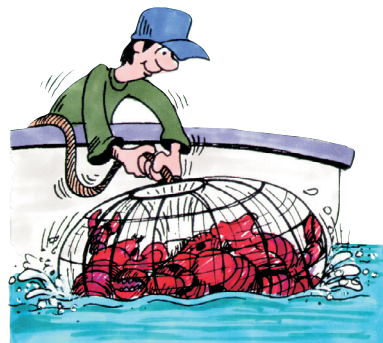
ROUNDING OFF NUMBERS

Sometimes we do not need to know the exact number of objects.

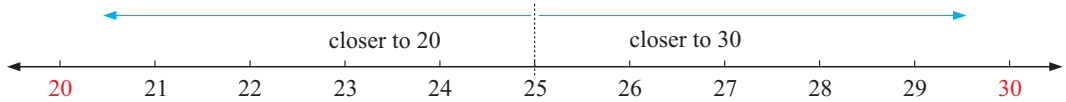
For example:

- You may look at a handful of marbles and say, “There are about thirty there.”
- A newspaper report might read “About 600 kg of crayfish was caught last week.”
- A commentator might estimate the crowd at the sporting event as 85 000.

When we give an estimate of a number of objects we usually round to the nearest 10, 100, 1000, 10 000 and so on. There are rules for doing this.



ROUNDING TO THE NEAREST TEN



25 is midway between 20 and 30 on the number line.

21, 22, 23 and 24 are closer to 20 than to 30 so we round them down to 20.

26, 27, 28 and 29 are closer to 30 than to 20 so we round them up to 30.

25 is rounded up to 30.

Even though they could go either way, numbers ending in 5 are rounded up to the nearest ten.



Rule for rounding to the nearest 10:

If the **last digit** is 0, 1, 2, 3, 4 we round **down**.

If the **last digit** is 5, 6, 7, 8, 9 we round **up**.

EXERCISE 1D

1 Round these numbers to the nearest ten.

- | | | | | | |
|-------------|-------------|-------------|-------------|-------------|-------------|
| a 14 | b 28 | c 91 | d 17 | e 25 | f 76 |
| g 7 | h 22 | i 69 | j 74 | k 93 | l 98 |

2 Round these numbers to the nearest ten.

For example; 258 is closer to 260 than it is to 250, so the answer is 260.

- | | | | | | |
|--------------|--------------|--------------|--------------|--------------|--------------|
| a 117 | b 162 | c 213 | d 358 | e 408 | f 502 |
| g 613 | h 485 | i 844 | j 777 | k 555 | l 996 |

ROUNDING TO THE NEAREST HUNDRED

245 is closer to 200 than it is to 300. So, 245 rounded to the nearest hundred is 200.

Rule for rounding to the nearest 100:

If the **last 2 digits** are 00 to 49 we round **down**.

If the **last 2 digits** are 50 to 99 we round **up**.



For example,

589



this will stay as it is
or go up by one when
using the rounding rule.

these are to be
replaced with 00

600) closer to 600
589)
500

Using the rule, 589 is rounded to 600.

3 Round these numbers to the nearest hundred.

- | | | | | |
|--------------|--------------|--------------|--------------|--------------|
| a 105 | b 98 | c 210 | d 275 | e 525 |
| f 619 | g 785 | h 842 | i 899 | j 949 |

Numbers in their thousands can also be rounded to the nearest hundred.

For example, 2348 ← these are to be replaced by 00

this will stay as it is
or go up by one
(by the rounding rule)

2400
2348)
2300) closer to 2300

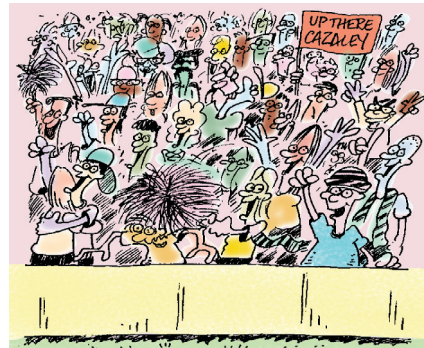
Using the rule, 2348 is rounded to 2300.

4 Round these numbers to the nearest hundred.

a 1467 b 2935 c 3042 d 3505 e 4968
f 5001 g 5100 h 6732 i 9073 j 9595

5 Round these to the nearest hundred.

- a The crowd at the car rally was 761.
- b I earned \$2386 last month.
- c There were 3255 at the netball grand final.
- d 7579 attended the AFL match on Saturday.



ROUNDING TO THE NEAREST THOUSAND

3417 is closer to 3000 than it is to 4000. So, 3417 rounded to the nearest thousand is 3000.

Also, 3518 rounded to the nearest thousand is 4000.

Rule for rounding to the nearest 1000:

If the **last 3 digits** are 000 to 499 we round **down**.

If the **last 3 digits** are 500 to 999 we round **up**.



For example, 9765 ← these are to be replaced by 000

this will stay as it is
or go up by one
(by the rounding rule)

10000)
9765)
9000) closer to 10000

Using the rule, 9765 is rounded to 10000.

6 Round these numbers to the nearest thousand.

a 2345 b 6543 c 8742 d 5789 e 9013
f 8804 g 1299 h 4500 i 7999 j 2020

7 Round these numbers to the nearest thousand.

a 12 354 b 78 842 c 13 579 d 24 680 e 20 301
f 79 842 g 87 006 h 50 036 i 92 222 j 96 669

- 8** Round these to the nearest thousand.
- a** The number attending the pop concert was 65 731.
 - b** My annual pay is \$28 076.
 - c** There were 97 428 at the Homebush stadium on Thursday.
 - d** Dad paid \$34 899 for his new car.



- 9** Which of these numbers round off to 36 000?
- a** 36 124 **b** 36 589 **c** 35 879 **d** 35 499
 - e** 36 499 **f** 36 500 **g** 35 500
- 10** True or false? To the nearest thousand
- a** 57 138 rounds to 58 000 **b** 48 718 rounds to 50 000
 - c** 30 992 rounds to 31 000 **d** 31 911 rounds to 40 000

E ESTIMATING

When we round off numbers we are giving **estimates** (or **approximations**) of them.

We often find estimates so that we can check our answers to more accurate calculations.

If we go shopping for food we often round costs to have some idea of the total. We do this so we know that

- we are within our food budget
- we have enough money to pay for the food
- to check that the check-out operator has not overcharged us.

To estimate a sum, we round each number so we can add quickly in our head.

For example, to estimate
$$\begin{array}{r} 347 \\ 286 \\ + 197 \\ \hline \end{array}$$
 we could do
$$\begin{array}{r} 300 \\ 300 \\ + 200 \\ \hline \end{array}$$

by rounding each number to the nearest hundred.

When we do the actual addition we expect an answer close to 800.

EXERCISE 1E

1 Estimate in hundreds the answer to

a	b	c	d
$\begin{array}{r} 379 \\ 83 \\ + 240 \\ \hline \end{array}$	$\begin{array}{r} 168 \\ 113 \\ + 479 \\ \hline \end{array}$	$\begin{array}{r} 621 \\ 79 \\ + 11 \\ \hline \end{array}$	$\begin{array}{r} 81 \\ 162 \\ 231 \\ + 380 \\ \hline \end{array}$

2 Estimate in hundreds the answer to

a	b	c	d
$\begin{array}{r} 672 \\ - 194 \\ \hline \end{array}$	$\begin{array}{r} 802 \\ - 74 \\ \hline \end{array}$	$\begin{array}{r} 432 \\ - 286 \\ \hline \end{array}$	$\begin{array}{r} 585 \\ - 137 \\ \hline \end{array}$

3 Estimate in thousands the answer to

$$\begin{array}{r} \text{a} \quad 3133 \\ + 2674 \\ \hline \end{array}$$

$$\begin{array}{r} \text{b} \quad 1928 \\ + 7465 \\ \hline \end{array}$$

$$\begin{array}{r} \text{c} \quad 595 \\ 4063 \\ + 3778 \\ \hline \end{array}$$

$$\begin{array}{r} \text{d} \quad 1799 \\ 837 \\ 2610 \\ + 3208 \\ \hline \end{array}$$

4 Estimate in thousands the answer to

$$\begin{array}{r} \text{a} \quad 3724 \\ - 1917 \\ \hline \end{array}$$

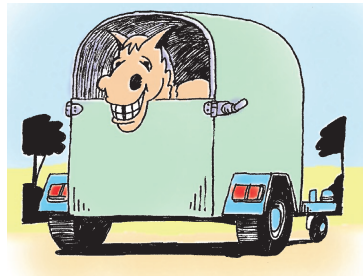
$$\begin{array}{r} \text{b} \quad 4063 \\ - 2987 \\ \hline \end{array}$$

$$\begin{array}{r} \text{c} \quad 1799 \\ - 986 \\ \hline \end{array}$$

$$\begin{array}{r} \text{d} \quad 2143 \\ - 1367 \\ \hline \end{array}$$

5 Estimate these amounts.

- a The amount I will be able to spend if I have vouchers for \$176, \$239, \$318 and \$97.
- b The total distance I travelled in 2 days if I travelled 589 km on Friday and 334 km on Saturday.
- c The mass to be towed if my horse float weighs 862 kg and my two horses weigh 496 kg and 534 kg.
- d The difference between the height of Mt Everest (8848 m above sea level) and Australia's highest mountain, Mt Kosciuszko (2228 m above sea level).



F

ADDING WHOLE NUMBERS

MENTAL ADDITION

EXERCISE 1F



1 Get a friend to time you to do these sets mentally. Just write down the answer.

$$\begin{array}{l} \text{a} \quad 2 + 5 = \\ 3 + 4 = \\ 5 + 7 = \\ 9 + 8 = \\ 4 + 7 = \\ 5 + 4 = \\ 6 + 7 = \\ 2 + 8 = \\ 6 + 8 = \\ 3 + 6 = \end{array}$$

$$\begin{array}{l} \text{b} \quad 3 + 5 = \\ 4 + 5 = \\ 5 + 6 = \\ 7 + 5 = \\ 4 + 9 = \\ 9 + 7 = \\ 7 + 3 = \\ 7 + 6 = \\ 2 + 6 = \\ 8 + 5 = \end{array}$$

$$\begin{array}{l} \text{c} \quad 8 + 6 = \\ 4 + 2 = \\ 8 + 7 = \\ 2 + 9 = \\ 4 + 4 = \\ 7 + 0 = \\ 3 + 8 = \\ 9 + 6 = \\ 3 + 9 = \\ 9 + 9 = \end{array}$$

When adding on 9, you can first add 10 and then take 1.



2 Copy and complete. You should be able to do this mentally.

$$\begin{array}{l} \text{a} \quad 7 + 3 = \square + 1 \\ \text{d} \quad 9 + 4 = \square + 7 \\ \text{g} \quad 8 + 5 = \square + 9 \\ \text{j} \quad 6 + 9 = 7 + \square \\ \text{m} \quad 8 + 6 = \square + 7 \end{array}$$

$$\begin{array}{l} \text{b} \quad 4 + 9 = 3 + \square \\ \text{e} \quad 7 + 6 = 6 + \square \\ \text{h} \quad 7 + 7 = \square + 5 \\ \text{k} \quad 2 + 7 = 6 + \square \\ \text{n} \quad 9 + 7 = \square + 9 \end{array}$$

$$\begin{array}{l} \text{c} \quad 7 + 6 = \square + 2 \\ \text{f} \quad 5 + 5 = 9 + \square \\ \text{i} \quad 6 + 8 = 7 + \square \\ \text{l} \quad 7 + 8 = \square + 6 \\ \text{o} \quad 9 + 9 = \square + 8 \end{array}$$

It is very useful to be able to remember the answers to easier additions quickly. This helps with harder examples.

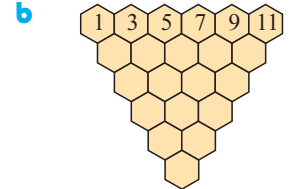
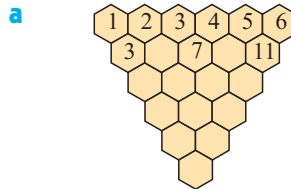
For example, if we know that $2 + 3 = 5$ then

$$\begin{array}{l} 12 + 3 = 15 \\ 22 + 3 = 25 \\ 102 + 3 = 105 \text{ etc.} \end{array} \qquad \begin{array}{l} 20 + 30 = 50 \\ 200 + 300 = 500 \\ 2000 + 3000 = 5000 \end{array}$$

3 Copy and complete.

<p>a</p> $5 + 4 =$ $50 + 40 =$ $500 + 400 =$ $5000 + 4000 =$	<p>b</p> $2 + 8 =$ $20 + 80 =$ $200 + 800 =$ $2000 + 8000 =$	<p>c</p> $6 + 5 =$ $60 + 50 =$ $600 + 500 =$ $6000 + 5000 =$	<p>d</p> $7 + 9 =$ $70 + 90 =$ $700 + 900 =$ $7000 + 9000 =$
--	--	--	--



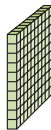
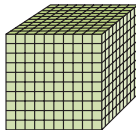
4 To find another number in the honeycomb cells add the two numbers above it.

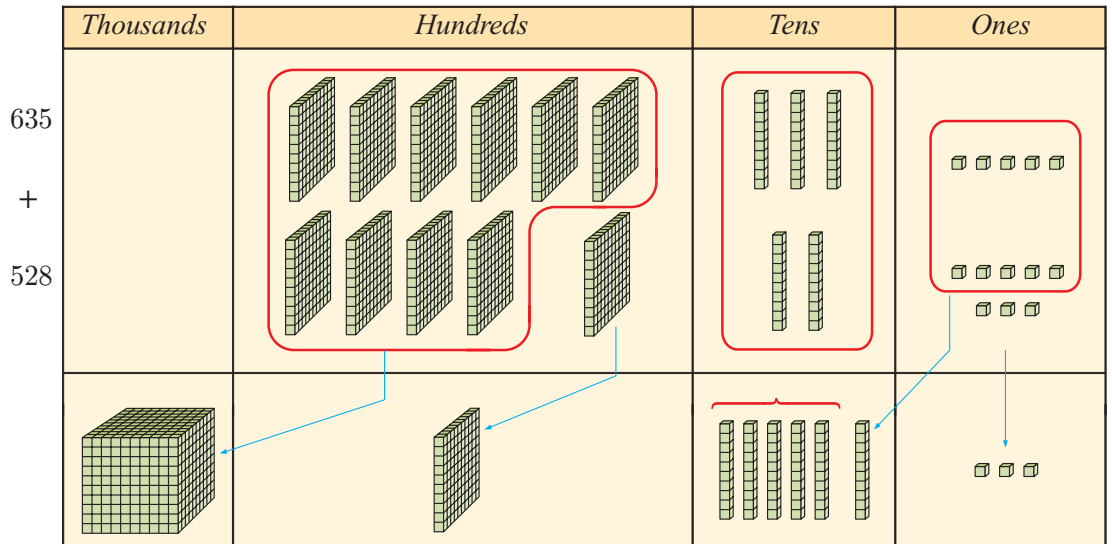


ADDING HUNDREDS

Let us look at the addition

$$\begin{array}{r} 635 \\ + 528 \\ \hline \end{array}$$

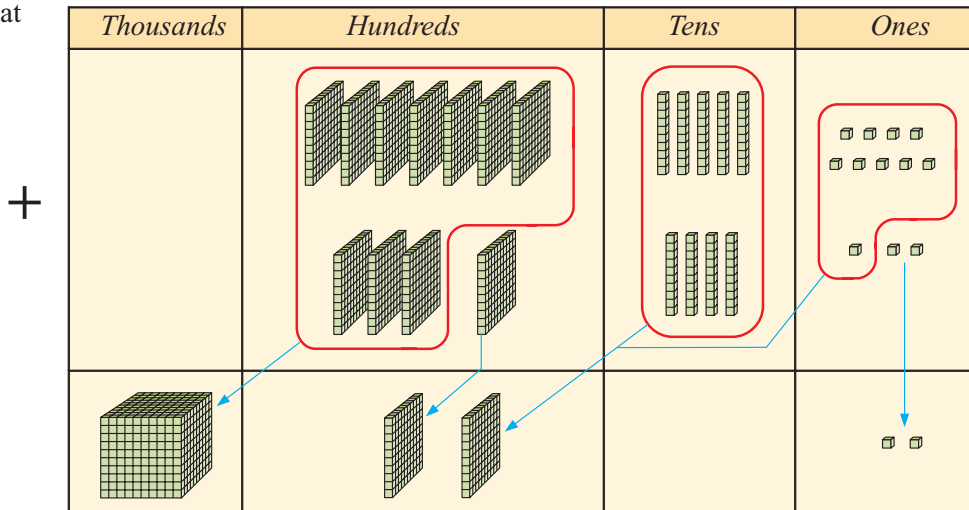
Using  to represent 1,  to represent 10,  to represent 100,  to represent 1000 we can see how to do the addition.



So,	Th	H	T	O
		6	3	5
+		5	2	8
	1	1	6	3



5 Look at



- a What two numbers are being added? b What is the final answer?
 c Write out this table using numbers only.



6 Copy and complete these additions.

a
$$\begin{array}{r} 132 \\ + 247 \\ \hline \end{array}$$

b
$$\begin{array}{r} 258 \\ + 327 \\ \hline \end{array}$$

c
$$\begin{array}{r} 551 \\ + 294 \\ \hline \end{array}$$

d
$$\begin{array}{r} 673 \\ + 251 \\ \hline \end{array}$$

e
$$\begin{array}{r} 491 \\ + 139 \\ \hline \end{array}$$

f
$$\begin{array}{r} 368 \\ + 863 \\ \hline \end{array}$$

g
$$\begin{array}{r} 549 \\ + 680 \\ \hline \end{array}$$

h
$$\begin{array}{r} 717 \\ + 454 \\ \hline \end{array}$$

i
$$\begin{array}{r} 555 \\ + 777 \\ \hline \end{array}$$

j
$$\begin{array}{r} 666 \\ + 909 \\ \hline \end{array}$$

k
$$\begin{array}{r} 79 \\ 168 \\ + 234 \\ \hline \end{array}$$

l
$$\begin{array}{r} 23 \\ 486 \\ + 107 \\ \hline \end{array}$$

m
$$\begin{array}{r} 22 \\ 234 \\ + 344 \\ \hline \end{array}$$

n
$$\begin{array}{r} 531 \\ 246 \\ + 173 \\ \hline \end{array}$$

o
$$\begin{array}{r} 666 \\ 555 \\ + 444 \\ \hline \end{array}$$

7 First estimate the answer by rounding to the nearest hundred. Then do the addition.

For example:

$$\begin{array}{r} 179 \\ + 866 \\ \hline \end{array}$$

Estimate: $200 + 900 = 1100$

$$\begin{array}{r} 179 \\ + 866 \\ \hline 1045 \end{array}$$

a
$$\begin{array}{r} 429 \\ + 368 \\ \hline \end{array}$$

b
$$\begin{array}{r} 594 \\ + 537 \\ \hline \end{array}$$

c
$$\begin{array}{r} 819 \\ + 918 \\ \hline \end{array}$$

d
$$\begin{array}{r} 135 \\ 246 \\ + 357 \\ \hline \end{array}$$

e
$$\begin{array}{r} 236 \\ 714 \\ + 692 \\ \hline \end{array}$$

f
$$\begin{array}{r} 361 \\ 742 \\ + 888 \\ \hline \end{array}$$

8 Find the missing digits in

a

$$\begin{array}{r} 238 \\ + 17\blacksquare \\ \hline \blacksquare 12 \end{array}$$

b

$$\begin{array}{r} 46\blacksquare \\ + 242 \\ \hline 7\blacksquare 9 \end{array}$$

c

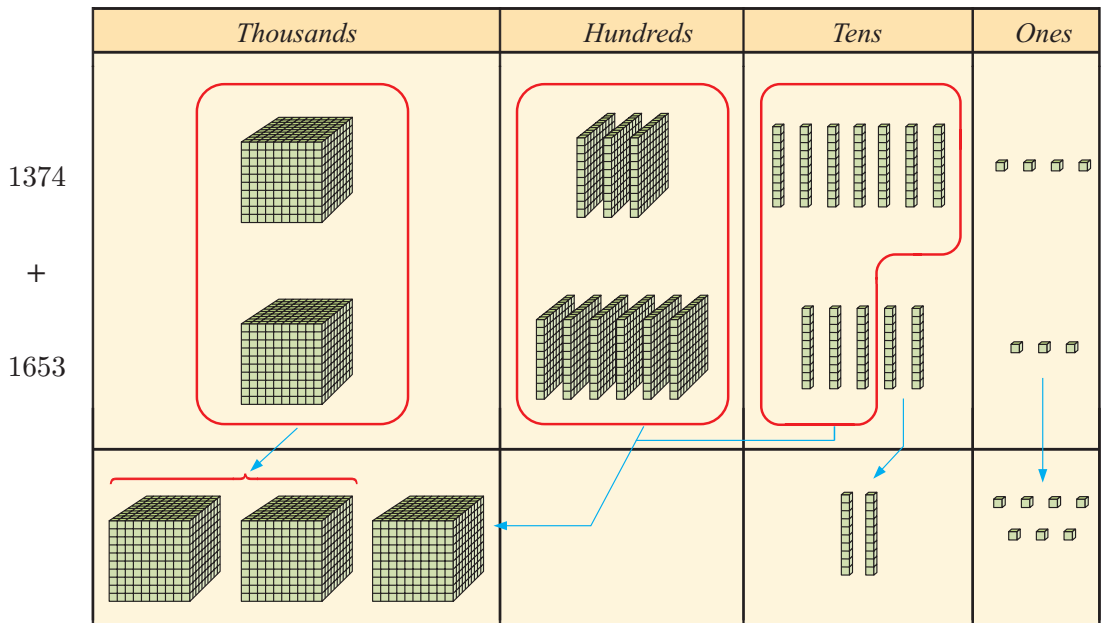
$$\begin{array}{r} 1\blacksquare 3 \\ 58\blacksquare \\ + \blacksquare 97 \\ \hline 975 \end{array}$$

d

$$\begin{array}{r} 176 \\ 23\blacksquare \\ + 3\blacksquare 3 \\ \hline \blacksquare 17 \end{array}$$

ADDING THOUSANDS

Once again, for the addition $\begin{array}{r} 1374 \\ + 1653 \\ \hline \end{array}$ we can use **MA blocks** to help us see what is happening.



Using numbers this is

	T	H	T	O
	1	3	7	4
	1	6	5	3
	<u>1</u>	<u>1</u>		
+	3	0	2	7



9 Copy and complete these additions.

a

$$\begin{array}{r} 1348 \\ + 2061 \\ \hline \end{array}$$

b

$$\begin{array}{r} 2425 \\ + 5406 \\ \hline \end{array}$$

c

$$\begin{array}{r} 7666 \\ + 1414 \\ \hline \end{array}$$

d

$$\begin{array}{r} 2259 \\ + 5555 \\ \hline \end{array}$$

e

$$\begin{array}{r} 1643 \\ + 8291 \\ \hline \end{array}$$

f

$$\begin{array}{r} 2020 \\ + 4974 \\ \hline \end{array}$$

g

$$\begin{array}{r} 25543 \\ + 3444 \\ \hline \end{array}$$

h

$$\begin{array}{r} 5902 \\ + 42997 \\ \hline \end{array}$$

i

$$\begin{array}{r} 23636 \\ + 76009 \\ \hline \end{array}$$

- 10** First estimate the answer by rounding to the nearest thousand. Then do the addition.

For example,

$$\begin{array}{r} 1348 \\ + 3682 \\ \hline \end{array}$$

Estimate: $1000 + 4000 = 5000$

$$\begin{array}{r} 1348 \\ + 3682 \\ \hline 111 \\ \hline 5030 \end{array}$$

a

$$\begin{array}{r} 7805 \\ + 1990 \\ \hline \end{array}$$

b

$$\begin{array}{r} 1346 \\ 2813 \\ + 5172 \\ \hline \end{array}$$

c

$$\begin{array}{r} 4021 \\ 2369 \\ + 4174 \\ \hline \end{array}$$

d

$$\begin{array}{r} 3669 \\ 12902 \\ + 34067 \\ \hline \end{array}$$

e

$$\begin{array}{r} 25607 \\ 2450 \\ + 73336 \\ \hline \end{array}$$

f

$$\begin{array}{r} 46142 \\ 42164 \\ + 44378 \\ \hline \end{array}$$

g

$$\begin{array}{r} 97463 \\ 52101 \\ + 27463 \\ \hline \end{array}$$

h

$$\begin{array}{r} 123466 \\ 501241 \\ + 277965 \\ \hline \end{array}$$

i

$$\begin{array}{r} 377402 \\ 209876 \\ + 433611 \\ \hline \end{array}$$

- 11** Find the missing digits of these sums.

a

$$\begin{array}{r} 1384 \\ + 2\blacksquare6\blacksquare \\ \hline \blacksquare1\blacksquare3 \end{array}$$

b

$$\begin{array}{r} 26\blacksquare7 \\ + 3\blacksquare5\blacksquare \\ \hline \blacksquare142 \end{array}$$

c

$$\begin{array}{r} 8\blacksquare53 \\ + \blacksquare42\blacksquare \\ \hline 164\blacksquare5 \end{array}$$

We can use other words instead of **add**. Here are some of them.

Find **the sum** of 2 and 3 means $2 + 3 = 5$.

Find **the total** of 7, 4 and 11 means $7 + 4 + 11 = 22$.

16 **plus** 7 means $16 + 7 = 23$.

Find the number that is 5 **more than** 13 means $5 + 13 = 18$.

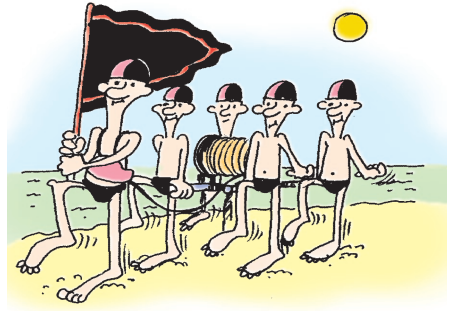
Increase 56 by 9 means $56 + 9 = 65$.

PROBLEM SOLVING

- 12** On Sports Day Cathy ran in the 100 metres, 200 metres, 400 metres and 1500 metres events. How far did she run altogether?
- 13** Kim had 146 cards showing photographs of footballers and Joshua had 273 cards. How many cards did they have between them?
- 14** At Athelton School there are 362 students in the Junior Primary, 239 students in the Middle Primary and 691 students in the Upper Primary. How many students attend Athelton School?
- 15** Jenny's great grandfather was born in 1913. He died on his 89th birthday. In what year did he die?



- 16** Find the total cost of the items that David bought for his flat: a refrigerator costing \$635, a washing machine costing \$539 and a television set costing \$1042.
- 17** An aeroplane made three flights in one day. The distances travelled were 643 km, 1647 km and 2809 km. How far did the aeroplane fly?
- 18** The population of the town of Bestbeach (usually 3641 people) was increased by 1097 on the day of the Surf Carnival. How many people were in Bestbeach on that day?
- 19** Dirk was flying to Europe for a holiday. His air fare was \$1239, his travel insurance was \$119 and he was going on a tour costing \$752. He spent \$1500 on extras. What was the cost of his holiday?
- 20** Last year Zoran was paid \$53 700 in wages plus a bonus of \$2000. How much did he earn in total?
- 21** Find the sum of 46 791 and 59 005.



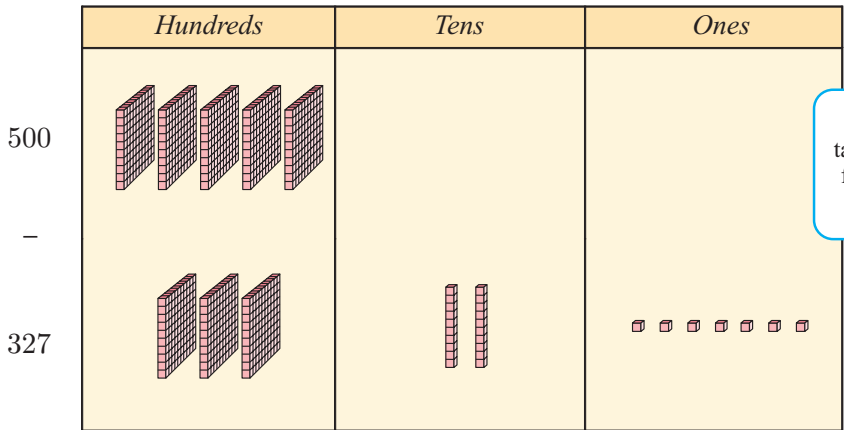
G SUBTRACTION

SUBTRACTING HUNDREDS

These blocks could help you to understand the subtraction method.

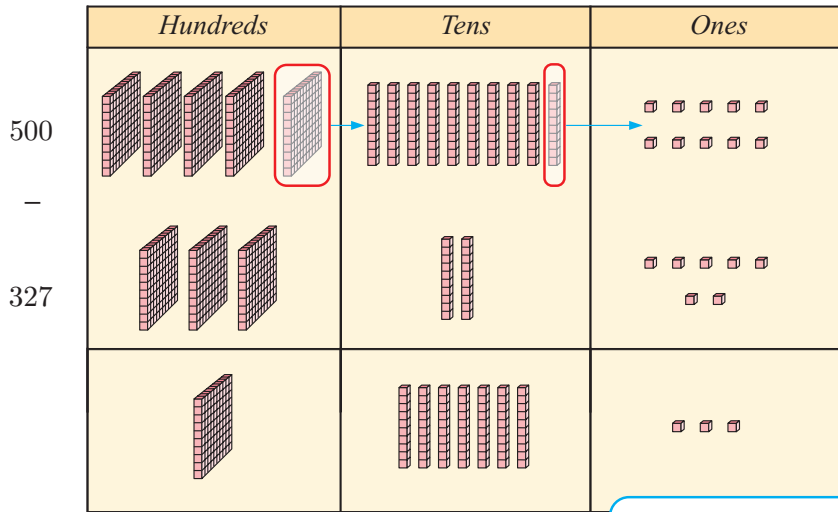
They show $500 - 327$.

To start with we have



We want to always take a smaller number from a bigger one so we exchange.





Notice the exchange of 100 for ten 10's, and 10 for ten 1's.



You can always check subtractions by adding. Here $327 + 173$ should add to 500.



So, our working looks like this:

$$\begin{array}{r}
 \overset{45}{\cancel{5}} \overset{10}{\cancel{0}} 0 \quad \text{then} \quad \overset{45}{\cancel{5}} \overset{90}{\cancel{9}} \overset{100}{\cancel{10}} \\
 - 327 \\
 \hline
 \end{array}$$

EXERCISE 1G

1 Find these subtractions.

a
$$\begin{array}{r} 200 \\ - 57 \\ \hline \end{array}$$

b
$$\begin{array}{r} 300 \\ - 126 \\ \hline \end{array}$$

c
$$\begin{array}{r} 300 \\ - 241 \\ \hline \end{array}$$

d
$$\begin{array}{r} 400 \\ - 68 \\ \hline \end{array}$$

e
$$\begin{array}{r} 400 \\ - 172 \\ \hline \end{array}$$

f
$$\begin{array}{r} 400 \\ - 258 \\ \hline \end{array}$$

g
$$\begin{array}{r} 500 \\ - 139 \\ \hline \end{array}$$

h
$$\begin{array}{r} 600 \\ - 322 \\ \hline \end{array}$$

i
$$\begin{array}{r} 700 \\ - 431 \\ \hline \end{array}$$

2 We could do this: $700 - 431 = \underbrace{699 - 431}_{\text{easy to do}} + 1$

Use this idea to redo question 1 parts f to i.

Check your answers by using addition.

3 Find

a
$$\begin{array}{r} 232 \\ - 117 \\ \hline \end{array}$$

b
$$\begin{array}{r} 372 \\ - 164 \\ \hline \end{array}$$

c
$$\begin{array}{r} 462 \\ - 238 \\ \hline \end{array}$$

d
$$\begin{array}{r} 518 \\ - 232 \\ \hline \end{array}$$

e
$$\begin{array}{r} 629 \\ - 376 \\ \hline \end{array}$$

f
$$\begin{array}{r} 418 \\ - 159 \\ \hline \end{array}$$

g
$$\begin{array}{r} 361 \\ - 278 \\ \hline \end{array}$$

h
$$\begin{array}{r} 513 \\ - 367 \\ \hline \end{array}$$

i
$$\begin{array}{r} 626 \\ - 449 \\ \hline \end{array}$$



SUBTRACTING THOUSANDS

Sometimes we do not need to do any exchanging.

For example, $4586 - 2452$

$$\begin{array}{r} 4586 \\ - 2452 \\ \hline 2134 \end{array}$$

We can see this using blocks.



	Thousands	Hundreds	Tens	Ones
4586				
-2452				

4 Find

a

$$\begin{array}{r} 3487 \\ - 1255 \\ \hline \end{array}$$

b

$$\begin{array}{r} 6819 \\ - 3204 \\ \hline \end{array}$$

c

$$\begin{array}{r} 8916 \\ - 5724 \\ \hline \end{array}$$

d

$$\begin{array}{r} 8362 \\ - 5362 \\ \hline \end{array}$$

e

$$\begin{array}{r} 5592 \\ - 4667 \\ \hline \end{array}$$

f

$$\begin{array}{r} 8312 \\ - 4444 \\ \hline \end{array}$$

g

$$\begin{array}{r} 9138 \\ - 9035 \\ \hline \end{array}$$

h

$$\begin{array}{r} 7063 \\ - 2109 \\ \hline \end{array}$$

i

$$\begin{array}{r} 5008 \\ - 3995 \\ \hline \end{array}$$

SUBTRACTING FROM WHOLE THOUSANDS

To find $5000 - 2376$ we could first find $4999 - 2376$ and then add 1 to the result.

So,

$$\begin{array}{r} \cancel{5000} \\ 4999 \\ - 2376 \\ \hline 2623 \\ + 1 \\ \hline 2624 \end{array}$$

take one

add one to balance

Doing this makes the subtraction easier to calculate.



5 Find

a
$$\begin{array}{r} 3000 \\ - 1234 \\ \hline \end{array}$$

b
$$\begin{array}{r} 5000 \\ - 1479 \\ \hline \end{array}$$

c
$$\begin{array}{r} 7000 \\ - 5203 \\ \hline \end{array}$$

d
$$\begin{array}{r} 2000 \\ - 1098 \\ \hline \end{array}$$

e
$$\begin{array}{r} 4000 \\ - 3157 \\ \hline \end{array}$$

f
$$\begin{array}{r} 6000 \\ - 4897 \\ \hline \end{array}$$

g
$$\begin{array}{r} 1000 \\ - 989 \\ \hline \end{array}$$

h
$$\begin{array}{r} 8000 \\ - 2076 \\ \hline \end{array}$$

i
$$\begin{array}{r} 9000 \\ - 7615 \\ \hline \end{array}$$

6 Find

a \$4000 – \$1765

b \$7000 – \$4317

c \$8000 – \$3907

HARDER SUBTRACTIONS

To find
$$\begin{array}{r} 427\textcircled{3} \\ - 253\textcircled{6} \\ \hline \end{array}$$
 ← we cannot do this so we trade from the 7

We now have
$$\begin{array}{r} 42\textcircled{67}\textcircled{13} \\ - 25\textcircled{36} \\ \hline \end{array}$$
 ← we can now do this to do the ‘hundreds’ we must trade from the 4

We now have
$$\begin{array}{r} \cancel{3}4\ \cancel{12}\ \cancel{67}\ \cancel{13} \\ - 2\ 5\ 3\ 6 \\ \hline 1\ 7\ 3\ 7 \end{array}$$

Here is another example.
$$\begin{array}{r} 520\textcircled{4} \\ - 37\textcircled{7}\textcircled{1} \\ \hline \end{array}$$
 ← we can do this
← we cannot do this so we trade from the 2

We now have
$$\begin{array}{r} 5\ \cancel{12}\ \cancel{10}\ 4 \\ - 3\ \textcircled{7}\ 7\ 1 \\ \hline \end{array}$$
 ← we cannot do this so we trade from the 5

We now have
$$\begin{array}{r} \cancel{4}\ \cancel{5}\ \cancel{11}\ \cancel{10}\ 4 \\ - 3\ 7\ 7\ 1 \\ \hline 1\ 4\ 3\ 3 \end{array}$$



7 Find

a
$$\begin{array}{r} 5246 \\ - 2318 \\ \hline \end{array}$$

b
$$\begin{array}{r} 5831 \\ - 2827 \\ \hline \end{array}$$

c
$$\begin{array}{r} 6839 \\ - 4759 \\ \hline \end{array}$$

d
$$\begin{array}{r} 8661 \\ - 4073 \\ \hline \end{array}$$

e
$$\begin{array}{r} 2987 \\ - 1668 \\ \hline \end{array}$$

f
$$\begin{array}{r} 3472 \\ - 2565 \\ \hline \end{array}$$

g
$$\begin{array}{r} 39455 \\ - 6446 \\ \hline \end{array}$$

h
$$\begin{array}{r} 48723 \\ - 27864 \\ \hline \end{array}$$

i
$$\begin{array}{r} 124877 \\ - 82158 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{j} \quad 60\,000 \\ - 23\,456 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{k} \quad 49\,872 \\ - 31\,446 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{l} \quad 426\,808 \\ - 77\,665 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{m} \quad 525\,622 \\ - 99\,449 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{n} \quad 975\,443 \\ - 913\,374 \\ \hline \end{array}$$

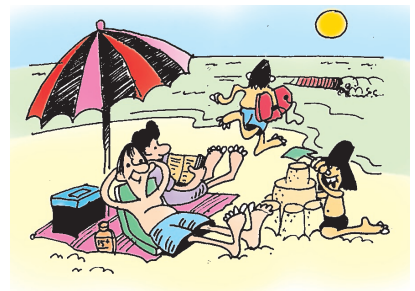
$$\begin{array}{r} \mathbf{o} \quad 426\,808 \\ - 177\,005 \\ \hline \end{array}$$

We can use other words instead of **subtract**. Here are some of them.

- Find the **difference** between 16 and 7 means $16 - 7 = 9$.
- 23 **minus** 18 means $23 - 18 = 5$.
- **Decrease** 20 by 2 means $20 - 2 = 18$.
- 67 **take away** 36 means $67 - 36 = 31$.
- 7 **less** than 10 means $10 - 7 = 3$.

PROBLEM SOLVING WITH SUBTRACTION

- 8** Tom is 185 cm tall and Andrew is 168 cm tall. Find the difference in height between Tom and Andrew.
- 9** Yesterday Kate started reading a book and read 225 pages. Today she finished reading the book. The book has 316 pages. How many pages did Kate read today?
- 10** There were 1500 tickets to be sold for a rock concert. 1263 tickets were sold with early bookings. How many were left to sell at the gate on the night of the concert?
- 11** Sarah has saved \$563. She wants to go on a holiday, and the holiday package costs \$791. How much more does Sarah need?
- 12** Nicholas wants to go on a holiday. Subtract his savings of \$1351 from the cost of the holiday, which is \$2119. This will tell you the amount of money he still needs to save.
- 13** A car manufacturer sold 7314 of his best selling family car in 2002 and 6789 of them in 2003.
 - a**
 - i** Did the sales increase or decrease?
 - ii** What was the difference in sales between these years?
 - b** If he sold 9495 cars in 2004, how many more cars did he sell in 2004 than 2003?
- 14** The Word Bookshop had 645 dictionaries in stock. They received orders for 251, 119 and 62 dictionaries. How many were left when the orders had been filled?
- 15** Find 46 703 minus 2980.



- 16** Sam was going to buy a second-hand car. He liked a red one priced at \$9875 and a blue one priced at \$7889. How much more than the blue car did the red one cost?

- 17** Decrease 156 407 by 18 866.



H

USING SYMBOLS

We can use symbols instead of words.

$>$ means **greater than**

$9 > 7$ means 9 is greater than 7.

$<$ means **less than**

$2 < 5$ means 2 is less than 5.

EXERCISE 1H

- 1** Write T (true) or F (false).

a $23 > 32$

b $101 < 110$

c $98 > 89$

d $990 > 99$

e $440 < 404$

f $276 < 267$

g $4428 > 4482$

h $3711 < 3171$

- 2** Write $>$ or $<$ to make a true sentence.

a $45 \square 54$

b $239 \square 329$

c $555 \square 556$

d $4672 \square 4267$

e $6010 \square 60100$

f $9476 \square 12\ 114$

We all know that $=$ means 'is equal to'. We can write $4 + 1 = 5$.

The symbol \neq means 'is not equal to'. We can write $8 - 1 \neq 6$.

- 3** Write T (true) or F (false).

a $4 + 7 = 11$

b $13 - 9 = 11 - 6$

c $101 + 9 \neq 191$

d $200 + 17 \neq 300 - 73$

e $4999 = 5000 - 1$

f $1060 + 201 \neq 1261$

- 4** Write $=$ or \neq to make a true sentence.

a $74 \square 47$

b $507 + 92 \square 599$

c $3000 - 149 \square 2951$

d $568 + 342 \square 444 + 456$

e $7559 - 1023 \square 4803 + 1732$

I

USING A CALCULATOR

The calculator key $\boxed{+}$ is used to add numbers. $\boxed{-}$ is used to subtract numbers.

For example, to *add* 56 and 67,

press $56 \boxed{+} 67 \boxed{=}$ and the answer should be 123.

Also, to *subtract* 37 from 82,

press $82 \boxed{-} 37 \boxed{=}$ and the answer should be 45.



Estimate before you calculate.

EXERCISE 11

1 Use your calculator to find

a $39 + 68$

b $113 - 87$

c $47 + 85$

d $7107 - 4842$

e $3268 + 1795$

f $6473 - 2166$

g $6177 + 2669$

h $72\,266 - 17\,749$

i

$$\begin{array}{r} 548 \\ + 799 \\ + 336 \\ \hline \end{array}$$

j

$$\begin{array}{r} 17\,025 \\ - 8974 \\ \hline \end{array}$$

k

$$\begin{array}{r} 756\,176 \\ - 519\,883 \\ \hline \end{array}$$

l

$$\begin{array}{r} 32\,381 \\ 86\,247 \\ 29\,179 \\ + 11\,407 \\ \hline \end{array}$$

2 Before you calculate these on your calculator first find an estimate.

a $89 + 52$

b $95 - 47$

c $128 + 487$

d $487 - 128$

e $6265 + 2119$

f $6291 - 4361$

g $84\,551 + 39\,062$

h $44\,051 - 19\,696$

3 **a** Use a calculator to add these and you will LOSE!

$1264 + 895 + 1348 =$

Turn your calculator upside down to see this.



b You will be buzzing if you get this one correct!

$3210 - 2871 =$

c Make up an addition or subtraction which gives a word of your choosing, when viewed upside down.

J **MIXED PROBLEM SOLVING**

Look for key words which give you a clue to **add** or **subtract**.



'Find the sum', 'find the total', 'altogether', 'plus', 'add together', are pointers to **add**.

'Find the difference between', 'minus', 'take away', 'how much more', 'how much less', 'how much was left', are pointers to **subtract**.



EXERCISE 1J

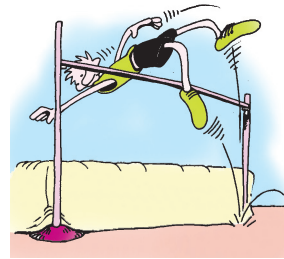
- 1 Caitlen went shopping for bedroom furniture. Find the total of her purchases.

Item	Cost
bed	\$299
mattress	\$435
chest of drawers	\$375

- 2 In a school high jump competition Mario jumped 147 cm and Damien jumped 129 cm. How much higher than Damien did Mario jump?

- 3 In a school cricket match John scored 114 runs and Peter scored 59.

- a How many runs did the boys score between them?
b How many more runs than Peter did John score?



- 4 The depth of a river increased from 237 cm to 396 cm during a flood. What was the increase in the depth of water?

- 5 The organisers of a Sports Carnival expected 8000 people to attend. The weather was wet and only 2169 people attended. How many short of the expected number were they?

- 6 Find the sum of these weights: 213 kg, 79 kg, 4698 kg.

- 7 Find 76 907 minus 55 493.

- 8 If 385 litres of water was used from a tank containing 3000 litres, how much water was left?



- 9 Kiri bought a new bicycle during a '\$55 off' sale. If she paid \$489, how much would the bicycle usually cost?

- 10 Find the total cost of five 'A'-Reserve tickets at \$68 each and three 'B'-Reserve tickets at \$49 each for a concert.

- 11 The Holiday Centre has these special deals for holidays. Adelaide to Gold Coast return flights cost \$521 per adult.

Tickets to	Adult	Child
Movie Park	\$58	\$37
Sea Park	\$58	\$37
Wet 'n' Wild Park	\$36	\$23
Dream Park	\$58	\$37

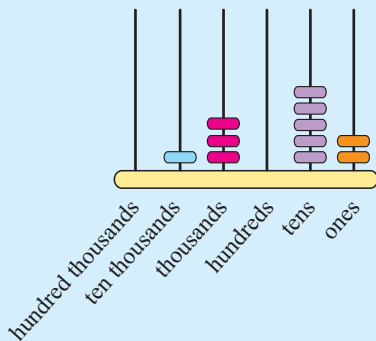
- a Find the cost for 2 adults and 2 children to fly to the Gold Coast if children travel at half price.
- b
- i Find the cost for 2 adults and 2 children to go to Movie Park, Sea Park and Wet 'n' Wild Park.
 - ii Holiday Centre has a special deal. To go to the three parks listed in i you can buy a 3 park Superpass. It costs \$150 per adult and \$96 per child. It includes a free return visit to any one of these parks. Find the greatest amount an adult can save by buying a 3 park Superpass.
- c Find the least amount needed to pay for the flights and a visit to all four parks for 2 adults and 2 children. You may use any of your previous calculations to help you.

MENTAL SET 1A

- 1 Write in simple form
 $30\,000 + 800 + 90 + 1$
- 2 What is the value of 2 in 52 076?
- 3 Write using digits the number forty three thousand three hundred and forty five.
- 4 Round 283 to the nearest hundred.
- 5 True or false?
 $7035 + 122 = 7157$
- 6 Find 300 minus 240.
- 7 Estimate in thousands
 $6742 + 4095$
- 8 Find the digit that replaces \square in
 $5 + 9 = 11 + \square$
- 9 $6003 + 580 =$
- 10 $698 - 56 =$

MENTAL SET 1B

- 1 Which of our numbers does the Roman numeral XVI represent?
- 2 Find $50 + 1050$.
- 3 Expand 4603.
- 4 What number is represented by

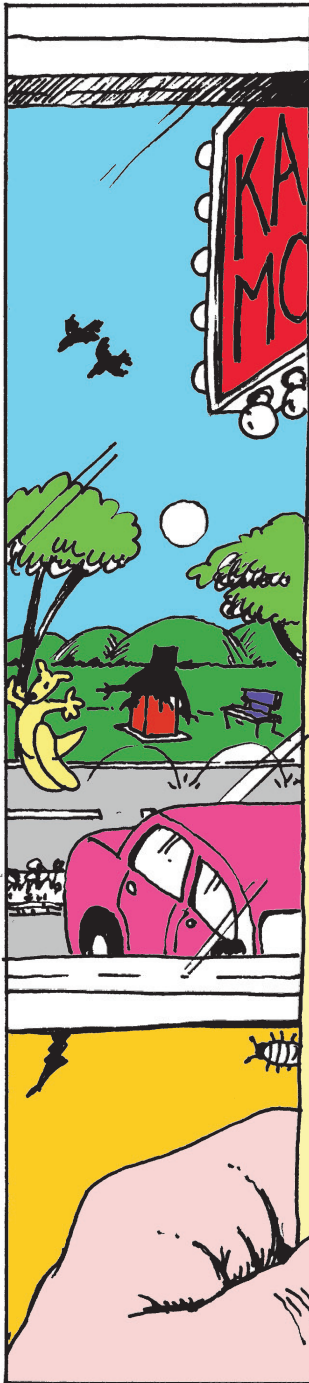


- 5 Make the smallest number you can using the digits 7, 1, 4, 2, 5 once only.

- 6 What is the smallest number in 24, 42, 34, 23, 43?
- 7 Round 6499 to the nearest thousand.
- 8 Estimate in hundreds the answer to 516×7 .
- 9 Find the digit that replaces \square in
 $18 - 11 = \square - 3$
- 10 Subtract 89 from 98.

MENTAL SET 1C

- 1 Write 16 as a Roman numeral.
- 2 Write in simple form $5000 + 20 + 9$
- 3 What is the value of 7 in 75 369?
- 4 Write 1541 in expanded form.
- 5 Write 50 366 in words.
- 6 Which number is largest?
187, 871, 781, 878, 788
- 7 Round 57 198 to the nearest thousand.
- 8 Estimate in thousands the answer to
 $6849 - 3180$.
- 9 Copy and complete:
 $\square + 7 = 9 + 3$
- 10 True or false?
 $76\,914 > 176\,914$



KANGA'S MOTOR INN

BREAKFAST MENU

Name Suite No
 PLEASE RETURN TO OFFICE BY 8 PM
 TIME REQUIRED (please tick)
 No. of Guests
 7.00 - 7.15 7.30 - 7.45 8.00 - 8.30
 7.15 - 7.30 7.45 - 8.00 8.30 - 8.45

KANGA'S SPECIAL per person \$13.00

- Fruit Juice - Orange, Pineapple, Tomato, Apple
- Cereal (Please state choice)
- Bacon & Eggs Extras \$1 per item
- Toast Marmalade Jam Vegemite
- Tea Coffee Black White

LOW CHOLESTEROL BREAKFAST

- Fresh Fruit and Natural Yoghurt \$5.00
- Fresh Fruit \$4.00
- Freshly Squeezed Orange Juice \$3.00
- Natural Muesli \$2.00
- Yoghurt \$2.00

AUSTRALIA'S CHOICE JUICE \$3.00

- Pineapple Tomato Orange Apple

CEREALS \$3.00

- Cornflakes Fibrebix Toasted Muesli
- Compote of Fruit Sultanas & Wheat Bran Weet Flakes
- Served with HOT MILK COLD MILK

HEARTY BREAKFAST SERVED ON TOAST

- Bacon, Eggs, Chop and Tomato \$10.00
- Bacon and Eggs \$9.00
- Scrambled Eggs
- Baked Beans and Bacon
- Poached Eggs and Grilled Tomatoes
- Spaghetti and Hash Browns
- Sausages and Eggs Extra \$1 per item

BAKERY (Toaster in Room)

- Wholemeal Bread (2 slices) \$2.00
- White Bread (2 slices)
- Wholegrain Bread (2 slices)
- Marmalade Jam Vegemite Honey
- 2 Warm Croissants with Butter and Jam \$4.00

BEVERAGES

- White Tea Black Tea Herbal Tea \$2.00
- White Coffee Black Coffee Glass of Milk \$2.00
- Milk Coffee Milk Milo \$3.00
- Freshly Brewed Coffee (2 cup plunger) \$5.00
- Freshly Brewed Coffee (4 cup plunger) \$7.00

MINIMUM CHARGE PER ROOM	\$7	TOTAL
--------------------------------	------------	--------------

SKILL TESTER
WHOLE NUMBERS

Imagine that you are on holiday with a family. Imagine that you are all staying at Kanga's Motor Inn. No one has brought a calculator. It is your job to check the charges for your breakfast orders. Use your whole number skills to answer the following questions. Remember to read **all** the information on the menu **carefully**.

- 1 How much would you pay altogether for: fresh fruit and natural yoghurt, apple juice and two slices of whole grain bread?
- 2 How much cheaper is a four cup plunger of freshly brewed coffee than four cups of coffee?
- 3 How much would spaghetti and hash browns with an egg, and two extra pieces of bread cost?
- 4
 - a If you ordered each item in Kanga's Special separately, what would the total cost be?
 - b What is the difference between this cost and the cost of Kanga's Special?
 - c Give two reasons why there could be a difference.
- 5 What is the total cost for the following order?
 - 2 serves of Weet Flakes with hot milk
 - 2 serves of Fibrebix with cold milk
 - 2 serves of bacon and eggs with an extra serve of bread each
 - 2 warm croissants with butter and jam
- 6 Each of the following are individual orders from your room. Answer *True* or *False* to the statements:
 - a 1 serve of bacon, eggs, chop and tomato, and herbal tea costs \$12
 - b 3 'Kanga Specials' costs \$38
 - c 1 serve of sausages, eggs and bacon and a white coffee costs \$11
 - d 1 'Kanga Special' and 1 poached eggs, grilled tomatoes and spaghetti and pineapple juice costs \$26
- 7 How much would you pay if you only wanted two warm croissants with butter and jam and a white coffee?
- 8 What would you order for breakfast if you could spend up to \$15?

REVIEW EXERCISE 1

1 What is the value of 2 in

a 20 046

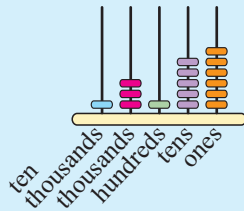
b 40 206

c 45 526

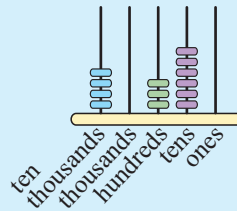
d 2546

2 What number is shown on the abacus?

a



b



3 Write on a place value chart.

a three thousand two hundred and one

b forty nine thousand eight hundred and sixty three

c thirty thousand and five

4 Write in sentence form.

a 3402

b 35 557

5 Write the a smallest and b largest numbers you can from the digits 3, 9, 6, 8, 2.

6 Arrange these numbers from largest to smallest: 456, 564, 546, 465, 654, 645

7 Arrange these numbers from smallest to largest:

1306, 3601, 3061, 1360, 1326, 2603

8 a Round to the nearest hundred.

i There are 581 students enrolled at the school.

ii My pay cheque last month was \$2487.

b Round to the nearest thousand.

i My boss earns \$72 400 a year.

ii There were 10 563 people at the fireworks display.

9 a Estimate in hundreds the answer to $715 - 329$.

b Estimate in thousands the answer to $2855 + 3401$.

10 Copy and complete:

$$\begin{array}{r} \text{a} \quad 596 \\ + 5964 \\ \hline \end{array}$$

$$\begin{array}{r} \text{b} \quad 5000 \\ - 1596 \\ \hline \end{array}$$

11 My father went on a business trip. When he left home in the car the odometer reading was 2379 km. When he returned the odometer reading was 3094 km. How far did he travel?

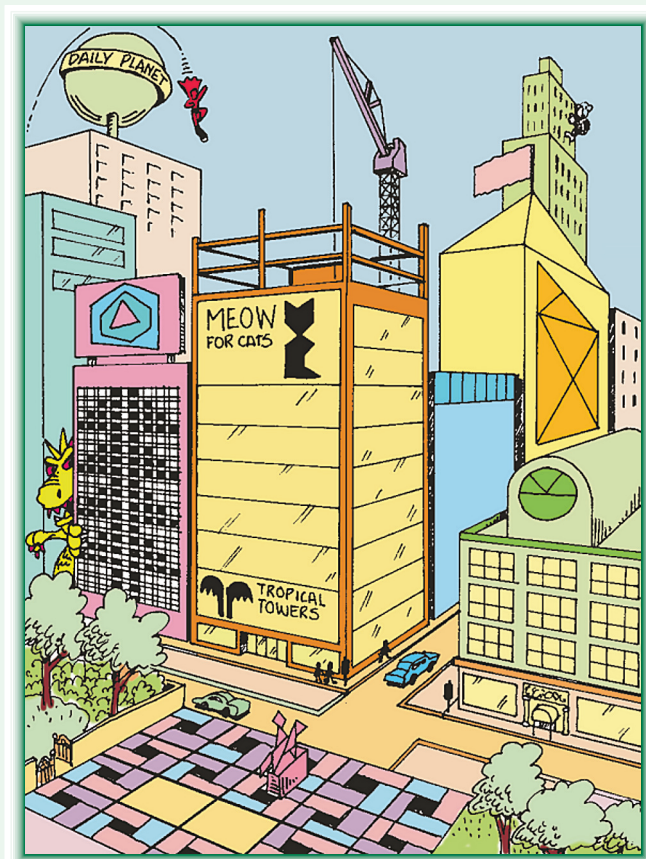
12 Three pallets of goods were loaded onto a truck. They weighed 618 kg, 355 kg and 469 kg. What was the total mass?

13 Fill in the \square with $>$, $<$ or $=$. $59\,674 \square 59\,070 + 64$.

Chapter 2

2 dimensional shapes

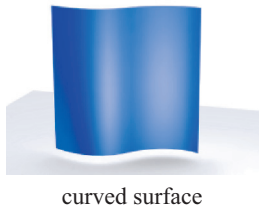
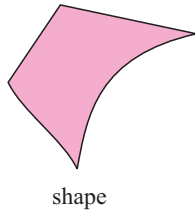
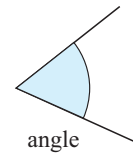
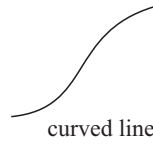
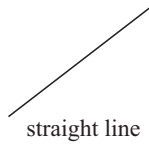
In this chapter you should learn to:



- ✓ recognise and name simple 2-D shapes
- ✓ recognise and name different angle types
- ✓ measure and draw angles
- ✓ recognise and name simple polygons
- ✓ recognise and name regular polygons
- ✓ observe parallel lines in everyday objects and buildings
- ✓ observe and make shapes which have line symmetry
- ✓ recognise and name special triangles and quadrilaterals
- ✓ recognise and name circles and their features.

Geometry is a part of mathematics that uses the facts about lines, angles, shapes, surfaces and solids.

Examples:

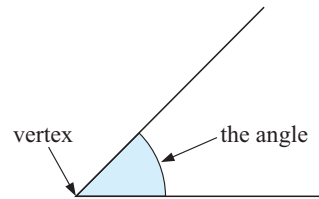


A ANGLES

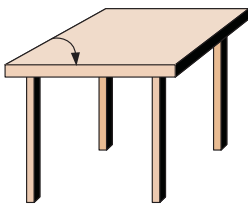
An **angle** is formed where two straight lines meet.

The angle is the amount of turning between the two lines.

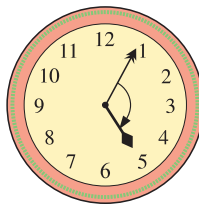
The point where the lines meet is called the **vertex** of the angle.



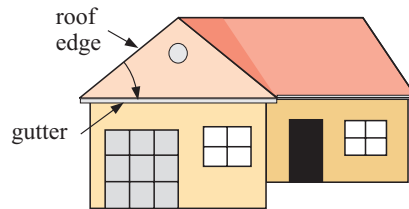
Here are some examples of angles.



the angle between two edges of a table top

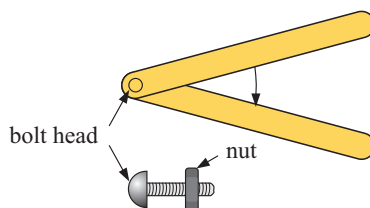


the angle between the hands of a clock



the angle between the roof edge and the gutter of a house

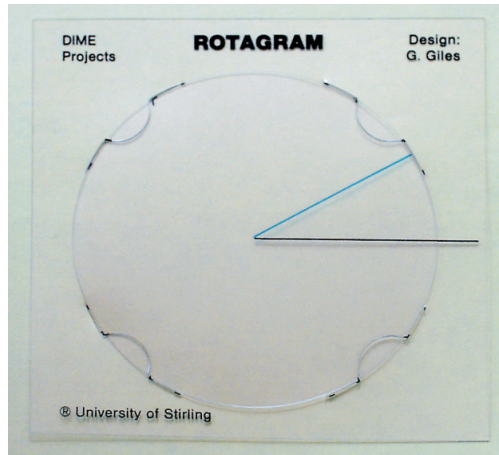
MOVING ANGLES



A moving angle can be made using iceblock sticks held together at one end with a tiny nut and bolt.

ROTAGRAMS

Rotagrams are made from plastic. A circular piece is able to rotate on top of a square piece. A line drawn from the centre of each piece helps to show angles.

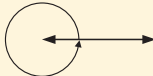
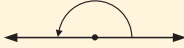
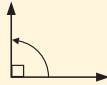
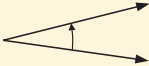




We will look at measuring angles in degrees later in the chapter.



NAMES OF ANGLES

Angles are given names depending on the amount of turning they have. This is called **classifying** angles according to their size.

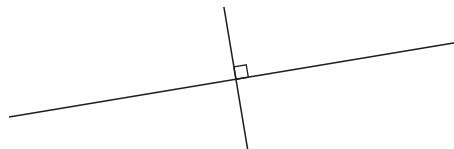
<p>Revolution</p>  <p>One complete turn 360°</p>	<p>Straight angle</p>  <p>$\frac{1}{2}$ turn 180°</p>	<p>Right angle</p>  <p>$\frac{1}{4}$ turn 90°</p>
<p>Acute angle</p>  <p>Less than a $\frac{1}{4}$ turn 0° to 90°</p>	<p>Obtuse angle</p>  <p>Between a $\frac{1}{4}$ turn and a $\frac{1}{2}$ turn 90° to 180°</p>	<p>Reflex angle</p>  <p>Between a $\frac{1}{2}$ turn and a full turn 180° to 360°</p>

A small square where two lines meet indicates a right angle, i.e.,



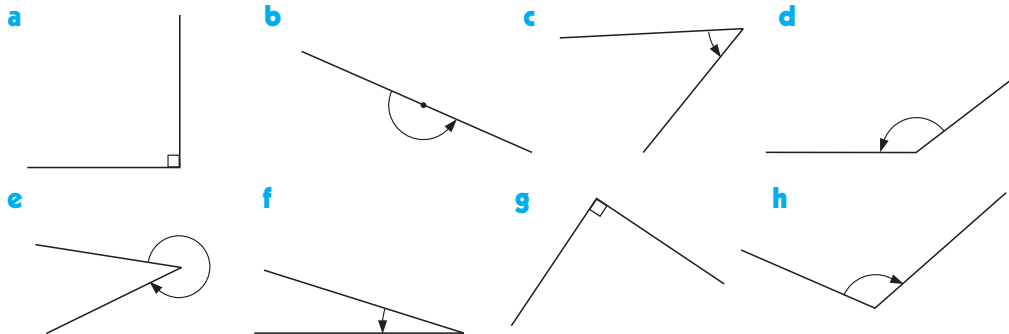
Lines which meet at right angles are **perpendicular**.

These lines are perpendicular.



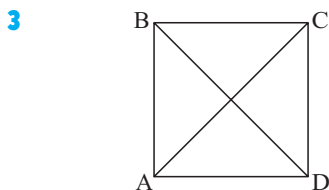
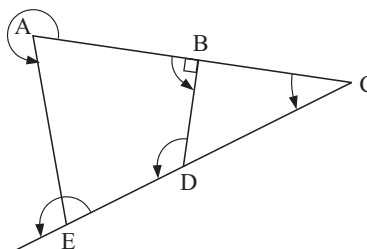
EXERCISE 2A

1 Name the following angles as acute, right angle, obtuse, straight angle or reflex.



2 Use the correct names to classify the angles marked at

- a A
- b B
- c C
- d D
- e E

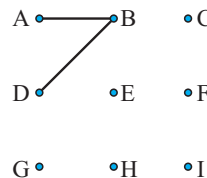


This diagram is a square with its two **diagonals** AC and BD drawn.

- a How many right angles does this figure have?
- b How many acute angles does it have?

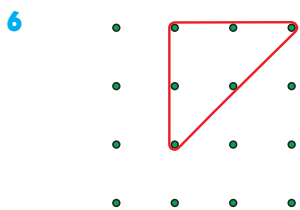
4 When AB and BD are drawn an acute angle is formed as shown. What angle type is drawn when we join

- a CF and FI
- b FI and HI
- c HI and HD
- d DF and HF?



5 Draw a figure which contains

- a three acute angles
- b a right angle and two acute angles
- c two obtuse angles, a right angle and an acute angle.



A coloured rubber band can be placed on the pegs of a geo-board to show an angle. The corner of the angle is not actually a point, but we suppose that it is.

Use a geo-board to construct each of the six angle types. Do this with your neighbour checking that you have done each one correctly. Swap tasks.

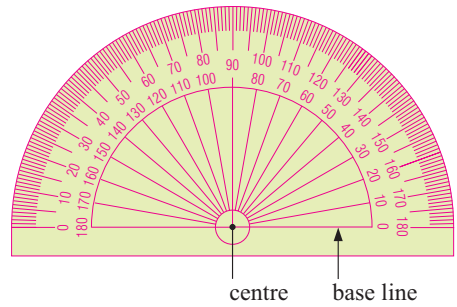


B MEASURING AND DRAWING ANGLES

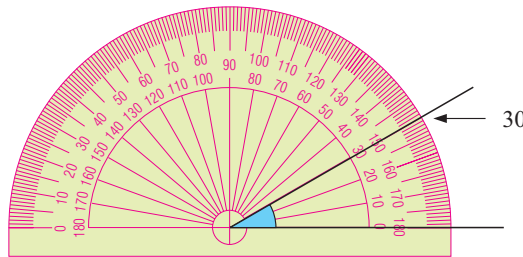
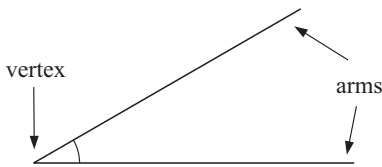
MEASURING ANGLES

We measure angle sizes with a protractor. A protractor measures angles in degrees. $^{\circ}$ is the symbol for degrees. To measure the size of the following angle we place a protractor on it.

- The centre of the protractor must be at the vertex of the angle.
- The baseline of the protractor must be along one arm of the angle.
- Start at 0° and measure to the other arm of the angle.



Check that you use the scale starting at zero on the baseline to read the correct size of the angle, for example, 30° not 150° .



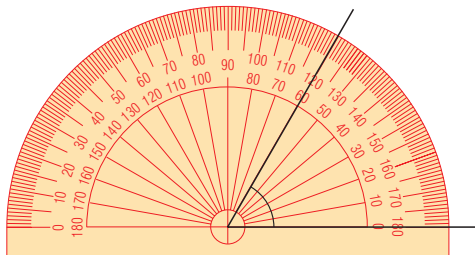
This angle is 30° , not 150°



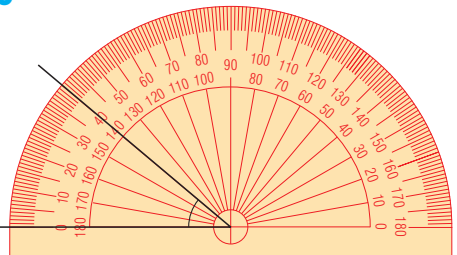
EXERCISE 2B

1 What angle size is measured in these cases?

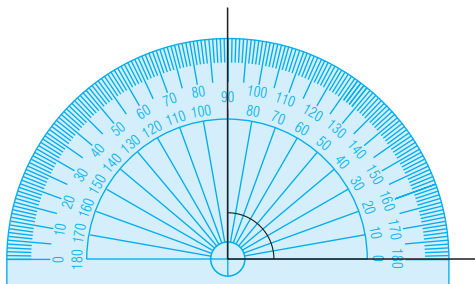
a



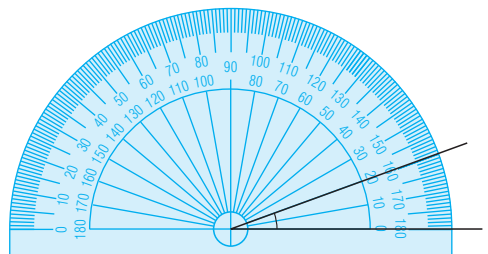
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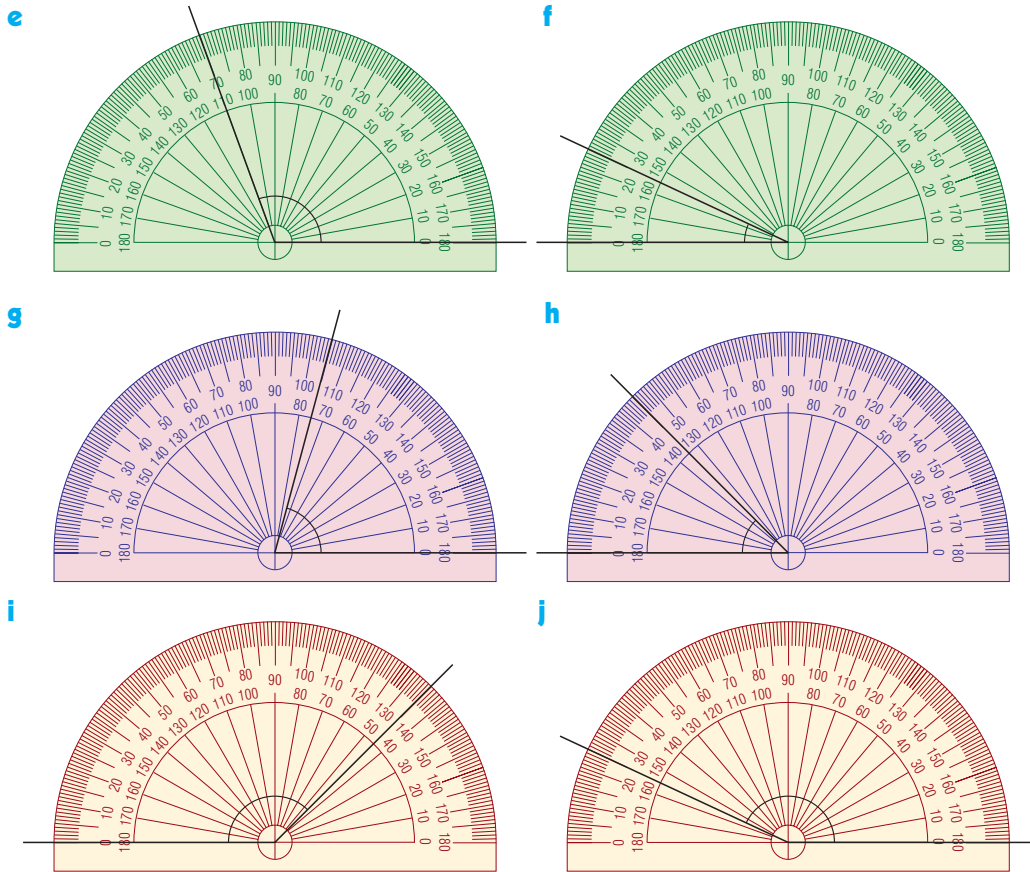


c



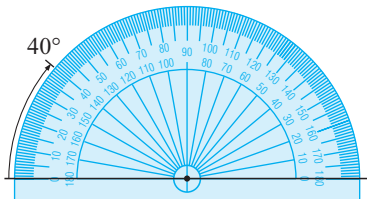
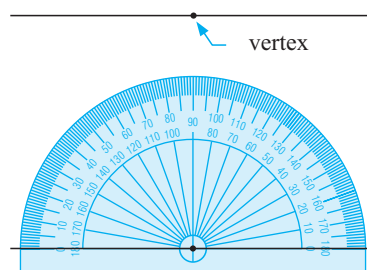
d





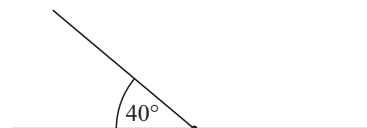
DRAWING ANGLES USING A PROTRACTOR

- Step 1:* Use a ruler to draw a line on your page.
- Step 2:* Mark a point on the line. This point is called the **vertex**.
- Step 3:* Place the baseline of the protractor on the line you have drawn. Make sure the centre of the protractor is on the vertex.



- Step 4:* Starting from **zero** count the number of degrees you want your angle to be. Mark the point at the edge of the protractor.

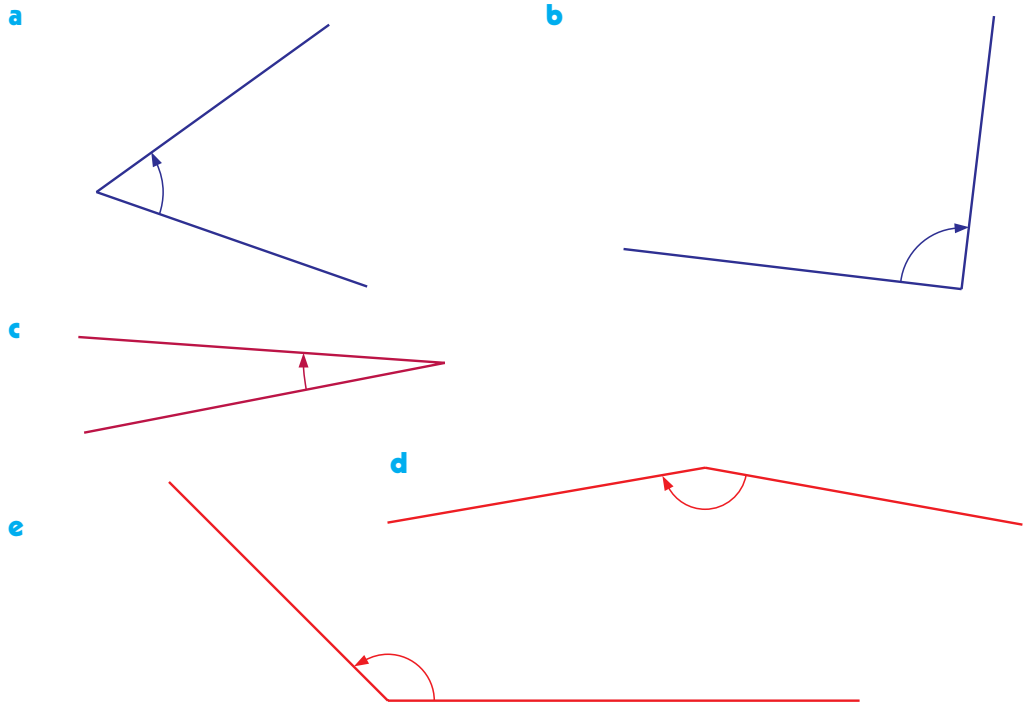
- Step 5:* Use your ruler to draw a line from the vertex to the point at the edge.



2 Use a protractor to draw these angles.

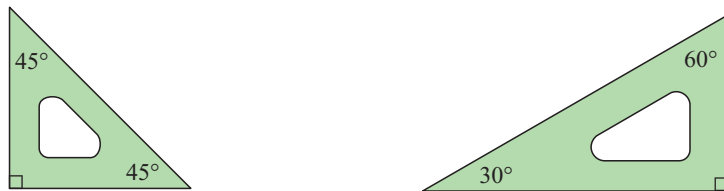
- a** 30° **b** 45° **c** 60° **d** 90° **e** 120° **f** 150°

3 Use a protractor to measure the size of these angles.

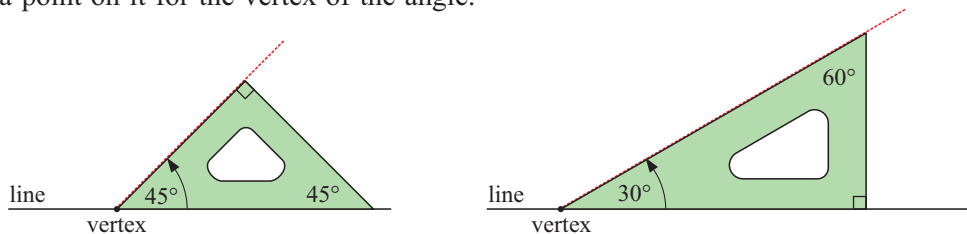


There are two set squares that are often used.

The 45° set square and the 30° - 60° - 90° set square.



We can use them to draw angles of 30° , 45° , 60° or 90° in this way. Draw a line and mark a point on it for the vertex of the angle.



Draw the other arm of the angle along the side of the set square. This is shown by the dotted line.

4 Use an appropriate set square to draw these angles.

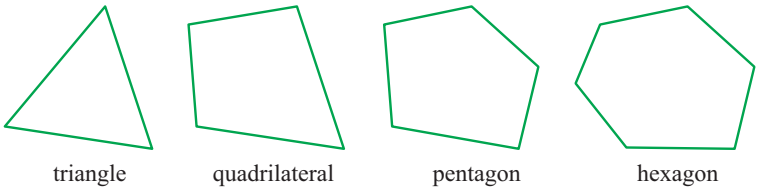
- a** 30° **b** 45° **c** 60° **d** 90° **e** 120° **f** 150°

C POLYGONS

A **polygon** is a closed figure (or shape) which has many straight line sides.

Poly means many. *Gon* means angle. The word *polygon* comes from the Greek language and means 'many angles'.

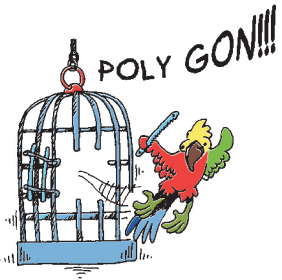
Here are some polygons.



These figures have no gaps, no cross-over lines and no curved sides. Here are some examples of polygons that we often see.

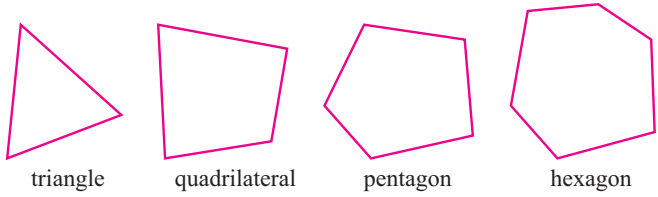


These figures are **not** polygons.



NAMING POLYGONS

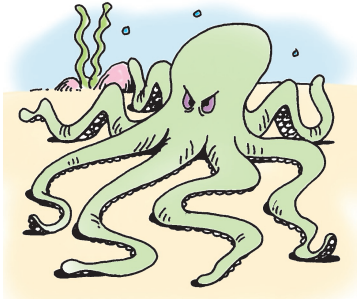
The simplest polygons are:



We use Greek words to name (classify) polygons depending on how many sides and angles they have.

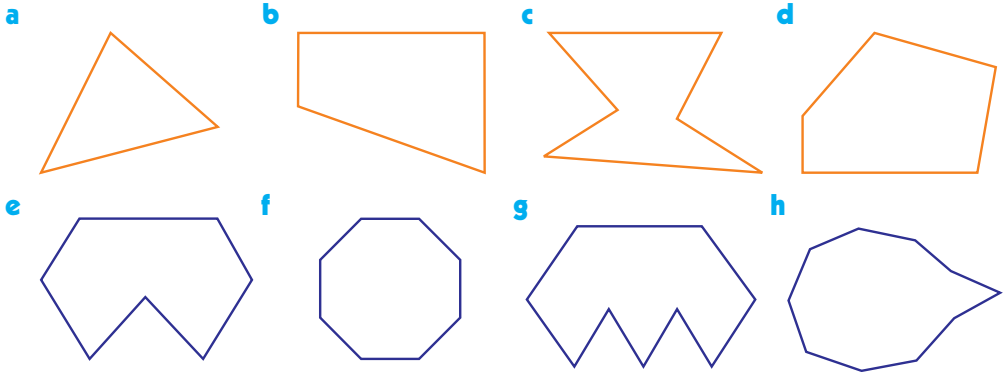
Triangle	3 angles	Quadrilateral	4 sides
Pentagon	5 angles	Hexagon	6 angles
Heptagon	7 angles	Octagon	8 angles
Nonagon	9 angles	Decagon	10 angles
Dodecagon	12 angles		

I am an **octopus** because I have 8 legs.



EXERCISE 2C

1 What names can be given to these shapes?

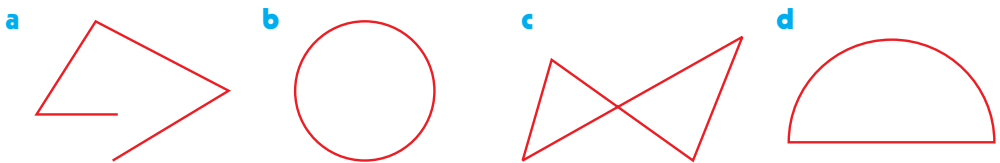


2 Give *two* examples in the environment of objects whose boundaries are polygons.

3 Draw sketches of these polygons.

- a a triangle with two equal sides
- b a pentagon
- c an octagon
- d a dodecagon

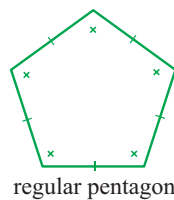
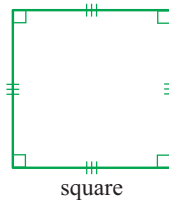
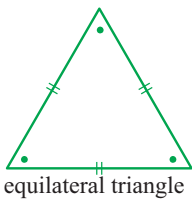
4 Why are these shapes not polygons?



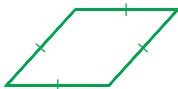
REGULAR POLYGONS

Members of the **regular polygon** family have

- all sides the same length and
- all angles the same size.



What do you think the markings on the sides of these figures mean?



This figure is not a regular polygon. It has equal sides, but its angles are not all equal.



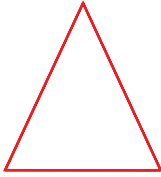
This figure is not a regular polygon. It has equal angles, but its sides are not all equal.



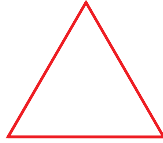
5 Give *three* examples in the classroom of objects whose boundaries are regular polygons. For example, the view of the end of a pen or pencil is a hexagon.

6 Which of these shapes are regular polygons?

a



b

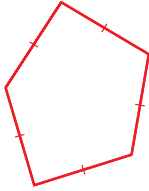


c

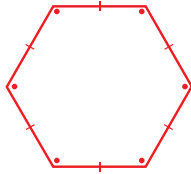


A regular polygon has equal sides and equal angles.

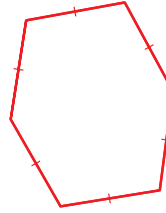
d



e

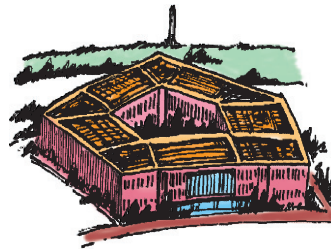


f



7 True or false?

- a A square is a regular quadrilateral.
- b A nonagon has nine sides.
- c A hexagon has five sides.
- d A regular hexagon has seven equal sides and seven equal angles.
- e A polygon with eleven sides has ten angles.



D

PARALLEL LINES

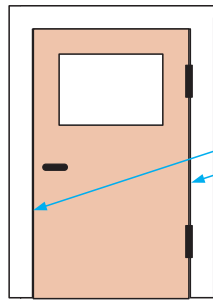
Parallel lines are lines which are always the same distance apart and so they will never meet.

These lines are parallel.

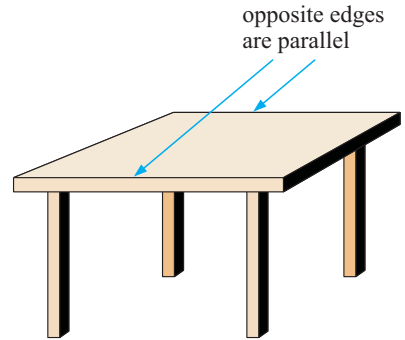


- Discussion**
- Look at the photograph and find examples of parallel lines.
 - Discuss sporting fields and courts which have parallel boundaries and markings.

- In your classroom there are many examples of parallel lines.
Here are two examples.



opposite sides are parallel

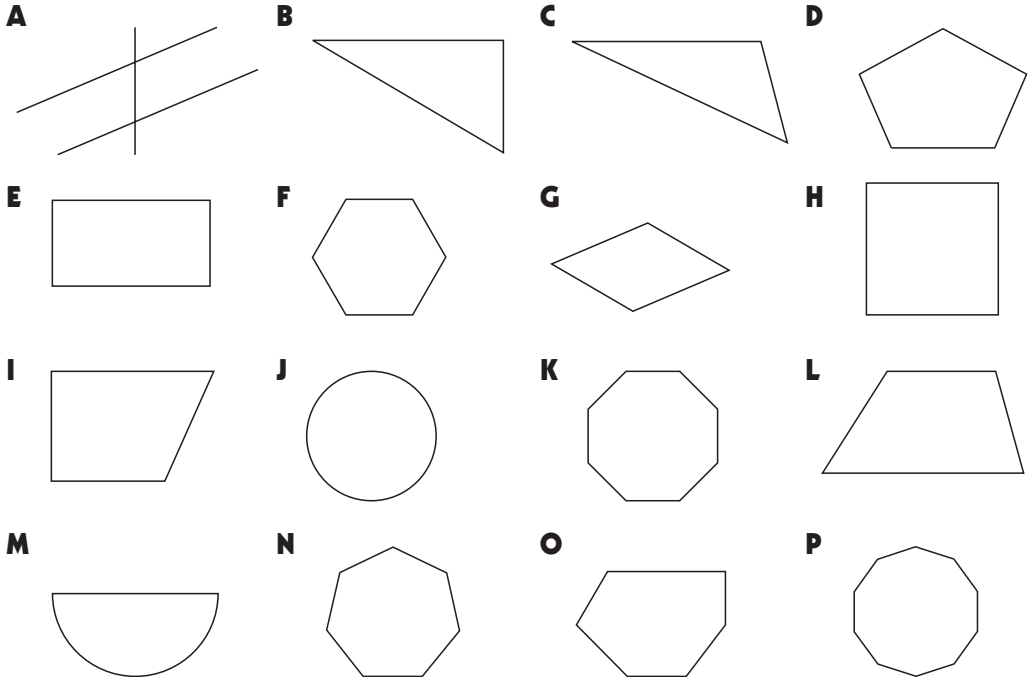


opposite edges are parallel

Find as many examples of parallel lines in your classroom as you can.

EXERCISE 2D

- 1 Look at these figures. Using the letters, list the figures which have parallel lines.



- 2 Describe what these road signs mean.



Which of them show parallel roads or lanes?

- 3 Give *three* examples of parallel lines found outside the classroom.

E SYMMETRICAL FIGURES


Your grandparents may remember when ink from inkwells was used for writing. Ink blots like those below could be made.



Children would place some ink or paint on a piece of paper and then fold the paper, forcing the ink to run in different directions.

These blots form **symmetrical figures**. The fold line is called the **line of symmetry**.

ACTIVITY
MAKING SYMMETRICAL BLOTS



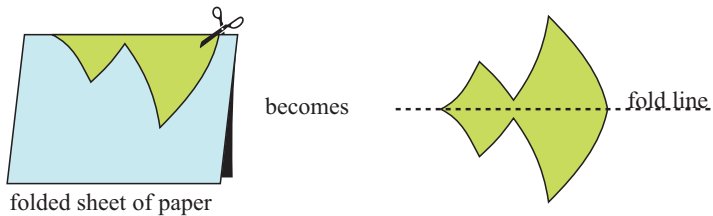
Materials needed: A4 paper and paint.

What to do:

- 1 Use a sheet of A4 paper. Put a *small* amount of paint to make a symmetrical blob in the centre of the page. Fold the paper through the paint blob. Press down in different directions to make the paint ‘run’.
- 2 Try two or more colours on another sheet. See what interesting patterns in colour you can make.
- 3 Display your results.

We can make symmetrical figures with paper and scissors.

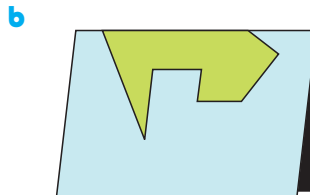
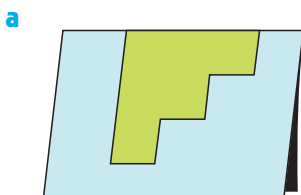
For example:



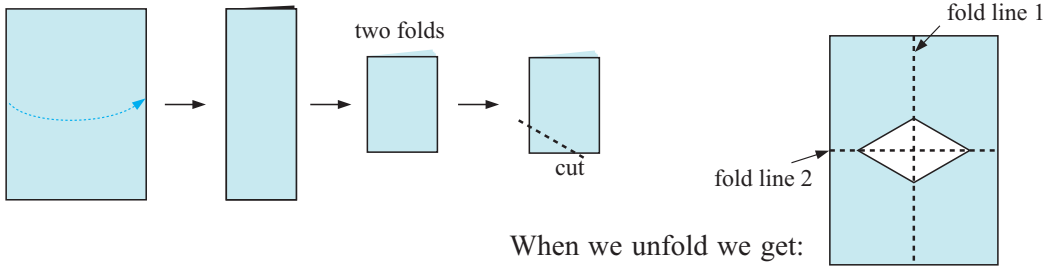
When you fold a symmetrical figure on its line of symmetry, the two halves will match up perfectly.

EXERCISE 2E

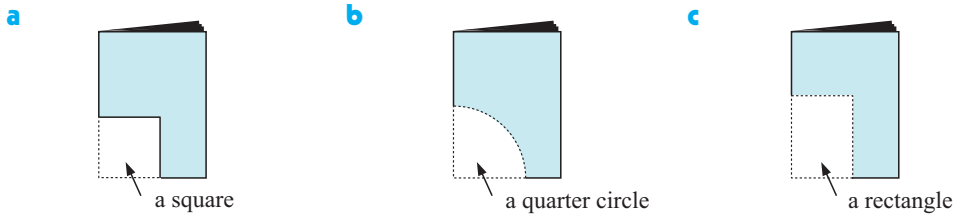
- 1 Cut out *two* different symmetrical patterns using paper and scissors.
- 2 Draw the cut out shape which results from these.



- 3 To make figures which have two lines of symmetry we can *double fold* the paper and make cuts on it. For example,



Draw the shape which results from cutting out from a double folded paper.



Mark any lines of symmetry on your figure.

- 4 Carefully sketch a ladybird or butterfly as viewed from above and show its line of symmetry.
- 5 Which letters of the alphabet are symmetrical?

F TRIANGLES AND QUADRILATERALS

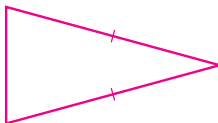
TRIANGLES

A **triangle** is a three-sided polygon.

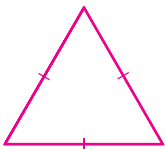
Triangles can be classified according to the length of their sides like this.



scalene - all three sides are different in length



isosceles - two sides are equal in length



equilateral - all three sides are equal in length

The same small marks on the side of a figure show equal lengths.



Note: An equilateral triangle is a special isosceles triangle.



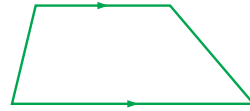
QUADRILATERALS

A **quadrilateral** is a four-sided polygon.

All four-sided polygons belong to the family of quadrilaterals.

Quadrilaterals can be classified according to the length of their sides. They can also be classified by the number of sides which are parallel.

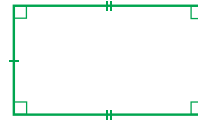
- A **trapezium** has one pair of opposite sides which are parallel.



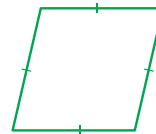
- A **parallelogram** has both pairs of opposite sides parallel. Opposite sides of a parallelogram are equal in length.



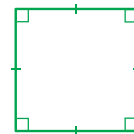
- A **rectangle** is a parallelogram with right-angled corners. Opposite sides of a rectangle are equal in length.



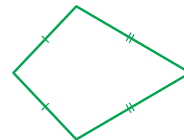
- A **rhombus** is a parallelogram with all four sides equal in length.



- A **square** is a rectangle with all sides equal in length. Both pairs of opposite sides of a square are parallel.



- A **kite** has two pairs of adjacent sides which are equal in length.



DISCUSSION

IN THE FAMILY OF QUADRILATERALS



Is a square a special parallelogram?

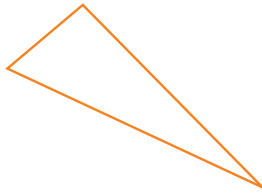
Is a square a special kite?

Is a parallelogram a special trapezium?

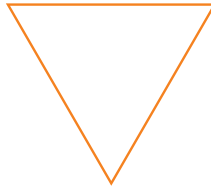
EXERCISE 2F

- 1 Use a ruler to measure the lengths of the sides of the following triangles. Classify the triangles as scalene, isosceles or equilateral.

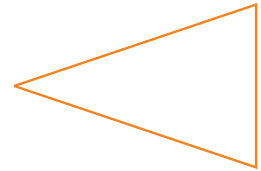
a



b



c



- 2 Draw an example of a

a rhombus

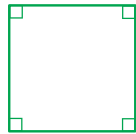
b rectangle

c trapezium

d parallelogram

- 3 Name the following quadrilaterals. (Use a ruler to help you.)

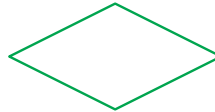
a



b



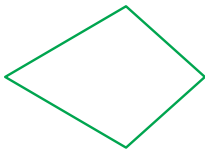
c



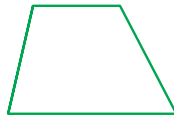
d



e



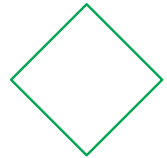
f



g



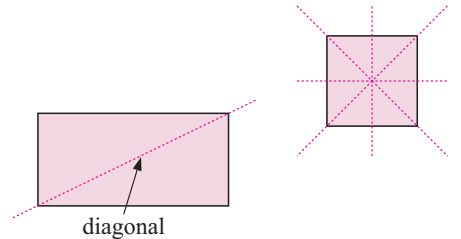
h



- 4 A square has four axes of symmetry.

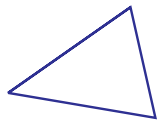
This means that if the square is cut out and folded along one of these lines one half will match up perfectly with its other half.

Cut a rectangle from a piece of paper. Fold it along a diagonal. Show that it does not have an axis (line) of symmetry along one of its diagonals.



- 5 For these shapes, copy and complete the table which follows.

a



b



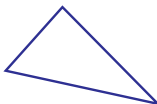
c



d



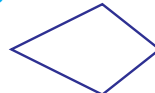
e



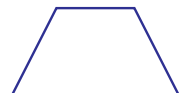
f



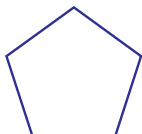
g



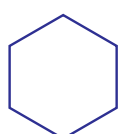
h



i



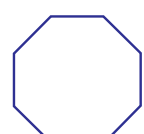
j



k



l



Shape	How many sides/angles?	Does it have any sides parallel?	How many lines of symmetry?	Is it regular?
a				
b				
c				
d				
e				
f				
g				
h				
i				
j				
k				
l				

PRINTABLE WORKSHEET







6 True or false?

- a A square is a special rhombus.
- b A square is a special rectangle.
- c A square is a parallelogram.
- d A rectangle is a parallelogram.

Extension

7 Copy and complete this table.

Shape				
Name				
Are opposite angles equal?				
Are opposite sides equal?				
Is it regular?				

PRINTABLE WORKSHEET



ACTIVITY

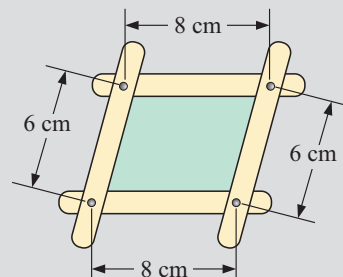
MAKING PARALLELOGRAMS



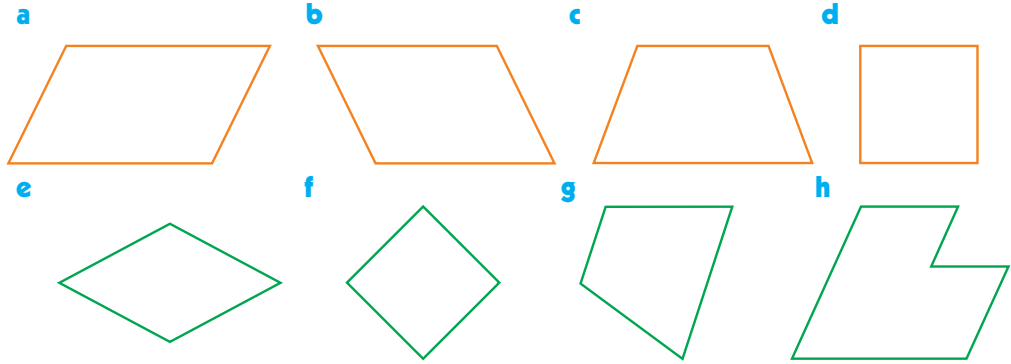
To make parallelograms with different angles you could use ice-block sticks.

What to do:

- 1 Join the ice-block sticks with four small bolts and nuts.
- 2 The parallelogram shaded may be changed by moving the wooden frame.
Use a pencil to draw inside the frame. Draw *five* different parallelograms.



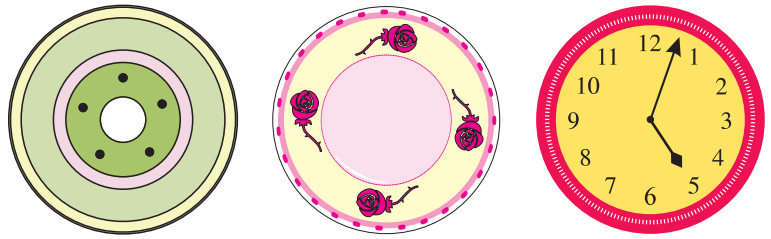
8 Which of these shapes are parallelograms?



G **CIRCLES**

THE CIRCLE

Most crockery and clock faces have an outline shape which is a **circle**. We say that their shapes are **circular**.



DISCUSSION



What are the advantages and disadvantages that

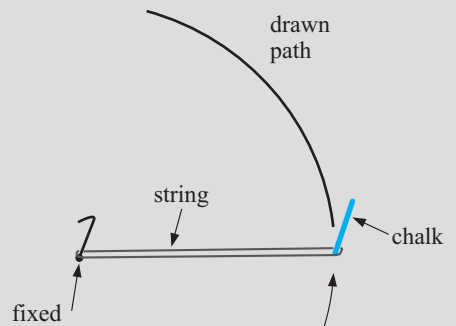
- circular plates would have over square plates
- circular buckets would have over rectangular buckets?

ACTIVITY **DRAWING A CIRCLE USING A PIECE OF STRING**



What to do:

- 1 Take a piece of string about 2 metres long and tie its ends together.
- 2 Place a peg at one end of the loop and a piece of chalk at the other end, as shown.
- 3 Hold the peg still. Keep the string taut while moving the chalk. The chalk will trace a circle. The peg will be the centre of the circle.



FACTS ABOUT CIRCLES

Every circle has a centre which lies inside its boundary.

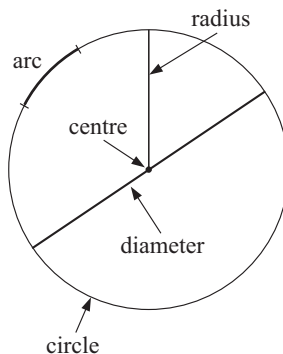


- Can you see the circles in the picture of the wheel with a tyre? The centre of each circle is at the centre of the axle.
- The centre of a clock is the point about which the hands move.

Every point on the circle is the same distance from the **centre**.

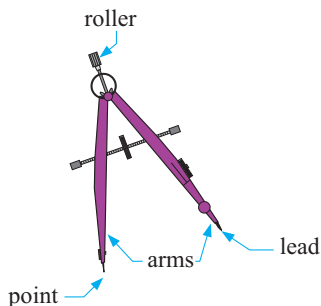
Any straight line from the centre to the circle is called a **radius**. Sometimes the length of this line is called the radius.

Any straight line which passes through the centre and starts and finishes on the circle is called a **diameter**.



An **arc** of a circle is part of the circle.

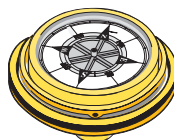
PAIR OF COMPASSES



A 'pair of compasses' is the correct name for the circle drawing device shown.

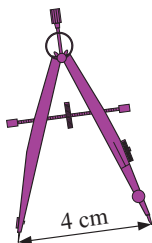
However, we frequently call it a 'geometrical compass' or simply a 'compass.'

A directional compass is used for finding directions.



EXERCISE 2G

1



If this 'compass' was used to draw a circle what would be its

- a radius
- b diameter?

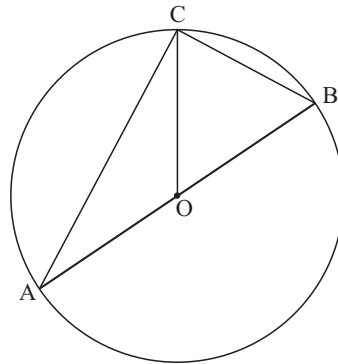
2 Use a geometrical compass to draw a circle of

- a radius 3 cm
- b radius 43 mm
- c diameter 8 cm
- d diameter 68 mm

- 3 a A circle has radius of length 5 cm. How long is a diameter of the circle?
- b A circle has a diameter of length 12 cm. How long is a radius of the circle?

4 For the drawn circle:

- a Name its centre.
- b If OA is the name given to one radius, what are the names of the other two radii shown?
- c Use the same naming method to name the diameter shown.
- d What is the length of the
 - i the radius of the circle
 - ii the diameter of the circle?



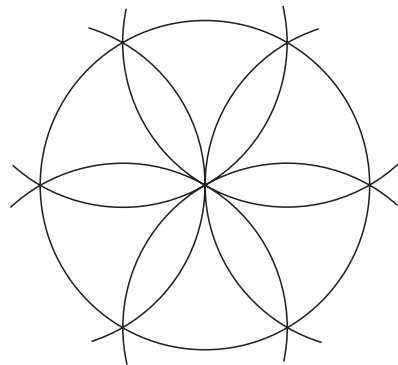
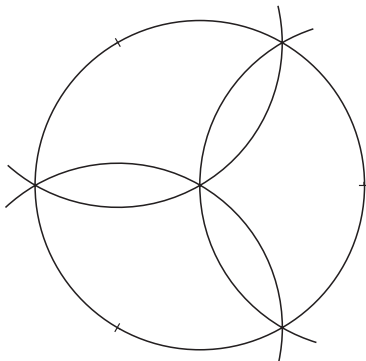
More than one radius are called radii.



5 Draw a circle of radius 4 cm and without changing the distance between the compass points, draw these patterns.

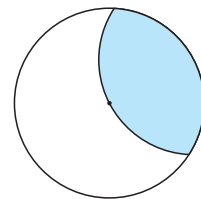
a the flower pattern

b the propeller pattern



6 For a propeller pattern, colour the *three* shapes like the one shown with the three colours blue, yellow and red.

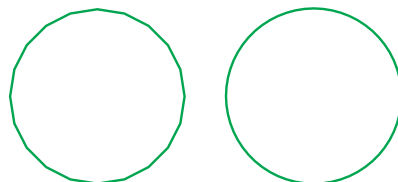
Yes, there is overlap of colours!

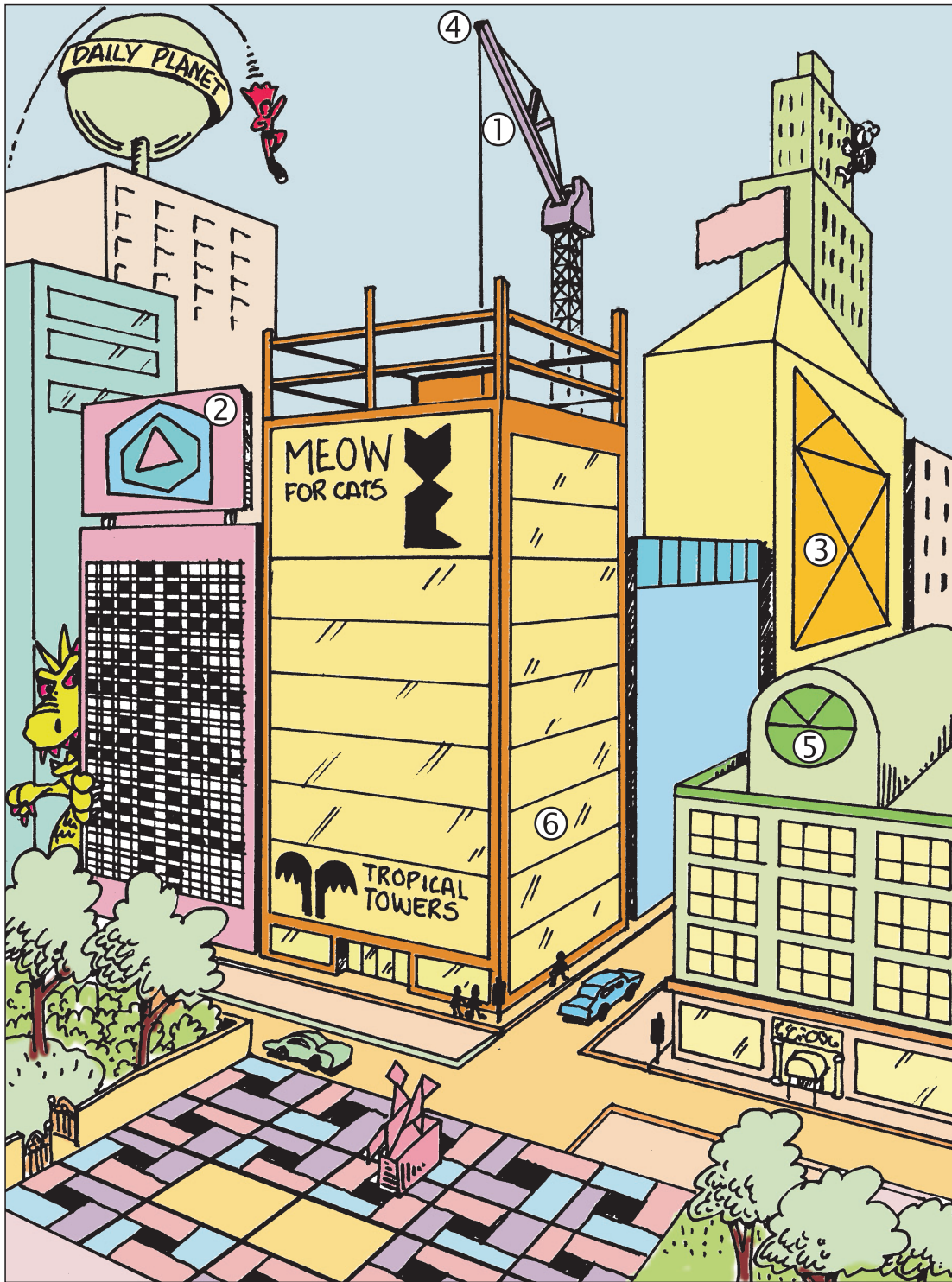


7 Look at these regular polygons.



Write down what you notice as you move from one to the next, left to right. Here is a 20-sided and 30 sided polygon.





SKILL TESTER

PLANE GEOMETRY

Use the drawing on the page alongside to answer these questions.

- 1 The angle formed by the crane at (1) is an angle.
A curved **B** straight **C** acute **D** right **E** reflex
- 2 Name the four polygons at (2) starting with the one with the least number of sides.
- 3 How many triangles can you make from the pattern at (3)?
- 4 Point (4) is the
A vertex **B** highest **C** cutest **D** scalene
- 5 What special names can be given to the lines at (5)?
- 6 Choose the best geometrical word to describe how the two streets meet.
A parallel **B** intersect **C** dead end **D** perpendicular
- 7 Draw and name Meow's missing piece.
- 8 Look at the building with the flag. What word would best describe each shaded shape under the flag pole?
A triangular **B** equilateral **C** obtuse **D** pyramid
- 9 Finish the following sentence by choosing one word from each row.

“The Tropical Towers logo has a

horizontal
vertical
diagonal

line
angle
rotation

of

circumference
tessellation
symmetry

.”

Extension

- 10 How many sets of parallel lines can you find? Name five of them.
- 11 You are looking straight at the middle of (6). Choose the best possible word to describe the shape you see.
A parallelogram **B** rhombus **C** trapezium **D** rectangle
- 12 Use the language of geometry to list four things wrong with this picture.

ACTIVITY

CIRCUMFERENCE

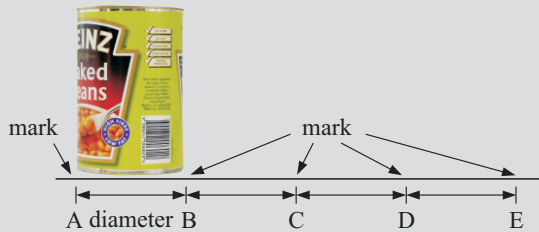


The distance around a circle is called its **circumference**. Is there any connection between a circle's circumference and its diameter?

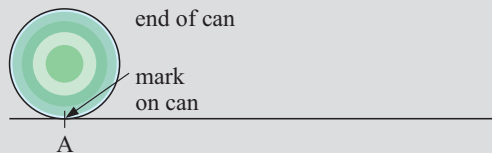
You will need: *three* tin cans of different diameter.

**What to do:**

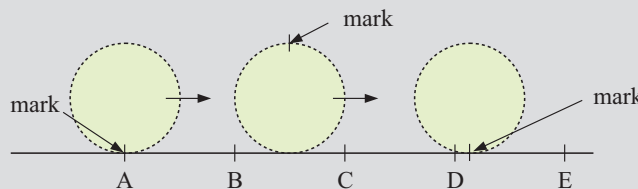
- 1 Take one of the cans. Mark out its diameter on a flat surface on a straight line. Repeat this length 4 times.



- 2 Place a mark on the circular rim of the can. Place the can on its side so that the mark lines up with mark A on the surface.



- 3 Roll the can along the line until the mark on the can is once again at the bottom. It has now turned one revolution.

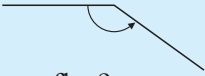



- 4 Copy and complete:

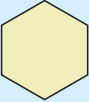
"The circle's circumference is a little more than times its diameter."

- 5 Test out your finding in 4 by repeating the steps with the other two cans.

MENTAL SET 2A

1  Acute, obtuse or reflex?

2 Polygon name? 

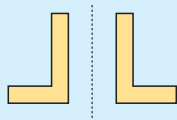
3  How many pairs of parallel sides?

4 How many lines of symmetry does a square have?

5 A triangle with all equal sides is called

6 A circle has radius 12 cm. How long is its diameter?


7 A regular 4-sided polygon is called a

8  This line is called a line of

9 Parallel lines are lines which meet.

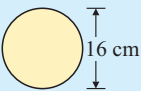
10  This is called an

MENTAL SET 2B

1  Polygon or not?

2 How many right angles has a rectangle?


3 Sketch a parallelogram


4  Radius is cm long.

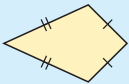
5  How many acute angles?

6 *True or false:* A rhombus is a regular quadrilateral.

7 A quadrilateral with one pair of parallel sides is called a

8  How many lines of symmetry?

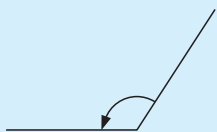
9 Sketch a circle and draw a diameter on it. 

10  is called a

REVIEW EXERCISE 2

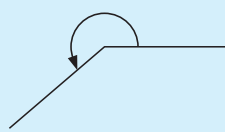
1 Name these angles as acute, right angle, obtuse, straight angle or reflex.

a

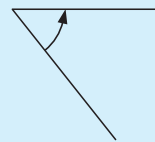


b $\frac{1}{4}$ turn

c

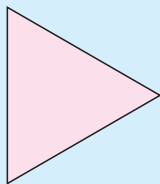


d

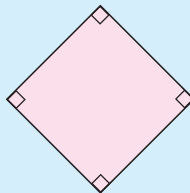


2 Name these polygons. (Use a ruler to help you.)

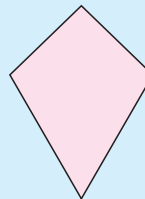
a



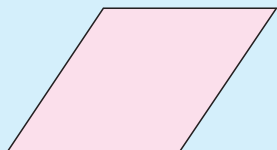
b



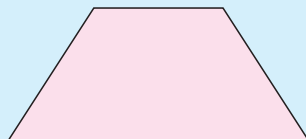
c



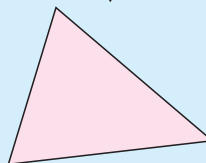
d



e

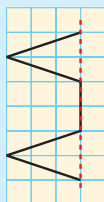


f

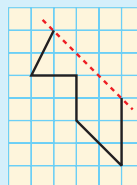


3 Copy and complete these figures given that the dotted line is a line of symmetry.

a

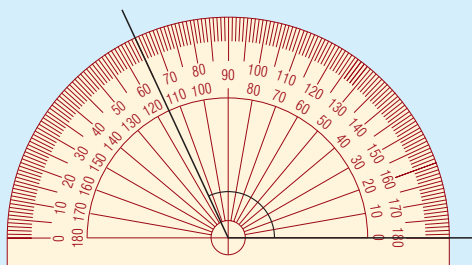


b



4 Draw a sketch of a regular hexagon and mark on it all lines of symmetry.

5 What angle size is shown?

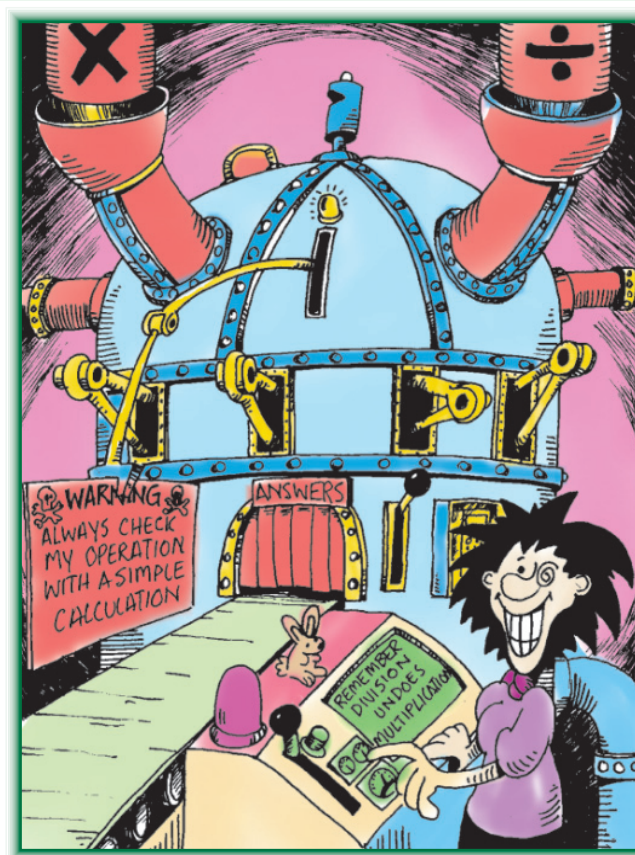


- 6
- Using a 'pair of compasses' draw a circle of radius 4 cm.
 - Let O be the centre of the circle and let A be any point on the circle. What will be the length of OA?
 - Use your ruler to check your answer.
 - Draw a diameter of the circle from the point A. What will be the length of this diameter?
 - Check your answer using your ruler.

Chapter 3

Multiplying and dividing whole numbers

In this chapter you should learn to:



- ✓ quickly answer times tables up to 10×10
- ✓ split whole numbers into their factors
- ✓ identify which whole numbers are prime numbers
- ✓ find multiples of whole numbers
- ✓ multiply whole numbers by 10, 100 and 1000
- ✓ identify square numbers
- ✓ estimate the result when multiplying
- ✓ use different strategies to multiply whole numbers
- ✓ divide by a single digit number by equal sharing
- ✓ use a division method
- ✓ estimate the result of a division
- ✓ solve everyday problems using either multiplication or division
- ✓ use an electronic calculator to do multiplication and divisions
- ✓ use the correct order of doing operation

Why do we use multiplying?

How would you like to have to add 3769 seven times?



I would not do that. It would take ages. I would multiply 3769 by 7. It would be much quicker.



The quick way of writing $23 + 23 + 23 + 23 + 23 + 23 + 23 + 23 + 23 + 23 + 23 + 23$ is 12×23 as there are 12 lots of 23 here.

Multiplying is a quicker way of doing additions of the same amount.

BASIC MULTIPLICATION TABLES

If you know your *times-tables* you will find the work in this chapter easier to do.

Here are some **hints** to help you learn these very important facts:

- Find out the ones you already know and write them down without looking at the table.
- For those you don't know, write them on flash cards. For example, on one side write 3×7 and on the other write the answer 21. At home get a family member to test you on saying your 7 times tables (make sure the set is well shuffled at the start).
- Say the tables you don't know out loud to yourself each night.

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100



A

FACTORS

We know that $1 \times 8 = 8$ and $2 \times 4 = 8$.

We say that 1, 2, 4 and 8 are **factors** of 8.

There are no other pairs of whole numbers that multiply to give 8.

We say that 8 has **factor pairs** of 1 and 8, 2 and 4.

Notice that

$$8 \div 1 = 8 \quad 8 \div 2 = 4 \quad 8 \div 4 = 2 \quad 8 \div 8 = 1$$

8 divided by any of its factors results in another of its factors.



EXERCISE 3A

1 Write down all the factor pairs of

a 6 b 7 c 10 d 11 e 12 f 16 g 24

2 List all the factors of

a 3 b 4 c 6 d 9 e 10 f 18 g 36

For larger numbers, like 54, we can find the factors in this way.

smallest to largest factors	$1 \times 54 = 54$	
	$2 \times 27 = 54$	
	$3 \times 18 = 54$	← 4 and 5 are not factors of 54
	$6 \times 9 = 54$	← 7 and 8 are not factors of 54

So the factors of 54 are 1, 2, 3, 6, 9, 18, 27 and 54.

3 List all the factors of

a 40 b 48 c 60 d 75 e 84

PRIME NUMBERS

Prime numbers are whole numbers which have exactly two different factors.

1 is not a prime number as it does not have two different factors.

$2 = 1 \times 2$, so 2 is the smallest prime number and it has only 1 and 2 as factors.

$4 = 1 \times 4$ and $4 = 2 \times 2$, so 4 is not a prime number as 4 has factors of 1, 2 and 4.

4 Which numbers are prime?

a 5 b 6 c 11 d 14 e 28

Composite numbers are whole numbers which have more than two factors.

8 is a composite number as its factors are 1, 2, 4 and 8.

5 a Copy and complete this table of factors.

<i>Number</i>	<i>Factors</i>	<i>Number</i>	<i>Factors</i>	<i>Number</i>	<i>Factors</i>
1	1	11		21	
2	1, 2	12		22	
3		13		23	
4	1, 2, 4	14		24	
5		15		25	
6		16		26	
7		17		27	
8		18		28	
9		19		29	
10		20		30	

2 is the only even prime number.



- b 2 has two factors. Shade the numbers in the table which have only two factors.
 c List all the prime numbers in the table.

6 List all the prime numbers between 10 and 20.

7 List all the composite numbers less than 15.

We can use a **factor tree** to write a number as the product of its *prime factors*.

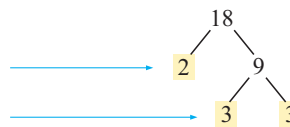


For example, to write 18 as a product of its prime factors:

The smallest prime factor of 18 is **2**. Its factor pair is 9.

The smallest prime factor of 9 is **3**. Its factor pair is **3**.

There are no more prime factors. So $18 = 2 \times 3 \times 3$.



8 Use factor trees to find the product of prime factors of these numbers.

a 12

b 24

c 36

d 60

B

MULTIPLES

The multiples of 3 are:

$$1 \times 3 = 3, \quad 2 \times 3 = 6, \quad 3 \times 3 = 9, \quad 4 \times 3 = 12, \dots$$

So, these are **3, 6, 9, 12, 15, 18, 21** and so on.

These are the answers to the 'three times tables'.



EXERCISE 3B

1 Make a list of the first ten multiples of these numbers.

a 4

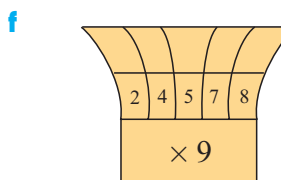
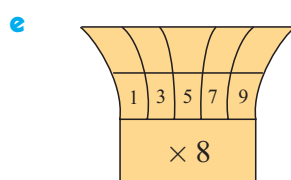
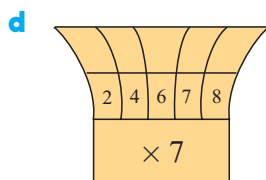
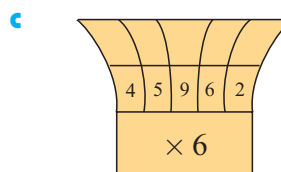
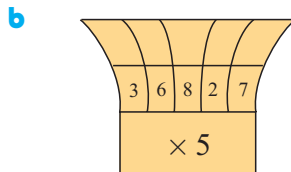
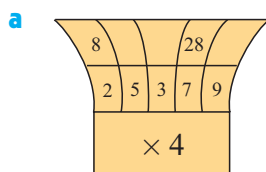
b 5

c 6

d 8

e 11

2 Copy and complete these multiple trees.



3 List the multiples of 4 between 20 and 30.

4 Find the fifth multiple of 12.

5 a List the first five multiples of 20.

b List the first four multiples of 25.

SQUARE NUMBERS

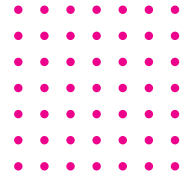
A **square number** can be shown as a square array of dots.

For example,

4 is a square number



49 is a square number



Notice that $4 = 2 \times 2$ and $49 = 7 \times 7$.

When a number is multiplied by itself the result is a **square number**.

We can use a small number 2 to indicate a square number.

For example, $7^2 = 49$.

We say that 7 squared equals $7 \times 7 = 49$.

6 Find the first ten square numbers. Start with $1 \times 1 = 1$.

7 Show that these are square numbers by filling in the boxes.

a $11 \times \square = 121$

b $\square \times \square = 400$

c $\square \times \square = 900$

8 Copy and complete these.

a $4^2 = \dots\dots$

b $5^2 = \dots\dots$

c $9^2 = \dots\dots$

d $11^2 = \dots\dots$

C

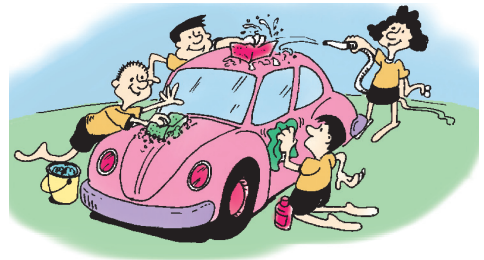
MULTIPLYING BY 10, 100, 1000

If you get \$3 for washing the car each week, how much will you earn in 10 weeks, 100 weeks or 1000 weeks?

For 10 weeks you earn

$$\begin{aligned} & \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 \\ & = \$30 \end{aligned}$$

That is, $\$3 \times 10 = \30



The rule for multiplying by 10 is:

When multiplying a whole number by 10, we place **one zero** on the end of it.

For example, $8 \times 10 = 80$ $23 \times 10 = 230$ $1719 \times 10 = 17190$.

EXERCISE 3C

1 What number goes into the box to make these true?

a $7 \times 10 = \square$

b $8 \times 10 = \square$

c $5 \times 10 = \square$

d $9 \times 10 = \square$

e $6 \times \square = 60$

f $\square \times 10 = 20$

g $16 \times 10 = \square$

h $42 \times 10 = \square$

i $72 \times 10 = \square$

j $32 \times \square = 320$

k $\square \times 10 = 530$

l $\square \times 10 = 610$

What happens when we multiply by 100?

$$\begin{aligned} & \$3 \text{ each week for 100 weeks} \\ & = \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \$3 + \dots \text{ one hundred of them} \\ & = \$300 \end{aligned}$$

The rule for multiplying by 100 is:

When multiplying a whole number by 100, we place **two zeros** on the end of it.

For example, $7 \times 100 = 700$, $31 \times 100 = 3100$, $157 \times 100 = 15\,700$

2 What number goes into the box to make these true?

a $8 \times 100 = \square$

b $7 \times 100 = \square$

c $6 \times 100 = \square$

d $5 \times \square = 500$

e $2 \times \square = 200$

f $\square \times 100 = 900$

g $24 \times 100 = \square$

h $32 \times 100 = \square$

i $69 \times 100 = \square$

j $53 \times \square = 5300$

k $\square \times 100 = 3600$

l $42 \times \square = 4200$

3 Copy and complete.

a When multiplying a whole number by 1000, we place zeros on the end of it.

b When multiplying a whole number by 10 000, we place zeros on the end of it.

4 What number goes into the box to make these true?

a $4 \times 1000 = \square$

b $7 \times 1000 = \square$

c $5 \times \square = 5000$

d $6 \times 10\,000 = \square$

e $\square \times 10\,000 = 90\,000$

f $3 \times \square = 30\,000$

5 What number goes in the box to make these true?

a $7 \times \square = 70$

b $7 \times \square = 700$

c $7 \times \square = 7000$

d $9 \times \square = 900$

e $9 \times \square = 90$

f $9 \times \square = 9000$

g $\square \times 4 = 4000$

h $\square \times 4 = 400$

i $\square \times 4 = 40$

j $\square \times 11 = 1100$

k $\square \times 11 = 110$

l $\square \times 11 = 11\,000$

6 Find mentally

a 43×10

b 43×100

c 43×1000

d 10×43

e 100×43

f 1000×43

g 10×10

h 10×100

i 10×1000

j 100×100

k 100×1000

l 114×10

m 114×100

n 114×1000

o 10×871

p 100×871

MORE MULTIPLYING

Look at this:

$$2 \times 3 = 6$$

and $2 \times 30 = 2 \times 3 \times 10 = 60$

and $2 \times 300 = 2 \times 3 \times 100 = 600$



2×30 is 10 times larger than 2×3 .
 2×300 is 100 times larger than 2×3 .

7 Complete mentally

a $3 \times 5 =$	b $3 \times 50 =$	c $3 \times 500 =$	d $3 \times 5000 =$
e $30 \times 5 =$	f $300 \times 5 =$	g $3000 \times 5 =$	h $30 \times 50 =$

8 Complete mentally

a $4 \times 7 =$	b $4 \times 70 =$	c $4 \times 700 =$	d $4 \times 7000 =$
e $40 \times 7 =$	f $400 \times 7 =$	g $4000 \times 7 =$	h $40 \times 70 =$

9 Complete mentally

a $7 \times 9 =$	b $7 \times 90 =$	c $7 \times 900 =$	d $7 \times 9000 =$
e $70 \times 9 =$	f $700 \times 9 =$	g $7000 \times 9 =$	h $70 \times 90 =$

10 Complete mentally

a $2 \times 5 =$	b $2 \times 50 =$	c $2 \times 500 =$	d $2 \times 5000 =$
e $20 \times 5 =$	f $200 \times 5 =$	g $2000 \times 5 =$	h $20 \times 50 =$

11 Replace \square by $>$, $<$ or $=$ to make a true statement.

a $8 \times 50 \square 80 \times 5$	b $8 \times 500 \square 8000 \times 5$
c $800 \times 5 \square 8 \times 500$	d $8 \times 5000 \square 80 \times 50$

ACTIVITY**MENTAL MULTIPLICATION**

These multiplications can be done in your head (that is, mentally).
Do not use a pen or pencil to find the answer.

1 $2 \times 5 \times 8$	2 $50 \times 2 \times 19$	3 $4 \times 5 \times 15$	4 $4 \times 25 \times 7$
5 $4 \times 29 \times 25$	6 $31 \times 50 \times 2$	7 $5 \times 18 \times 200$	8 $250 \times 17 \times 4$

Tell your teacher the quick method you used to find the answers.

D**ESTIMATING MULTIPLICATIONS**

A good way to check if we have multiplied two numbers correctly is to estimate our answer. This is useful when we are using a calculator to answer a problem and we need to check that we have not pushed the wrong keys.

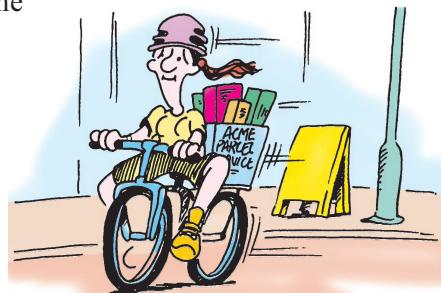
For example,

- Briony earns \$48 per week. How much will she earn in 7 weeks?

Estimate: $48 \times 7 \approx 50 \times 7 \approx \350
 \approx means 'is approximately equal to'.

- John travels 12 km to school each day on his bike. How far would he travel over the 39 week school year?

Estimate: $39 \times 12 \approx 40 \times 10 \approx 400$ km



EXERCISE 3D

1 Estimate the answer to these problems by rounding each number to the nearest 10.

a
$$\begin{array}{r} 29 \\ \times 9 \\ \hline \end{array}$$

b
$$\begin{array}{r} 43 \\ \times 8 \\ \hline \end{array}$$

c
$$\begin{array}{r} 68 \\ \times 11 \\ \hline \end{array}$$

d
$$\begin{array}{r} 32 \\ \times 18 \\ \hline \end{array}$$

e
$$\begin{array}{r} 69 \\ \times 31 \\ \hline \end{array}$$



$$\begin{array}{r} 412 \\ \times 7 \\ \hline \end{array}$$
 That's about
 400×7

To estimate 412×7 we round 412 to the nearest 100.

So 412×7 is approximately $400 \times 7 \approx 2800$

2 Estimate in hundreds the answer to these.

a
$$\begin{array}{r} 192 \\ \times 2 \\ \hline \end{array}$$

b
$$\begin{array}{r} 384 \\ \times 3 \\ \hline \end{array}$$

c
$$\begin{array}{r} 217 \\ \times 9 \\ \hline \end{array}$$

d
$$\begin{array}{r} 773 \\ \times 8 \\ \hline \end{array}$$

3 Estimate in thousands the answer to these.

a
$$\begin{array}{r} 3817 \\ \times 2 \\ \hline \end{array}$$

b
$$\begin{array}{r} 4763 \\ \times 5 \\ \hline \end{array}$$

c
$$\begin{array}{r} 5119 \\ \times 3 \\ \hline \end{array}$$

d
$$\begin{array}{r} 1998 \\ \times 4 \\ \hline \end{array}$$

4 Estimate the answer to these problems by rounding each number to the nearest 10 or 100.

a
$$\begin{array}{r} 121 \\ \times 9 \\ \hline \end{array}$$

b
$$\begin{array}{r} 289 \\ \times 11 \\ \hline \end{array}$$

c
$$\begin{array}{r} 99 \\ \times 19 \\ \hline \end{array}$$

d
$$\begin{array}{r} 724 \\ \times 21 \\ \hline \end{array}$$

e
$$\begin{array}{r} 687 \\ \times 32 \\ \hline \end{array}$$

5 Erik earned \$41 a day for 11 days. Estimate how much he earned in total.

6 Amelia was able to deliver 87 pamphlets a day for 19 days. Estimate how many pamphlets she delivered in total.

7 Estimate how much I will receive over six weeks if I am paid \$513 a week.

E

MULTIPLICATION

PLACE VALUE METHOD OF MULTIPLICATION

Sam bought six cows and each one cost him \$238.

How much did Sam pay for the herd?

We need to calculate 6 lots of \$238, that is 238×6 .

Here is a method of multiplying:

HTO	
$\begin{array}{r} 238 \\ \times 6 \\ \hline 48 \\ 180 \\ 1200 \\ \hline 1428 \end{array}$	$238 = 200 + 30 + 8$
← this is 8×6	8
← this is 30×6	180
← this is 200×6	1200

'lots of' indicate that we should multiply the numbers.



This method could be called the **place value method**.

EXERCISE 3E

1 Write in expanded form. For example, $378 = 300 + 70 + 8$

- a** 163 **b** 293 **c** 318 **d** 406 **e** 728 **f** 2305

2 Complete these multiplications.

a

$$\begin{array}{r} 213 \\ \times 5 \\ \hline \end{array}$$

← 3×5
 ← 10×5
 ← 200×5
 ← 213×5

b

$$\begin{array}{r} 324 \\ \times 4 \\ \hline \end{array}$$

← 4×4
 ← 20×4
 ← 300×4
 ← 324×4

c

$$\begin{array}{r} 436 \\ \times 6 \\ \hline \end{array}$$

← 6×6
 ← 30×6
 ← 400×6
 ← 436×6

d

$$\begin{array}{r} 502 \\ \times 7 \\ \hline \end{array}$$

← 2×7
 ← 0×7
 ← 500×7
 ← 502×7

e

$$\begin{array}{r} 675 \\ \times 8 \\ \hline \end{array}$$

←
 ←
 ←
 ←

f

$$\begin{array}{r} 839 \\ \times 9 \\ \hline \end{array}$$

←
 ←
 ←
 ←

3 Multiply

- a** 173 by 6 **b** 406 by 5 **c** 123 by 8 **d** 468 by 3
e 308 by 7 **f** 555 by 3 **g** 803 by 9 **h** 680 by 4
i 129 by 9 **j** 312 by 4 **k** 456 by 6 **l** 964 by 7

4 Find

- a** 218×7 **b** 725×4 **c** 369×8 **d** 421×5
e 888×3 **f** 704×8 **g** 306×9 **h** 834×5
i 468×9 **j** 277×3 **k** 864×6 **l** 897×7

5 Find

- a** $\$369 \times 4$ **b** $\$418 \times 9$ **c** $\$738 \times 7$ **d** $\$808 \times 8$

6 Solve these problems:

- a** Three shearers were each given 132 sheep to shear in a day. How many sheep were shorn?
b Find the cost of 4 tennis racquets priced at \$287 each.
c 983 people each paid \$7 for a ticket to the Agricultural Show. How much was paid in total?



- d** If eight students ran 655 metres each in a relay, how far did they run in total?
- e** Five trucks were each loaded with identical cargo weighing 678 kg. What was the total mass carried by the trucks?
- f** Grandpa gave each of his four grandchildren \$375. How much did he give them in total?
- g** If I bought three bicycles each costing \$599, how much would I pay altogether?
- h** Find the number of days in four consecutive years.

Consecutive means one after the other.



Multiplying numbers with thousands is done in the same way as multiplying numbers with hundreds.

For example, 1387×5

Th	H	T	O	
1	3	8	7	
			× 5	
		3	5	← 7×5
	4	0		← 80×5
	1	5	0	← 300×5
	5	0	0	← 1000×5
	6	9	3	5

7 Find

a 1423×8

b 1304×5

c 2134×3

d 3042×7

e 4068×4

f 1919×9

g 1544×6

h 4224×5

ANOTHER METHOD OF MULTIPLICATION

Here is a second method of multiplying. We will use 238×6 again.

	Th	H	T	O
		2	3	8
×	1	2	4	6
	1	4	2	8

- ① Start here $8 \times 6 = 48$, which is $40 + 8$
So, we put 4 in the tens column and 8 in the ones.
- ② We now have $30 \times 6 + 40 = 220$
So, we put 2 in the hundreds column and 2 in the tens.
- ③ We now have $200 \times 6 + 200 = 1400$, which is $1000 + 400$
So, we put 1 in the thousands column and 4 in the hundreds.

Of course, we do not have to write out all of our steps as shown in this worked example.

It could look like this:

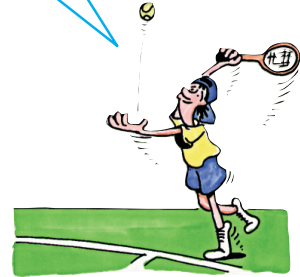
	Th	H	T	O
		2	3	8
×	1	2	4	6
	1	4	2	8



If you want to be highly skilled doing multiplication you must

- know your times tables
- practise the method.

I did not get to be a top tennis player without many hours of practice.



8 Use the new method to find

a
$$\begin{array}{r} 24 \\ \times 6 \\ \hline \end{array}$$

b
$$\begin{array}{r} 87 \\ \times 5 \\ \hline \end{array}$$

c
$$\begin{array}{r} 139 \\ \times 4 \\ \hline \end{array}$$

d
$$\begin{array}{r} 207 \\ \times 6 \\ \hline \end{array}$$

e
$$\begin{array}{r} 285 \\ \times 5 \\ \hline \end{array}$$

f
$$\begin{array}{r} 311 \\ \times 9 \\ \hline \end{array}$$

g
$$\begin{array}{r} 158 \\ \times 8 \\ \hline \end{array}$$

h
$$\begin{array}{r} 370 \\ \times 7 \\ \hline \end{array}$$

i
$$\begin{array}{r} 422 \\ \times 3 \\ \hline \end{array}$$

j
$$\begin{array}{r} 609 \\ \times 4 \\ \hline \end{array}$$

k
$$\begin{array}{r} 1124 \\ \times 5 \\ \hline \end{array}$$

l
$$\begin{array}{r} 1630 \\ \times 3 \\ \hline \end{array}$$

m
$$\begin{array}{r} 2001 \\ \times 9 \\ \hline \end{array}$$

n
$$\begin{array}{r} 1324 \\ \times 8 \\ \hline \end{array}$$

o
$$\begin{array}{r} 3033 \\ \times 7 \\ \hline \end{array}$$

p
$$\begin{array}{r} 2805 \\ \times 3 \\ \hline \end{array}$$

q
$$\begin{array}{r} 3047 \\ \times 4 \\ \hline \end{array}$$

r
$$\begin{array}{r} 5009 \\ \times 8 \\ \hline \end{array}$$

s
$$\begin{array}{r} 3176 \\ \times 7 \\ \hline \end{array}$$

t
$$\begin{array}{r} 4381 \\ \times 9 \\ \hline \end{array}$$

36×12 is the same as 12 lots of 36.

We can write this as 2 lots of 36 + 10 lots of 36.

So we multiply like this.

$$\begin{array}{r} \text{H T O} \\ 36 \\ \times 12 \\ \hline 72 \quad \leftarrow 2 \times 36 \\ 360 \quad \leftarrow 10 \times 36 \\ \hline 432 \quad \leftarrow 12 \times 36 \end{array}$$

You can do this faster if you know your 11 and 12 times tables.



9 Find

a
$$\begin{array}{r} 29 \\ \times 11 \\ \hline \end{array}$$

b
$$\begin{array}{r} 35 \\ \times 11 \\ \hline \end{array}$$

c
$$\begin{array}{r} 41 \\ \times 11 \\ \hline \end{array}$$

d
$$\begin{array}{r} 79 \\ \times 11 \\ \hline \end{array}$$

e
$$\begin{array}{r} 54 \\ \times 12 \\ \hline \end{array}$$

f
$$\begin{array}{r} 73 \\ \times 12 \\ \hline \end{array}$$

g
$$\begin{array}{r} 48 \\ \times 12 \\ \hline \end{array}$$

h
$$\begin{array}{r} 95 \\ \times 12 \\ \hline \end{array}$$

F

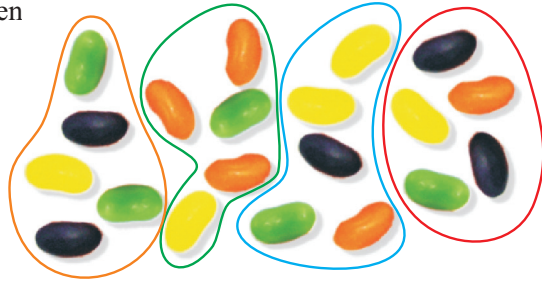
DIVISION

Jane has 20 jelly beans to share equally between herself and three friends.

How many jelly beans will each person get?

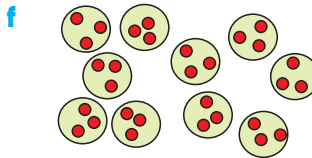
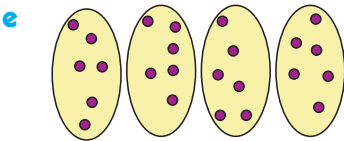
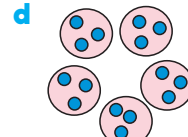
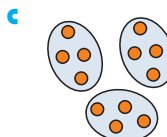
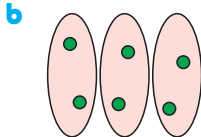
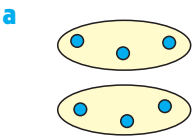
Jane divides the 20 jelly beans into four equal groups. This is shown as $20 \div 4$.

Each gets 5, so $20 \div 4 = 5$



EXERCISE 3F

1 What division is represented by these diagrams?



2 Draw diagrams (like those in question 1) to show these divisions.

a $10 \div 2$

b $10 \div 5$

c $9 \div 3$

d $18 \div 3$

e $24 \div 6$

3 Find the answer to these

a $30 \div 5$

b $20 \div 4$

c $15 \div 3$

d $25 \div 5$

e $32 \div 8$

f $28 \div 7$

g $24 \div 4$

h $14 \div 2$

i $42 \div 6$

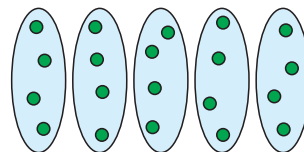
j $54 \div 9$

REMAINDERS

$20 \div 4$ can also mean “How many lots of 4 make up 20?”

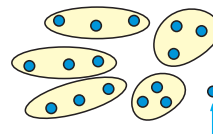
We can see the answer if we divide 20 into groups of 4.

The answer is exactly 5 as there are none left over.



Sometimes Jane sees that there are left overs, which we call **remainders**.

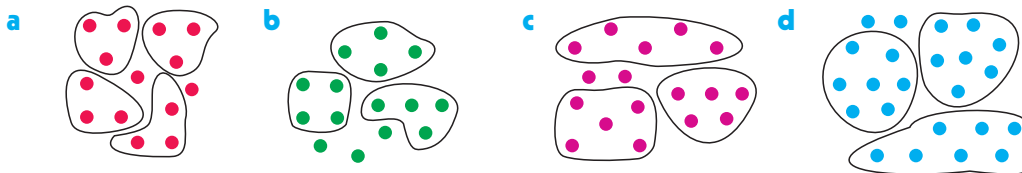
$16 \div 3$ can mean “How many lots of 3 make up 16?”



So, for $16 \div 3$, we have one remainder

So, we write $16 \div 3 = 5$ with remainder 1, which we write as $5 \text{ r } 1$.

4 What division is being represented by these diagrams?



5 Copy and complete

- | | | | | | |
|----------|--|----------|--|----------|--|
| a | $8 \div 3 = \square \text{ r } \square$ | b | $10 \div 4 = \square \text{ r } \square$ | c | $11 \div 5 = \square \text{ r } \square$ |
| d | $13 \div 5 = \square \text{ r } \square$ | e | $13 \div 6 = \square \text{ r } \square$ | f | $13 \div 7 = \square \text{ r } \square$ |
| g | $25 \div 4 = \square \text{ r } \square$ | h | $25 \div 5 = \square \text{ r } \square$ | i | $27 \div 5 = \square \text{ r } \square$ |
| j | $18 \div 4 = \square \text{ r } \square$ | k | $18 \div 5 = \square \text{ r } \square$ | l | $18 \div 6 = \square \text{ r } \square$ |
| m | $28 \div 3 = \square \text{ r } \square$ | n | $28 \div 5 = \square \text{ r } \square$ | o | $39 \div 7 = \square \text{ r } \square$ |

6 If 19 apples are shared equally among four people, we write the division

$$19 \div 4 = 4 \text{ r } 3 \quad \{\text{as } 16 \div 4 = 4\}$$

So, each person gets 4 apples and 3 are left over.

Write the problem as a division and then answer the question in words.

- a** 18 eggs are shared amongst four people. How many eggs per person?
- b** How many teams of seven netballers can be made from 59 players?
- c** If 27 chocolates are shared between 5 people, how many does each person get?
- d** 98 books are packed into eight boxes with the same number of books in each box. How many books are in each box?
- e** 59 dingoes are to go into seven zoo pens. How many dingoes for each pen?

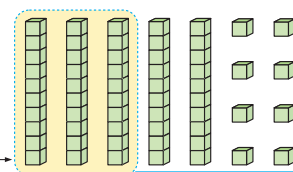
A DIVISION METHOD

For $58 \div 3$, we will look at **MA blocks**.

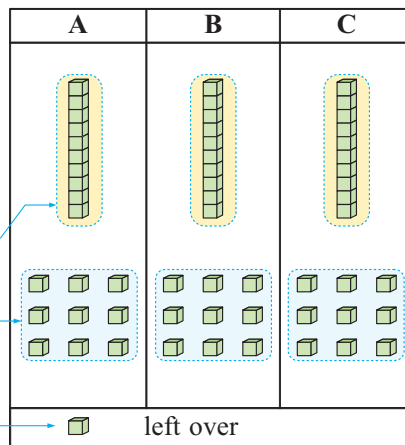
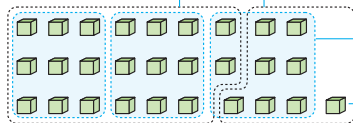
The blocks represent

$$5 \times 10 + 8$$

When we $\div 3$ each gets one of these tens.



We change the two remaining tens into ones and add them to the 8 ones.



When we $\div 3$ each gets 9.

So, $58 \div 3 = 19 \text{ r } 1$.

We can easily show this trading.

$$\begin{array}{r} 1 \\ 3 \overline{) 528} \\ \underline{3} \\ 28 \\ \underline{27} \\ 1 \\ \underline{0} \\ 0 \end{array}$$

$$\begin{array}{r} 1 \text{ r } 1 \\ 3 \overline{) 528} \\ \underline{3} \\ 28 \\ \underline{27} \\ 1 \\ \underline{0} \\ 0 \end{array}$$

Step 1: How many 3's in 5?
Answer 1 r 2

Step 2: How many 3's in 28?
Answer 9 r 1

For divisions with larger numbers the method is the same.

Examples: For $413 \div 6$

$$6 \overline{) 413} \begin{array}{l} 68 \text{ r } 5 \\ \underline{36} \\ 13 \\ \underline{12} \\ 1 \\ \underline{0} \\ 0 \end{array}$$

So, $413 \div 6 = 68 \text{ r } 5$

For $2145 \div 4$

$$4 \overline{) 2145} \begin{array}{l} 536 \text{ r } 1 \\ \underline{8} \\ 14 \\ \underline{12} \\ 25 \\ \underline{20} \\ 5 \\ \underline{4} \\ 1 \\ \underline{0} \\ 0 \end{array}$$

So, $2145 \div 4 = 536 \text{ r } 1$

7 Copy and complete these divisions.

a $4 \overline{) 52}$

b $3 \overline{) 111}$

c $6 \overline{) 216}$

d $2 \overline{) 868}$

e $7 \overline{) 210}$

f $8 \overline{) 408}$

g $5 \overline{) 205}$

h $9 \overline{) 378}$

8 Copy and complete these divisions.

a $4 \overline{) 125}$

b $3 \overline{) 670}$

c $5 \overline{) 322}$

d $6 \overline{) 437}$

e $5 \overline{) 441}$

f $2 \overline{) 699}$

g $7 \overline{) 402}$

h $8 \overline{) 300}$

i $3 \overline{) 905}$

j $9 \overline{) 200}$

k $4 \overline{) 373}$

l $6 \overline{) 871}$

9 Copy and complete these divisions.

a $5 \overline{) 2020}$

b $3 \overline{) 6617}$

c $2 \overline{) 4950}$

d $7 \overline{) 2112}$

e $8 \overline{) 1008}$

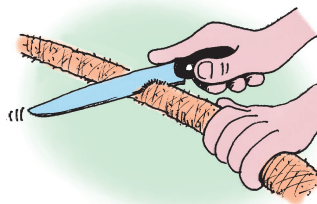
f $4 \overline{) 7531}$

g $6 \overline{) 1039}$

h $9 \overline{) 3221}$

10 Solve the following problems:

- a** Divide \$225 equally between five children.
- b** 856 metres of rope is cut into eight equal pieces. How long is each piece?
- c** Share 485 marbles equally between seven children.



- d** A restaurant bill of \$536 is to be 'split' between the eight diners. How much does each diner pay?
- e** 2560 kg of school books are to be loaded in equal loads onto four pallets to send to a school supplier. What mass should be loaded on to each pallet?
- f** Each student paid the same amount to go to the school camp. If nine students paid \$567 altogether, how much did each student pay?

- g** The Music Society paid \$9771 for three saxophones. How much did each cost, if they were all the same price?
- h** 8640 litres of fuel flows into six tanks so each tank contains the same amount. How much fuel is in each tank?
- i** 2844 Christmas hampers were given to seven charities to distribute. How many did each charity receive?
- j** A flock of 3614 sheep is to be evenly divided between three paddocks. How many sheep should be in each paddock?



G

ESTIMATING DIVISIONS

We can also estimate divisions by rounding the number to be divided to the nearest 10 or 100. This helps us see that our answer is likely to be correct when using a calculator.

For example

$$\begin{aligned} & \bullet \quad 81 \div 4 \\ & \approx 80 \div 4 \\ & \approx 20 \end{aligned}$$

$$\begin{aligned} & \bullet \quad 412 \div 8 \\ & \approx 400 \div 8 \\ & \approx 50 \end{aligned}$$

$$\begin{aligned} & \bullet \quad 873 \div 3 \\ & \approx 900 \div 3 \\ & \approx 300 \end{aligned}$$

EXERCISE 3G

1 Estimate the answer to

a $79 \div 2$ **b** $37 \div 8$ **c** $19 \div 4$ **d** $89 \div 3$ **e** $48 \div 5$

2 Estimate the answer to

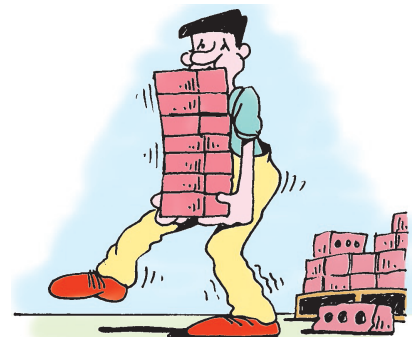
a $189 \div 4$ **b** $789 \div 2$ **c** $297 \div 3$ **d** $612 \div 3$ **e** $996 \div 5$

3 Estimate the length of each piece of string if 397 metres of string is cut into 4 equal pieces.

4 Estimate how far Heidi travels per day if she travels 98 km in 5 days.

5 Estimate the weight of a brick if 8 bricks weigh 42 kg in total.

6 Peter put 11 icecream sticks end to end and they stretched for 104 cm. Estimate the length (in cm) of one icecream stick.



7 By rounding to the nearest thousand, estimate the answer to

a $1032 \div 5$ **b** $2794 \div 3$ **c** $6742 \div 7$ **d** $9181 \div 3$

H

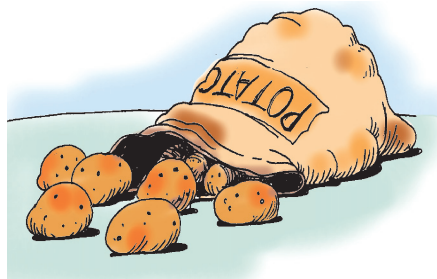
USING A CALCULATOR

To calculate 317×29 press 317 \times 29 $=$ *Answer*
9193

To calculate $406 \div 7$ press 406 \div 7 $=$ 58

EXERCISE 3H

- Use a calculator to find
 - 25×17
 - 119×18
 - 153×22
 - 331×47
- Use a calculator to find
 - $665 \div 5$
 - $441 \div 7$
 - $399 \div 7$
 - $392 \div 8$
- Key into your calculator the number 12345. Now add 12345 five more times. Did you get 74070?
You have found $12345 + 12345 + 12345 + 12345 + 12345 + 12345$.
 - Now press 12345 \times 6 $=$. Did you get 74070?
 - Now check that $27 + 27 + 27 + 27 + 27 + 27 + 27 = 27 \times 7$.
- Multiplication undoes division and division undoes multiplication. Use your calculator to find
 - $27 \times 18 \div 18$
 - $27 \div 18 \times 18$
 - $336 \times 2 \div 2$
 - $336 \div 3 \times 3$
- Use your calculator to show that $53 \times 21 = 1113$.
 - Now find $1113 \div 53$ and $1113 \div 21$. What do you notice?
 - Show that $85 \times 29 = 2465$. Without using your calculator, find $2465 \div 85$ and $2465 \div 29$. Check your results by using your calculator.
- Use a calculator to help solve these problems.
 - Eighty three students each paid \$17 to join the summer art class. How much did they pay altogether?
 - A farmer sold 349 bags of potatoes each weighing 25 kg. What weight of potatoes was that?
 - Thirty three theatre tickets were bought at a cost of \$1881. How much did one ticket cost?
 - David travelled 5759 kilometres in 13 days. If he travelled the same distance each day, how far was that?
 - How many years in 1095 days?
 - An electrical goods company bought 36 refrigerators for \$389 each to sell in their shop. How much did they pay for the refrigerators?



1

PROBLEM SOLVING USING MULTIPLICATION AND DIVISION



'Share between' and 'how much would each one' may suggest that you should divide.

EXERCISE 3I

Solve these problems **showing all working** and **giving your final answer in a sentence**.

- 1 The local council planted six rows each with 428 trees along the main highway. How many trees did they plant?
- 2 5846 Easter eggs were packed into baskets. If each basket held nine eggs, how many baskets were filled?
- 3 On one weekend, eight buses each carrying 42 skiers left Adelaide for the Victorian Snowfields. How many skiers travelled?
- 4 A \$5000 prize was shared equally between 6 people. How much (in whole dollars) did each receive?
- 5 Nine hundred and fifty seven people each gave \$5 to support disadvantaged children. How much money was given?
- 6 Michael lives 26 kilometres from the local swimming pool. Each week he makes six trips to the pool for training. How far does he travel each week going to and from training?
- 7 Seven trucks each had the same sized load. They delivered 8785 kilograms of filling to a building site. How much did each truck carry?
- 8
 - a Find out how much Sam paid in rent if he paid \$135 each week for eight weeks.
 - b Leslie rented a luxury apartment in the city. She paid \$785 per week. How much did Leslie pay if she rented for five weeks?



- 9 The Post Office delivers mail five days a week. In one week 6479 items were delivered to Karen's office. How many items were delivered each day, on average?
- 10 How many cartons each holding one dozen eggs could be filled if a farmer supplied 6879 eggs?
- 11 How much wire would there be on eight rolls each with 265 metres?
- 12 Four salespersons travelled from Sydney to Perth for a conference. The bill for their tickets was \$2932. How much was each ticket?

'On average' means that we assume the same number were delivered each day.



J

FURTHER PROBLEM SOLVING

To be good at problem solving you must train yourself to notice which operation or operations are needed.

Here are some words and phrases used in problems which indicate the operation to use.

Operations in mathematics are
+ addition, - subtraction,
× multiplication, ÷ division.



+	-	×	÷
add	subtract	multiply	divide
sum	difference	product	quotient
plus	minus	times	share
total			



I have been successful at problem solving. When I get stuck, I use simpler numbers. I then go back to the actual ones.

However, some problems do not have these words and phrases, so you have to think carefully before making a decision.

EXERCISE 3J

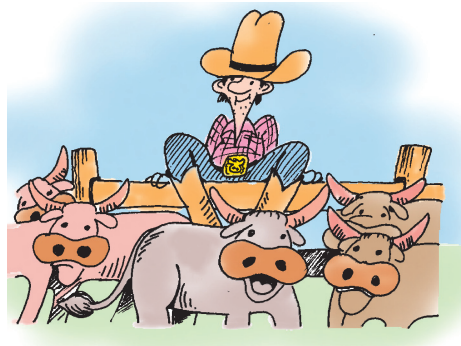
- 1 Eight rows of 24 pine trees were planted, but five trees died. How many trees remained?
- 2 Five buses each with 32 seats were needed to carry all the students from Eden Valley Primary School. If there were seven vacant seats only, how many students go to Eden Valley Primary School?
- 3 Find the total cost of four new tyres at \$185 each and a wheel alignment at \$45.



- 4 A supermarket bought 327 cartons each containing six bottles of softdrink. The supermarket already had 189 bottles on the shelf. How many bottles did they have in total?
- 5 A bookshop received 3600 books. 432 books were put on the shelves in the shop. The rest were packed into boxes with eight books in each. How many boxes were needed?
- 6 Louis stayed at a hotel for 7 nights. When he checked out he paid \$735. He had *already* paid \$210 when he made his booking. How much was he charged per night?
- 7 A man's estate was \$56 720. \$50 000 was given to charity and the rest was divided between his three sons. How much did each son receive?



- 8 A block of flats has eight storeys. There are 14 flats on each storey and each flat has four windows. How many windows are there in total?
- 9 My grandmother left \$9870 in her will. It was to be shared equally between her three daughters. My mother divided her share equally between my brother and I. How much did I receive?
- 10 How much did I pay in total for four T-shirts costing \$32 each and three pairs of jeans costing \$39 each?
- 11 The ranch foreman knew that there were 3502 cows on the ranch. He knew that five paddocks each held 263 cows. The rest were equally divided between three larger paddocks. How many cows were in each of the larger paddocks?



K

ORDER OF OPERATIONS

To find $2 + 3 \times 4$ Harry pressed $2 \boxed{+} 3 \boxed{\times} 4$ on his basic operations calculator.

The answer he got was 20.

The calculator did $2 \boxed{+} 3$ first to get 5, and then found $5 \boxed{\times} 4$.

Hilda had a more advanced scientific calculator.

When she pressed $2 \boxed{+} 3 \boxed{\times} 4$ she got 14 for her answer.

Discuss whether Hilda's answer or Harry's answer is correct.

Should both types of calculator give the same result?

ORDER OF OPERATIONS

To avoid problems of misunderstanding **rules** have been made for the order of doing operations.

The more advanced calculator used by Hilda gave the correct answer using these rules.

$$\begin{aligned} \text{So, } & 2 + 3 \times 4 \\ & = 2 + 12 \\ & = 14 \end{aligned}$$

In arithmetic where grouping brackets and operations are used

- do contents of brackets first
- do \times and \div in order from left to right
- do $+$ and $-$ in order from left to right.

The word **BEDMAS** will help you remember the order.

B Brackets first.

E Division and Multiplication in order.

A Addition and Subtraction in order, last of all.

Remember to do the contents of the brackets first.

Example Find $13 - (5 \times 2)$

$$\begin{aligned} & 13 - (5 \times 2) \\ & = 13 - 10 \\ & = 3 \end{aligned}$$



EXERCISE 3K

1 Find

a $13 - (3 \times 2)$

b $2 \times (3 + 4)$

c $11 + (5 \times 3)$

d $4 + (9 \div 3)$

e $6 \div (3 - 2)$

f $3 \times (17 - 5)$

g $(3 + 4) \times 9$

h $(12 - 7) \times 12$

i $(19 - 13) \div 6$

j $(30 - 14) \div 2$

k $(9 - 5) \times (4 + 3)$

l $(3 + 6) \div (5 - 2)$

Example Find $15 - 6 + 2 - 8$

Answer

$$\begin{aligned} & 15 - 6 + 2 - 8 \\ & = 9 + 2 - 8 \\ & = 11 - 8 \\ & = 3 \end{aligned}$$



If only $+$ and $-$ are seen, do the operations in order from left to right.

2 Find

a $3 + 4 - 6$

b $2 + 6 - 7$

c $12 - 8 + 4$

d $9 - 4 - 5$

e $9 + 4 - 5$

f $9 - 4 + 5$

g $18 + 7 - 6$

h $18 - 7 + 6$

i $18 - 7 - 6$

j $12 - 8 + 14 - 3$

k $5 + 6 - 7 - 2$

l $11 - 3 + 4 - 6$

Example Find $10 \times 2 \div 5$

$$\begin{aligned} \text{Answer} \quad & 10 \times 2 \div 5 \\ & = 20 \div 5 \\ & = 4 \end{aligned}$$

If only \times and \div are seen, do the operations in order from left to right.



3 Find

a $10 \div 5 \times 2$

b $8 \times 5 \div 4$

c $27 \div 9 \div 3$

d $27 \div 9 \times 3$

e $4 \times 2 \times 8$

f $4 \div 2 \times 8$

g $6 \times 7 \div 2$

h $36 \div 9 \times 4$

i $36 \div 9 \div 4$

j $4 \times 9 \div 6$

k $12 \div 3 \div 2$

l $12 \div 3 \times 2$

Example Find $4 + (13 - 5) \div 2$

$$\begin{aligned} \text{Answer} \quad & 4 + (13 - 5) \div 2 \\ & = 4 + 8 \div 2 \quad \leftarrow \text{doing brackets first} \\ & = 4 + 4 \quad \leftarrow \text{doing } \times, \div \text{ next} \\ & = 8 \quad \leftarrow \text{doing } +, - \text{ last} \end{aligned}$$

4 Find using the rules for correct order of operations

a $17 + (9 - 4) \div 5$

b $6 + (3 + 8) \times 7$

c $(18 - 6) \times 3 + 5$

d $48 - 6 \times (3 + 5)$

e $18 \div 6 \times (3 + 5)$

f $18 \div (6 \times 3) + 5$

g $2 + 48 \div (6 + 2)$

h $2 + 48 \div (6 \times 2)$

i $50 - (12 - 6) \times 8$

j $(12 - 4) \times (3 + 6)$

k $12 - 4 \times 3 + 6$

l $(12 - 4) \times 3 + 6$

m $(37 + 8) \div (3 + 6)$

n $3 \times 6 \div (2 + 4)$

o $5 + 4 \times 9 - 6$

p $(5 + 4) \times (9 - 6)$

q $(5 + 4) \times 9 - 6$

r $(5 + 4) \div 9 + 6$

5 Challenge

When transferring my computer files from one program to another unfortunately the operation symbols and brackets all dropped out. Can you help me to replace them correctly?

a $4 \quad 6 \quad 2 \quad = \quad 8$

b $4 \quad 6 \quad 2 \quad = \quad 26$

c $4 \quad 6 \quad 2 \quad = \quad 22$

d $4 \quad 6 \quad 2 \quad = \quad 7$

e $4 \quad 6 \quad 2 \quad = \quad 1$

f $14 \quad 7 \quad 2 \quad = \quad 19$

g $14 \quad 7 \quad 2 \quad = \quad 9$

h $14 \quad 7 \quad 2 \quad = \quad 4$

i $14 \quad 7 \quad 2 \quad = \quad 5$

j $14 \quad 7 \quad 2 \quad = \quad 0$

6 Make up some missing operation puzzles to test your friends.

7 Challenge

There could be many possible answers to the following. Find a possible answer to

a $\square + \square \times \square = 30$

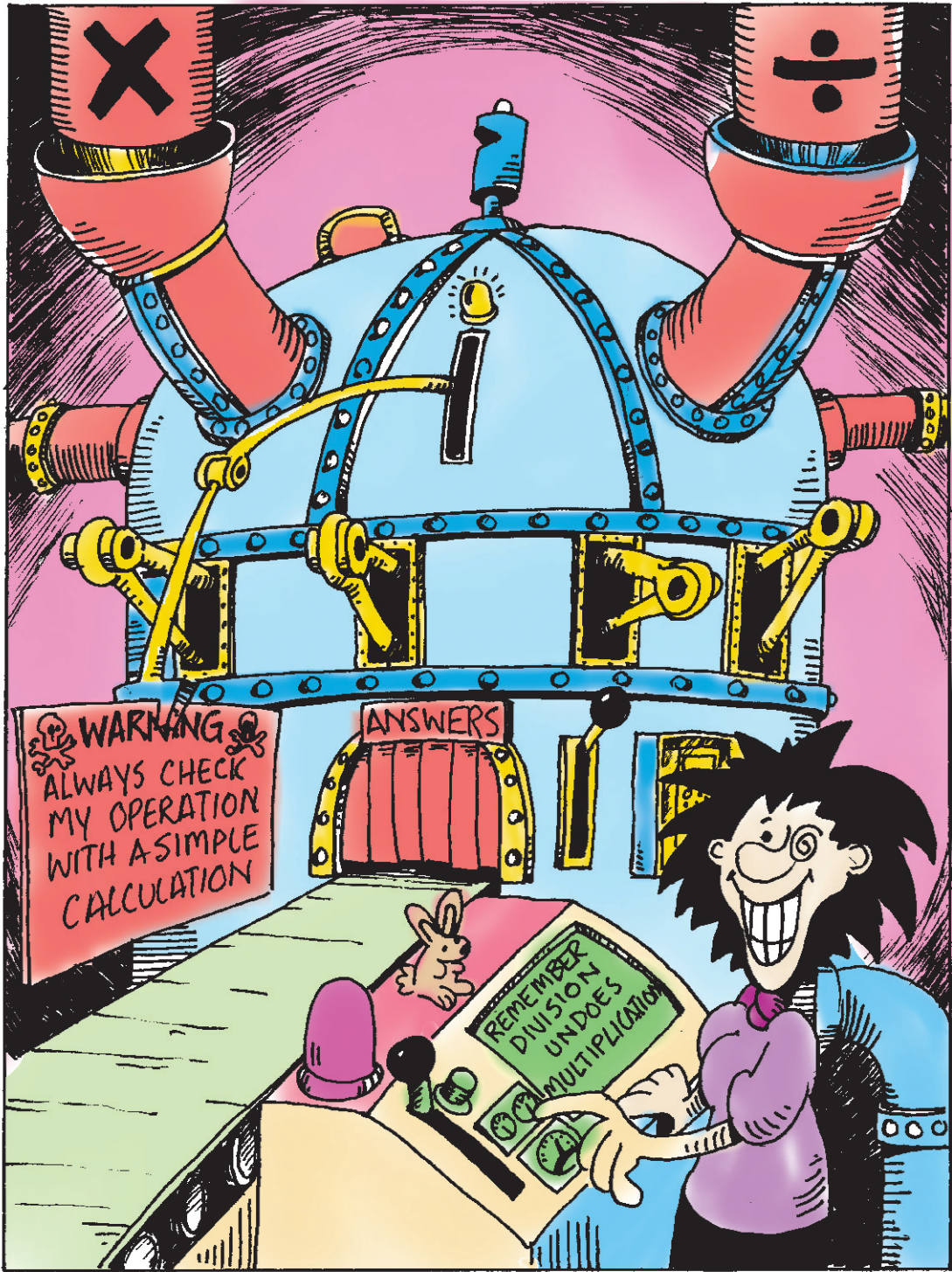
b $\square \times \square \times \square = 24$

c $\square \div \square + \square = 17$

d $\square \times \square - \square = 8$

e $\square - \square \times \square = 14$

f $\square - \square \div \square = 5$



SKILL TESTER**MARY'S MIXED UP MULTIPLICATION MACHINE**

Mary's machine sometimes makes mistakes. It is your job to check on the machine. Use the most popular computer in the world - your brain.

Calculate the answer for each question. Put a tick ✓ if the machine is correct. Give the correct answer if the machine has made a mistake.

- 1 When Mary put the first set of multiplication operations into the machine she got the answers as shown.

a i $3 \times 4 = \boxed{12}$

ii $30 \times 4 = \boxed{1200}$

iii $30 \times 40 = \boxed{1200}$

iv $300 \times 4 = \boxed{12000}$

b i $6 \times 5 = \boxed{40}$

ii $60 \times 5 = \boxed{400}$

iii $60 \times 50 = \boxed{4000}$

iv $600 \times 5 = \boxed{3000}$

- 2 Mary tried to undo the multiplication above. She put the answers through the division inlet. This is what she got.

a i $\boxed{12} \div 4 = 3$

ii $\boxed{1200} \div 4 = 300$

iii $\boxed{1200} \div 40 = 30$

iv $\boxed{12000} \div 30 = 400$

b i $\boxed{40} \div 5 = 6$

ii $\boxed{400} \div 5 = 80$

iii $\boxed{4000} \div 50 = 8$

iv $\boxed{3000} \div 5 = 600$

- 3 She then multiplied the following numbers by i 10 ii 100 then iii 1000. Check the machine's answers.

a i 57 ii 570 iii 5070 iv 5700

b i 275 ii 2750 iii 27500 iv 270500

c i 309 ii 3090 iii 30900 iv 300900

- 4 The machine really confused Mary when it gave her five answers for each operation. Which one was correct?

a $38 \times 7 =$ i 256 ii 266 iii 276 iv 286 v 296

b $146 \times 4 =$ i 5624 ii 564 iii 5804 iv 5644 v 584

- 5 Then it gave no answers. Find the answers for Mary.

a $23 \times 5 = \square$

b $47 \times 3 = \square$

c $68 \times 7 = \square$

d $123 \times 6 = \square$

e $368 \times 9 = \square$

f $1436 \times 4 = \square$

- 6 Mary tried the \div inlet with the following results:

a $492 \div 4 = \boxed{123}$

b $1035 \div 3 = \boxed{355}$

c $999 \div 3 = \boxed{300}$

d $714 \div 7 = \boxed{12}$

e $792 \div 8 = \boxed{97}$

f $1416 \div 6 = \boxed{237}$

- 7 She tried division again. This time only the remainder came out. What number was missing?

a $59 \div 3 = \square \text{ r } 2$

b $419 \div 9 = \square \text{ r } 5$

c $247 \div 4 = \square \text{ r } 3$

When using any machine or calculator, what should you do first of all?

MENTAL SET 3A

- 1 $7 \times 8 =$
- 2 $15 \div 3 =$
- 3 What is the smallest prime number?
- 4 $8 \times 100 =$
- 5 Write 679 in expanded form.
- 6 What is the 7th multiple of 4?
- 7 $9 \div 4 = \dots r \dots$
- 8 $3 \times 400 =$
- 9 List all factors of 6.
- 10 What prime numbers are between 10 and 20?

MENTAL SET 3C

- 1 $9 \times 7 =$
- 2 $28 \div 4 =$
- 3 $5^2 = \dots$
- 4 What are the factor pairs of 14?
- 5 $11 \div 4 = \dots r \dots$
- 6 $400 + 70 - 8 =$
- 7 $14 - 4 \times 2 =$
- 8 $13 \times 1000 =$
- 9 What is the 5th multiple of 8?
- 10 Estimate in hundreds the answer to 479×5 .

MENTAL SET 3B

- 1 $23 \times 100 =$
- 2 $19 \div 5 = \dots r \dots$
- 3 $16 + 4 \times 3 =$
- 4 How many prime numbers are less than 12?
- 5 If $3 \times 7 = 21$, then $30 \times 70 =$
- 6 List the factor pairs of 8.
- 7 $6 \times 9 =$
- 8 $45 \div 5 =$
- 9 $11 \times 1000 =$
- 10 Estimate the answer to $4879 \div 5$.

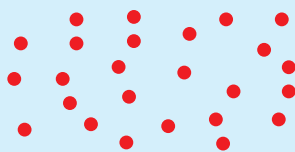
MENTAL SET 3D

- 1 List the factors of 7.
- 2 $14 - 4 \times 3 =$
- 3 $6 \times 7 =$
- 4 $42 \div 7 =$
- 5 $38 \times 100 =$
- 6 $31 \div 7 = \dots r \dots$
- 7 Write 541 in expanded form.
- 8 What are the last two prime numbers before 30?
- 9 If $7 \times 5 = 35$, find 700×50 .
- 10 $15 - (4 \times 2) =$

REVIEW EXERCISE 3

- 1 a Write down the *four* factor pairs of 24.
 b Write down in order (smallest to largest) the factors of 24.
 c Write down the prime numbers which are factors of 24.
- 2 Write down the multiples of 7 which lie between 20 and 40.
- 3 Find the square number between 30 and 40.
- 4 Copy and complete: $5 \times 6 =$ $5 \times 60 =$ $500 \times 6 =$
 $50 \times 6 =$ $5 \times 6000 =$ $50 \times 60 =$
- 5 Estimate in hundreds the answer to 789×9 .
- 6 Find
- a 214×7 b $\$308 \times 6$ c 1807×9
- 7 Granny Smith gives \$235 to each of her 5 grandchildren. How much did she give in total to her grandchildren?

8



If these dots were grouped in *threes*,

- a how many would remain?
 b Write this grouping as a division problem.
- 9 Complete these divisions.
- a $5 \overline{)335}$ b $6 \overline{)704}$ c $7 \overline{)5902}$
- 10 Eight pallet loads of jam were loaded onto a truck. The total weight loaded was 2920 kg. What was the mass of each pallet load?
- 11 A hotel has 15 floors and each floor contains 8 rooms.
- a How many rooms does the hotel have in total?
 b Room cleaning must be done each day between 10.30 am and 1.00 pm. A cleaner can only do 6 rooms in this time. How many cleaners are needed?
- 12 Wei Fong is paid \$250 a week and in addition \$43 for each washing machine sold. If Wei sells 9 washing machines during a week, how much is earned in total?
- 13 Using the correct order of operations

- brackets first, then
- \times and \div next, then
- $+$ and $-$ last

Find

- a $19 - 13 + 8$ b $28 - 8 \times 3$ c $4 \times 5 \div 2$
 d $(28 - 8) \times 3$ e $12 + 3 \times (4 + 2)$ f $(3 \times 8) + (4 \times 7)$

HAVE FUN WITH THESE USING A CALCULATOR

- 1 Select any *two* digit number. Reverse the digits and add this number to the one you started with.

For example,

$$\begin{array}{r} 54 \\ + 45 \\ \hline 99 \end{array}$$

$$\begin{array}{r} 27 \\ + 72 \\ \hline 99 \end{array}$$

$$\begin{array}{r} 81 \\ + 18 \\ \hline 99 \end{array}$$

- Do this with five more numbers of your choosing.
- Do you always get 99? Careful!
- Use your calculator to write *true* or *false* to these statements:
 - “The final result always divides exactly by 9.”
 - “The final result always divides exactly by 11.”

- 2 Select any *three* digit number.

Reverse the digits of this number and subtract the smaller number from the larger number.

For example

$$\begin{array}{r} 864 \\ - 468 \\ \hline 396 \end{array}$$

Now reverse the digits of your answer and add this number to your answer.

$$\begin{array}{r} 396 \\ + 693 \\ \hline 1089 \end{array}$$

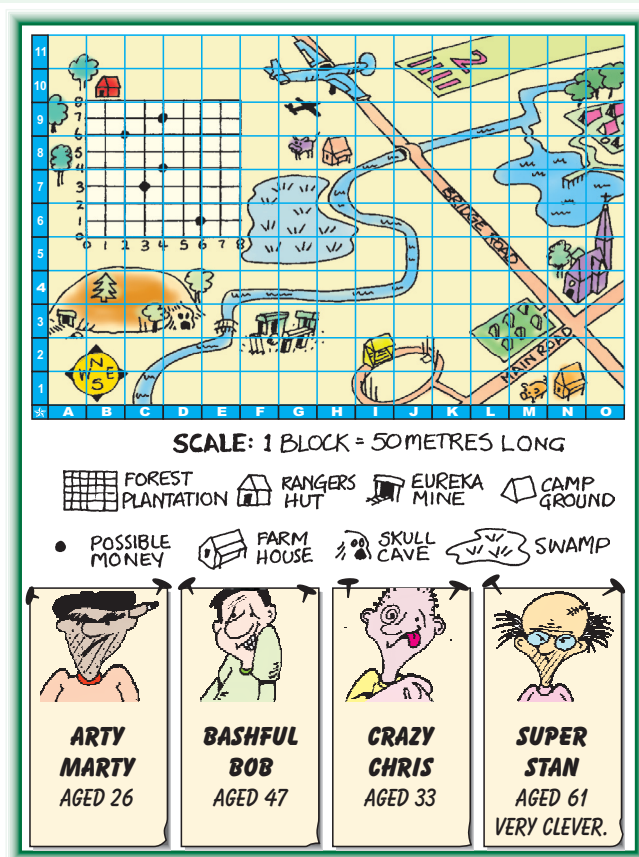
- Do the same, starting with
 - 778
 - 649
 - 962.
 - What do you notice about your answers?
- 3 Write down any *two* digit number and repeat the digits to form a *four* digit number.
- For example, 7474
- Use your calculator to show that $7474 \div 101 = 74$
 - Repeat this activity *three* more times with numbers of your choosing. Each time divide by 101. Do you always get the same result that you expected?
- 4 Write down any *three* digit number and repeat these digits to form a *six* digit number.
- For example, 237237
- Use your calculator to show that 1001 divides exactly into this number.
 - Repeat this activity with three other numbers of your choosing. Are the results always exactly divisible by 1001?

Chapter 4

Location

In this chapter you should learn to:

- ✓ use words to show position
- ✓ find places on maps and street directories using grid lines
- ✓ find objects and places on diagrams which have a grid
- ✓ use compass points to show direction
- ✓ use scales on maps, diagrams and plans
- ✓ use degrees and compass points to show direction
- ✓ use coordinates to show positions



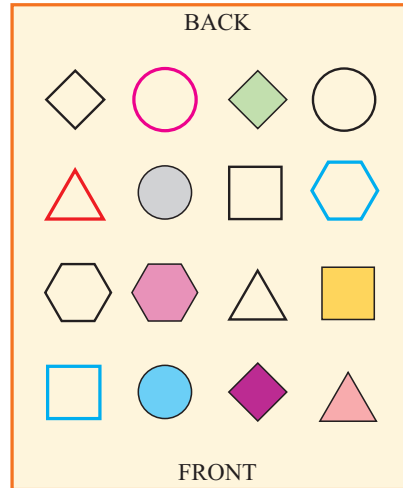
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









THE LANGUAGE OF POSITION

We use common words like *behind*, *in front* and *alongside* to help us locate or find places.

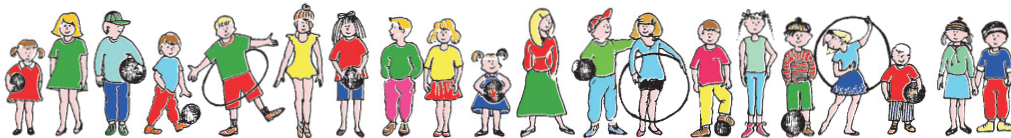
EXERCISE 4A

The family of polygons is seated at the theatre. Study the arrangement of the polygons shown. Draw your answers to these questions.



- 1
 - a What shape is two places behind  ?
 - b What shape is three places closer towards the front than  ?
 - c What shape is between  and  ?
 - d What shape is in front of the  and between  and  ?
 - e What are the next three shapes diagonally behind the  ?
 - f  is in the back row. What shapes in his row are alongside him?
 - g  is in the front row. As he sits facing the front, he turns to the shape on his left. What is it?

2



Starting from the left hand side, look at the picture of children.

- a How many people have someone on both sides of them?
- b Describe the third person on the right of the first person with a hoop.
- c The little girl with the pigtails, holding the ball, is between which two people?
- d How many people are between the last two people with hoops?
- e Who has only one person alongside them?

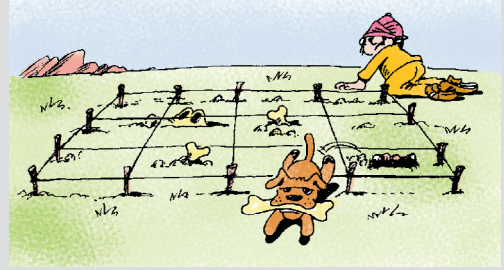
ACTIVITY



Your teacher will give you a picture to study. You are going to give instructions to your partners so that they can make an accurate version of the picture **without seeing it**.

Choose the words you use carefully so that your partners know exactly what to do. Your partners' papers have a border around them.

Your partners should listen to, and follow carefully, the instructions given. When finished, compare drawings made with the original one.



What to do:

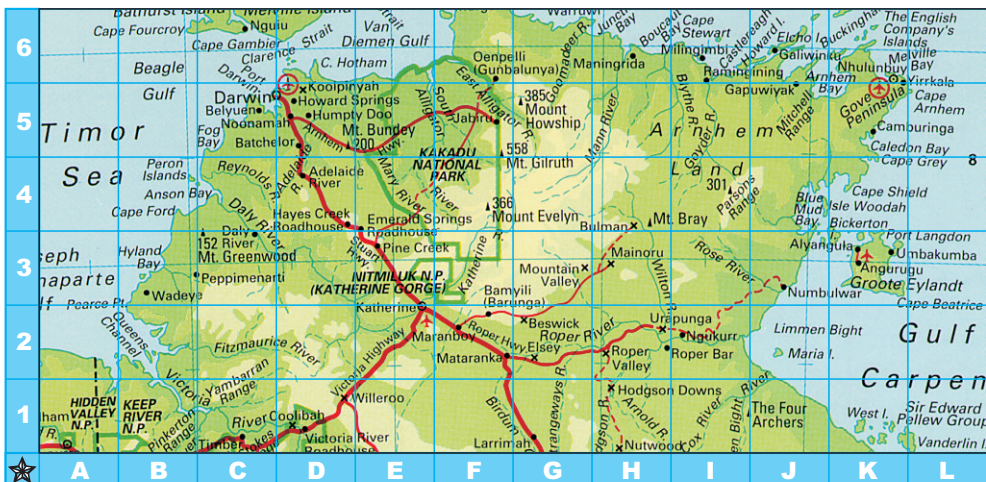
- a Discuss the drawings made by your partners and write down what was well done and not well done.
- b Were the drawings like the originals? How well did they match?
- c How many of these words were used to help describe the original picture?

on	after	inside	around	before	behind	over
beside	outside	under	between	along	forwards	far
middle	underneath	on top	sideways	away from	towards	near
above	in front	backwards	next to	below	centre	

Using common words and language to find items is not the only way to give or receive directions.

We look at a **map** so that we can find out where a city or town is located. We can also see how far away it is and in what direction.

Look at the map below. Can you find Darwin? Can you find Katherine? Can you find Kakadu National Park?

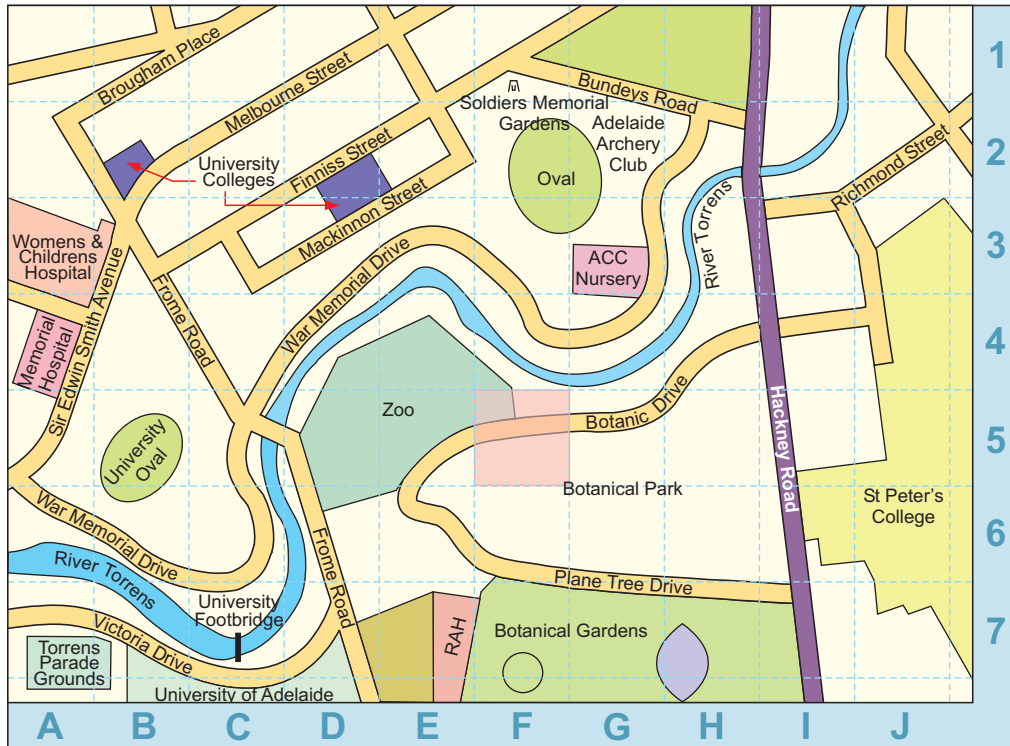


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We look at a **street directory** so that we can find the suburb and street where a friend lives. We can also find out how to get from your house to your friend's house.

Notice the lines that go over the street map. They are the same distance apart and they go across and up and down on the map. These lines are called **grid lines**.

Notice the **letters** along the bottom and the **numbers** along the side help us to find the **grid points**. The letters and numbers are halfway between the grid lines.



Look at the map from a street directory.

The pink shaded square is F5. It is in the F column and in row 5. The letter is written *before* the number.

- 3 Name the road passing through F5.
- 4 Match the squares G7, C5, J6, G2, A3 and C7 with the features listed below.

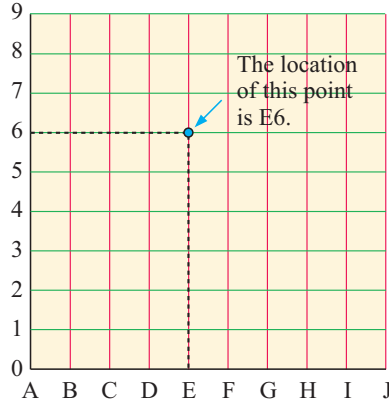
a St Peters College	b the Womens & Childrens Hospital
c the University Footbridge	d the Botanical Gardens
e the Adelaide Archery Club	
f the intersection of Frome Road and War Memorial Drive	
- 5 Name the square where
 - a Victoria Drive meets Frome Road
 - b Sir Edwin Smith Avenue becomes Melbourne Street.
- 6 Name the special features (not roads) in these squares.

a A7	b B5	c A4	d F1	e G3	f E5
------	------	------	------	------	------

B FINDING POINTS

A point on the grid is found by giving a letter and number such as E7.

We refer to this point as a **grid reference point** or **grid position**.



Even if a street or other place is not exactly at a grid point it will be close to it and so it is easy to find.

Notice the dot at E6.

Notice that we write E6 and not 6E. It is traditional to move **horizontally** first then **vertically**.



Moving horizontally is to move .
 Moving vertically is to move .

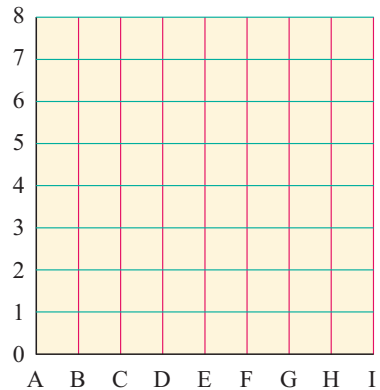


EXERCISE 4B

1 Copy the given grid and mark these points on it.

- | | | |
|-------------|-------------|-------------|
| a C3 | b D7 | c E8 |
| d A1 | e G1 | f A2 |
| g A8 | h H7 | i I4 |

Give the horizontal shift first, then the vertical shift.

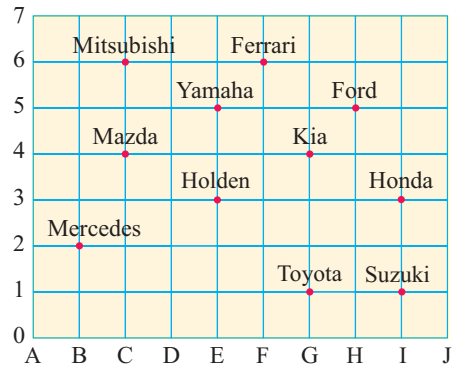


2 On a grid like the one above, plot the points given. Join the points in the order given. Write the correct name of the shape.

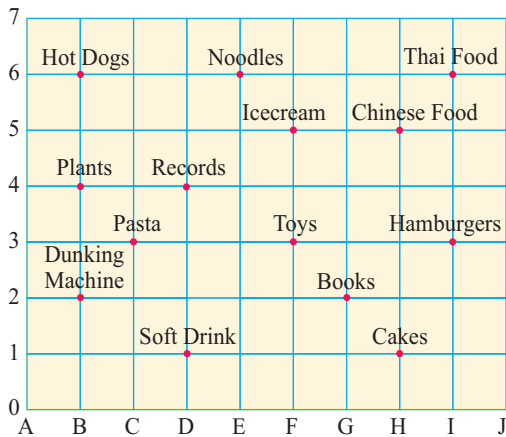
- | | |
|-----------------------------|---------------------------------|
| a B1, D1, D4, B4, B1 | b B7, C5, D8, B7 |
| c F8, I8, H5, E5, F8 | d F4, H4, I3, G1, E3, F4 |

3 This grid shows where vehicle manufacturers have their salesperson and display at a motor show.

- a** Find the grid position of these.
- i** Ford
 - ii** Toyota
 - iii** Holden
- b** To move from one display to another, follow the grid lines. Each grid unit is 10 metres. The distance from Mitsubishi to Ferrari is 30 metres. How far is it along the pathways from
- i** Mitsubishi to Honda
 - ii** Suzuki to Mazda?



4 This grid shows the position of stalls at the local fair.

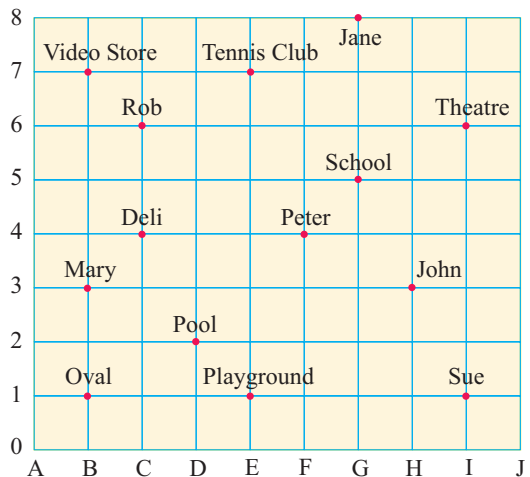


- a** Find the grid position of
- i** Toys
 - ii** Chinese Food
 - iii** Soft drink
- b** To get from the Icecream stall to the Hamburgers you could give directions “go right 3 units, and down 2 units”. Give directions for going from
- i** Books to Records
 - ii** Records to Books
 - iii** Thai Food to Pasta



5 The grid shows the homes of friends and the positions of other important places nearby.

- a** Find the location of the
- i** play ground
 - ii** video store
 - iii** Deli
 - iv** pool
- b** Find using horizontal and vertical steps, how to get from
- i** Mary’s to Jane’s
 - ii** Rob’s to John’s
 - iii** Sue’s to Peter’s.



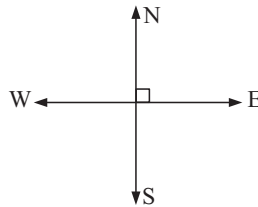
The horizontal shift is right or left.
The vertical shift is up or down.



C

DIRECTION

A **magnetic compass** (also called a **directional compass**) helps us find directions between objects and places.



COMPASS POINTS

There are four main directions. These are the **cardinal points** on the compass.

South is opposite in direction to **North**.

If we turn clockwise from North through a right angle we are facing **East**.

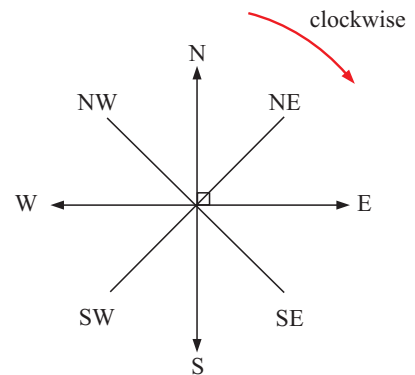
West is in the opposite direction to East.

Clockwise means in the direction that the hands of a clock turn.

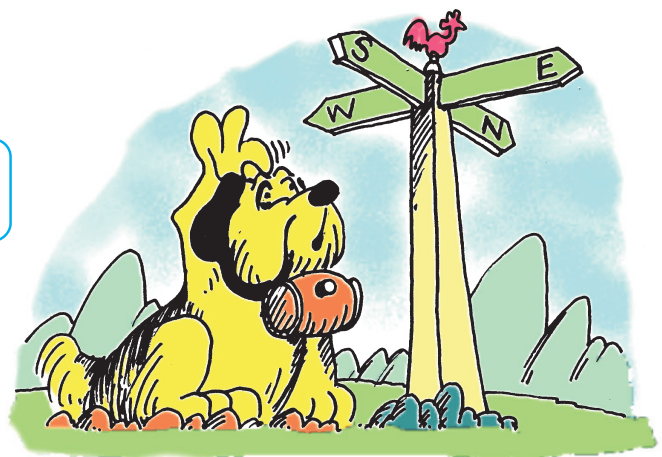
Single letters are used instead of words. For example, N is North.

Halfway directions are:

NE	(North-East)
SE	(South-East)
NW	(North-West)
SW	(South-West)



The word **NEWS** came from the letters for the cardinal points.

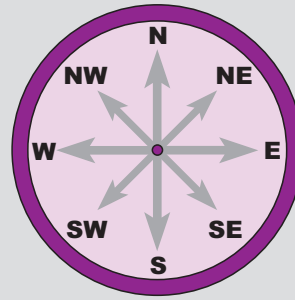


GROUP ACTIVITY

WHICH WAY DO I GO?

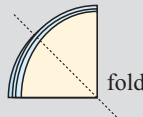
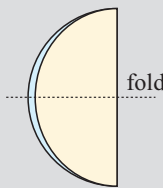
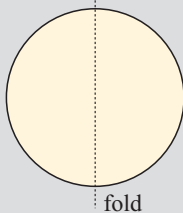


From a meeting place at school Mark and Anna want to know the compass directions of rooms, offices, sports areas and so on. They decide to make a direction finder. It looks like this:



What to do:

- 1 Draw a circle of radius 5 cm on a piece of paper and cut out the circle with scissors.
- 2 Fold the circle in halves, then quarters, then eighths and crease down hard each time.



The sun sets (goes down) in the West.
Buildings are usually aligned North-South.
Look at your school buildings.

- 3 Unfold the paper, and draw lines where the creases were.
- 4 Mark the 8 compass points on your circle.
- 5 Take the compass card outside and line its N line in the direction of North.
- 6 Find, if possible, some object or place in each of the 8 compass directions.



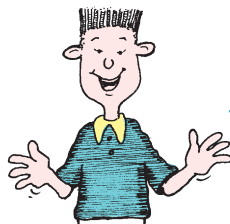
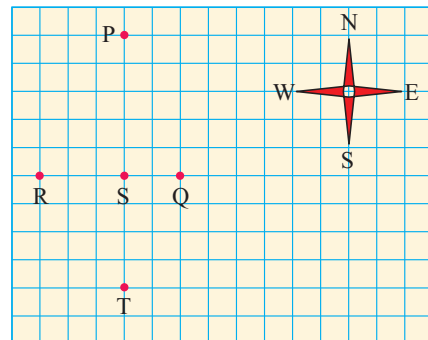
EXERCISE 4C

1 In the diagram one grid step is 1 km.

- a Find the direction of

i R from S	ii S from R
iii P from T	iv T from P
v Q from R	vi R from Q
- b How far is it between

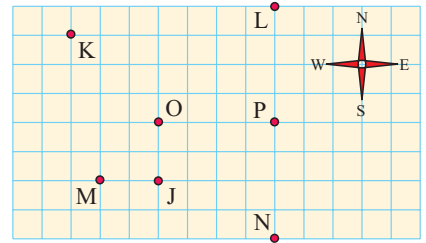
i R and S	ii R and Q
iii P and S	iv P and T



To find the direction of R from S, imagine that you are at S looking towards R.

2 Use the 8 main compass points to find the direction of

- | | |
|-------------------|-------------------|
| a J from O | b K from O |
| c L from O | d M from O |
| e N from O | f P from O |
| g L from M | h M from L |



3



Use this map of Australia to answer these questions.

- Which states or territories have a compass direction in their names. Why is this?
- What state or territory is
 - North of New South Wales
 - West of Northern Territory
 - South of Victoria
- If you fly South from Queensland, what states could you fly over?
- Name the Eastern states.

4 A \$20 note is hidden at the point shown. Tom, Pia and Joe are each given directions to help find the note. For example, E30 means go East 30 metres.

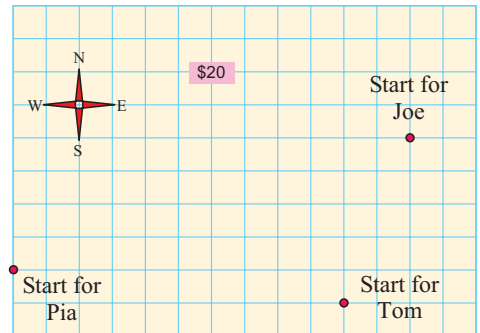
Directions are:

Tom: N60, W50, S20, E10, N20

Pia: 30E, 70N, 30E, 10S

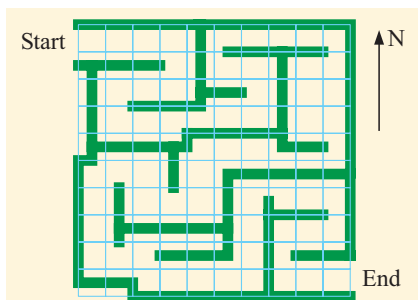
Joe: 70W, 30N, 20E, 10S, 10W

- Who finds the \$20 note?
- Who walks the greatest distance?
- Would
 - Pia find the note if she walked exactly in the NE direction
 - Tom find the note if he walked exactly in the NW direction?



Each grid unit is 10 m

5



Give your partner directions to get from the Start to the End of this maze

Each square is 2 m long.

D

SCALES

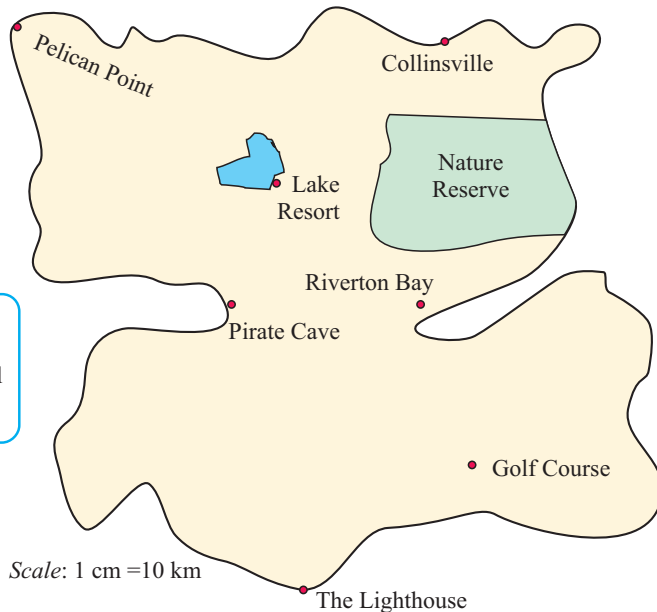
Most maps and directories have a grid. They show the North direction and also show a scale. The **scale** of a map is used to work out approximate **actual distances**.

GIANT ISLAND

Here is a map of a large island.
The scale given is

1 cm = 10 km.
 ↑ ↑
 map actual
 distance distance
 (or real distance)

1 cm = 10 km means
that 1 cm on the map
means 10 km of actual
distance on the island.



‘1 cm represents 10 km’ is the same as ‘10 mm represents 10 km’.

So, 1 mm represents 1 km.

The map distance from Pirate Cove to Riverton Bay (measured with a ruler) is 25 mm.

This means that the real life (actual) distance is 25 km.

EXERCISE 4D

1 Copy and complete:

- a For a scale of 1 cm = 10 km,
 2 cm represents
 5 cm represents
 $\frac{1}{2}$ cm represents
 1 mm represents
 30 km is represented by
 56 km is represented by

- b For a scale of 1 cm = 5 km
 3 cm represents
 10 cm represents
 1 mm represents
 $\frac{1}{2}$ cm represents
 20 km is represented by

2 For a scale of 1 cm = 2 km, find the actual length of these map distances.

a _____

b _____

c _____

d _____

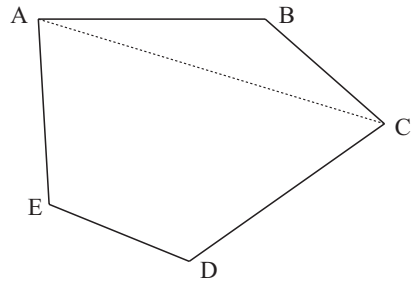
e _____

f _____

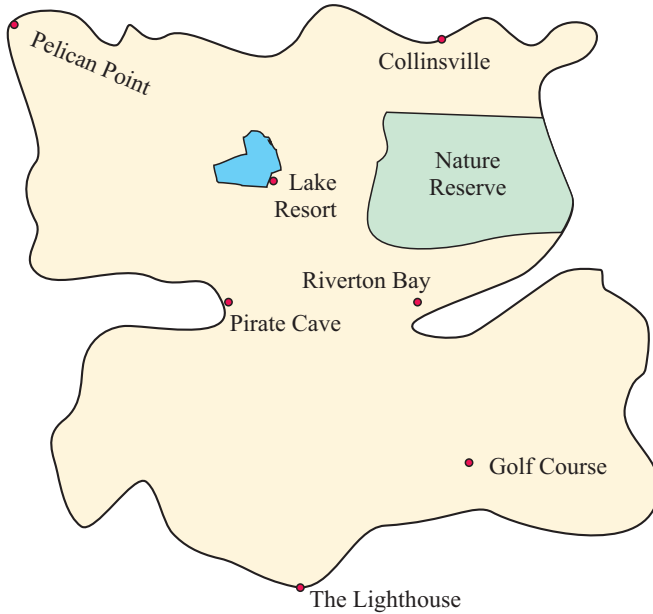
3 The scale used in this scale diagram is $1 \text{ mm} = 3 \text{ m}$.

Measure the distances with your ruler then use the scale to find the actual distance from

- a** A to B **b** B to C
- c** D to E **d** A to C
- e** A to B to C, then back to A.



4



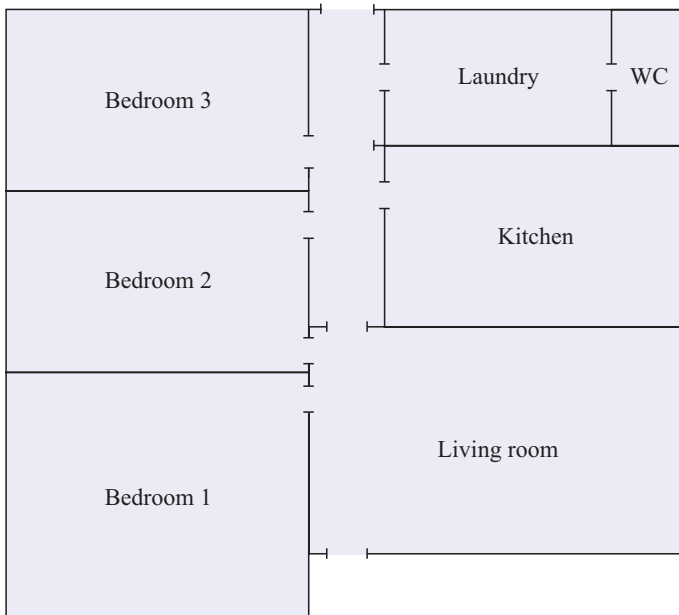
a Find the map distance in mm from

- i** Lake Resort to the Golf Course
- ii** Collinsville to Pirate Cove
- iii** Pelican Point to Riverton Bay

b Use the scale $1 \text{ cm} = 10 \text{ km}$ to find the actual distance in km from

- i** Lake Resort to the Golf Course
- ii** Collinsville to Pirate Cove
- iii** Pelican Point to Riverton Bay

5 Here is a scale drawing of a small house plan.



You can get house plans from newspapers, Real Estate agents and builders.



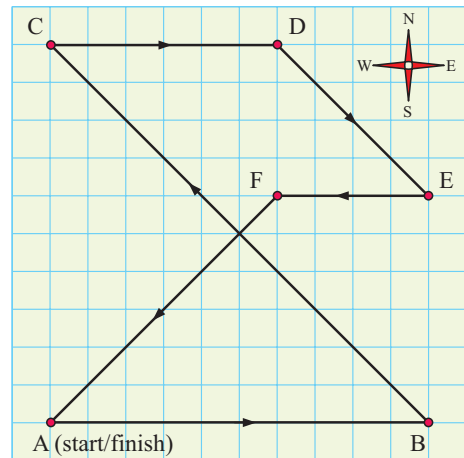
Copy and complete this table.

Room	Drawing sizes	Real sizes
Living	5 cm by 3 cm	5 m by 3 m
Kitchen		
Bedroom 1		
Bedroom 2		

6 This is the course for the Millennium Cup Yacht Race which starts at point A, goes to B, C, D, E, F and then back to A.

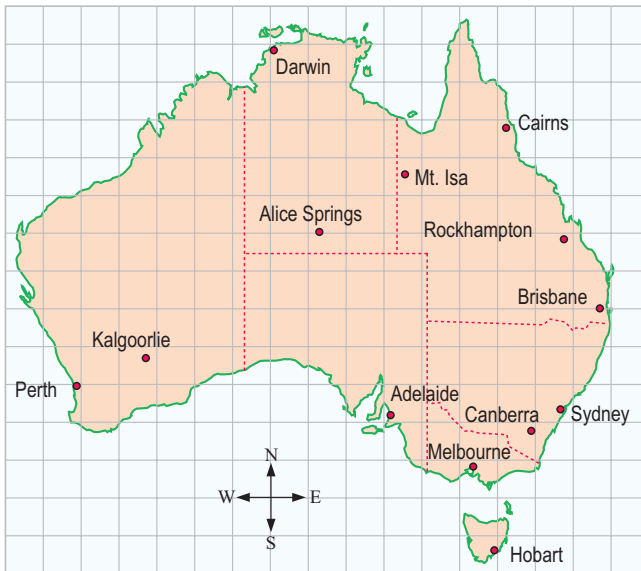
a Copy and complete:

Part of race	Direction	Map distance
A to B	East	5 cm
B to C		
C to D		
D to E		
E to F		
F to A		
	<i>Total</i>	cm



b What is the actual length of the race in km?

7



Use your ruler and the scale given to find the direct distance from

- a Kalgoorlie to Alice Springs
- b Darwin to Mt Isa
- c Brisbane to Adelaide
- d Sydney to Hobart
- e Melbourne to Perth to Cairns to Canberra and back home to Melbourne

Scale: 1 cm represents 500 km

8 Draw a scale diagram of either

- part of your school (such as a building or part of the yard)
- the house or dwelling that you live in
- your bedroom.

E

DEGREES

Using only the eight compass points can be very inaccurate, especially if we are working with long distances.

Early navigators decided that a complete turn or revolution should be divided into 360 equal parts called **degrees**.

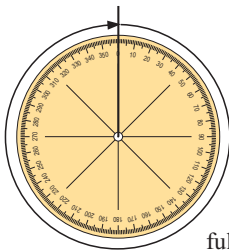
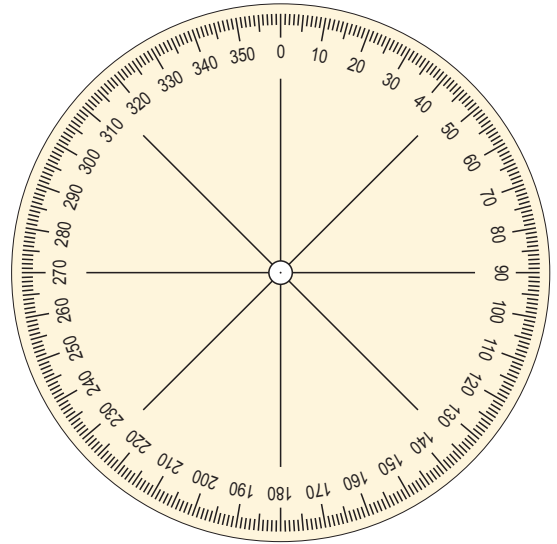
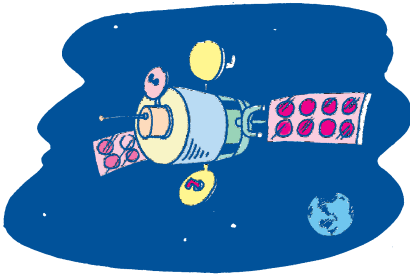
We do not know exactly why 360 degrees was chosen. Some people think that it had something to do with 365 days in a year. Most mathematicians believe that 360 was chosen because we can easily find useful fractions of it, such as halves, thirds, quarters, fifths, sixths, eighths, ninths, tenths and twelfths.

CIRCULAR PROTRACTORS

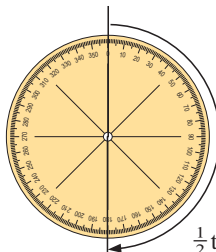
Circular protractors are used to measure the sizes of angles on geometric figures. (Semi-circular protractors can also be used.)

Directional compasses are used for navigation and have accuracy to one degree.

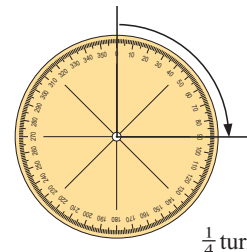
In recent years navigation by satellite has been used for even greater accuracy.



full turn
 360°



$\frac{1}{2}$ turn
 180°

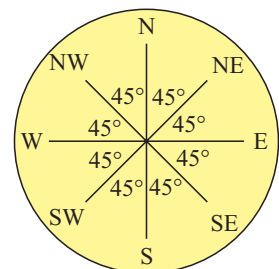


$\frac{1}{4}$ turn
 90°

For magnetic compasses we line up the magnet to **magnetic north** and call this **zero (0) degrees true**. The direction of any other object can then be given in **degrees from true north** by measuring **clockwise**.

A quarter turn or right angle is measured to be 90 degrees.

We write this as 90° .



EXERCISE 4E

1 Match these angles with the statements.

a straight angle



b acute angle



c right angle



d revolution



e obtuse angle



f reflex angle



A a full turn through 360 degrees

B a turn between 0 degrees and 90 degrees

C a turn between 90 degrees and 180 degrees

D a quarter turn through 90°

E a turn between 180 degrees and 360 degrees

F a half turn of 180 degrees

2 a If you are walking South and you turn to walk West, through what angle have you turned?

b If you are walking North-East and you turn to walk South, through what angle have you turned?

3 a If you are walking East and turn clockwise through 45 degrees, in what direction are you now going?

b If you are walking South-West and turn anticlockwise through 135 degrees, in what direction are you now going?

Clockwise means in the direction that clock hands turn. Anticlockwise is opposite to clockwise.



F

FINDING TREASURES

It was common for treasures such as gold ornaments, precious jewels and paintings to be hidden in times of war. Pirates and others buried treasures. They made maps of the sites so that they could find the treasure some-time later.

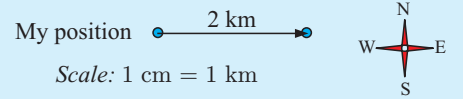
Landmarks, directions and distances are all important parts of treasure maps.



EXERCISE 4F

1 Draw freehand scale diagrams from the following directions.

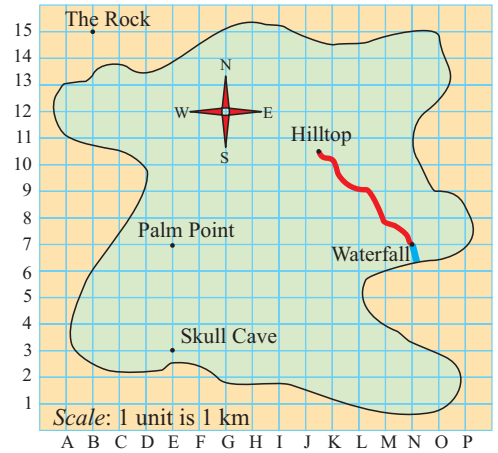
Example: From where you are now, go 2 km East.



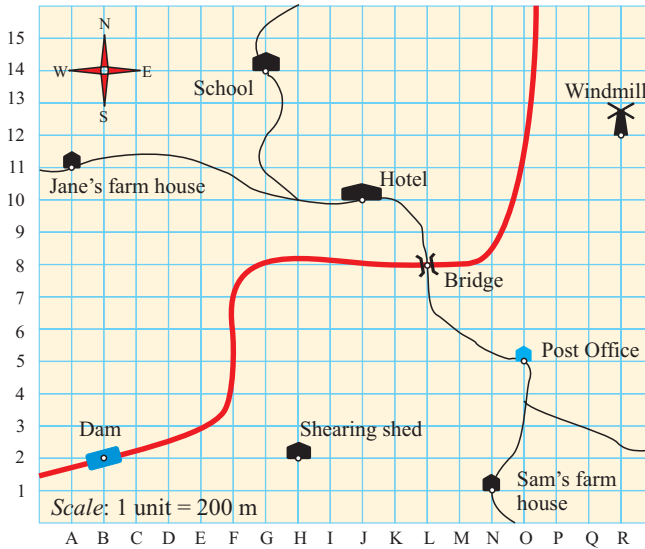
- a** From where you are now, go 3 km South. (Scale: 1 cm = 1 km)
- b** From where you are now, go 30 m West. (Scale: 1 cm = 10 m)
- c** From where you are now, go 4 km NE. (Scale: 1 cm = 1 km)
- d** From where you are now, go 350 m SW. (Scale: 1 cm = 100 m)

2 Locate the treasure in each case, giving its grid reference.

- a** We came ashore at D9, went East for 4 km and then South for 5 km.
- b** We came ashore at N11 and travelled South West. The treasure was buried in the bank of a stream.
- c** We came ashore just over 1 km from the waterfall. We could see the falls in a North-Easterly direction. We travelled 5 km West and then 7 km North.



3



A wealthy farmer once owned all the land shown in the map. Fifty years later his grandchildren Jane and Sam discovered the map he had left them and a letter that talked about \$500 000 hidden in gold and silver coins.

There were two sets of instructions for finding the coins.

Sam's instructions: Start at your farm, travel 1 km West then 2 km North. The treasure is now South-East of you.

Jane's instructions: Start at your farm and travel 2 km South, turn 90 degrees anticlockwise and travel 800 m in that direction. The treasure is now North-East of you.

Where did they find the coins?

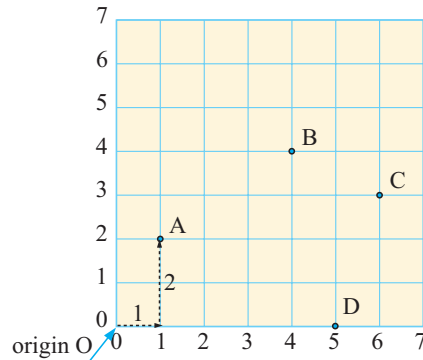
G

COORDINATES

Instead of using letters and numbers to locate positions on a map we can use numbers on both axes.

The pairs of numbers are called **coordinates** or **ordered pairs**. They are ordered pairs because we use the order (horizontal movement, vertical movement) from the **origin O**.

The coordinates of the origin are (0, 0).



From the origin, A is 1 unit right and 2 units up.

So, A has the coordinates (1, 2).





B is (4, 4), that is, 4 units right and 4 units up from the origin.

C is (6, 3), that is, 6 units right and 3 units up from the origin.

D is (5, 0), that is, 5 units right and 0 units up from the origin.

EXERCISE 4G

1 a Write down the coordinates of the

- i polo 
- ii pole vault 
- iii swimming 
- iv sprints 

b What sports would you find at these coordinates?

- i (2, 3) ii (5, 6)
- iii (6, 5) iv (5, 1)

c Write down the coordinates of the

- i cycling ii canoeing

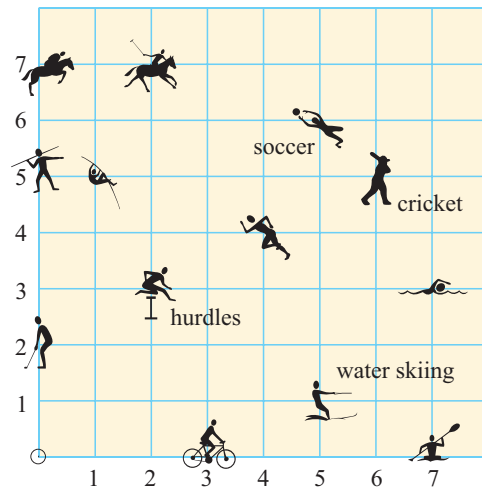
What do you notice about these ordered pairs?

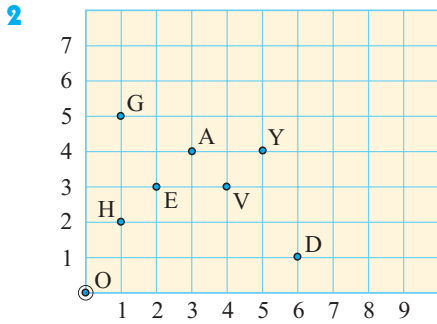
d Write down the coordinates of the

- i golf ii javelin iii showjumping 

What do you notice about these ordered pairs?

Sporting complex





Write down the letters given by these coordinates.

- (1, 2), (3, 4), (4, 3), (2, 3)
- (3, 4)
- (1, 5), (0, 0), (0, 0), (6, 1)
- (6, 1), (3, 4), (5, 4)

What is the message?

3 Copy the grid onto squared paper.

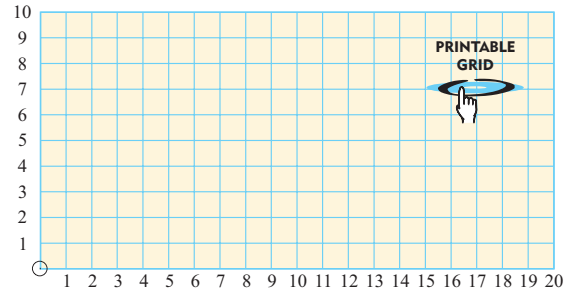
Plot the coordinates and join them with straight lines.

Start with (0, 2), (1, 0), (16, 0), (17, 1), (16, 2), (13, 2)

then (0, 2), (1, 4), (3, 4), (4, 2), (6, 2), (6, 5), (8, 7), (13, 7), (15, 5), (15, 3), (13, 2), (9, 2), (7, 4), (9, 6), (12, 6), (13, 5), (13, 4), (12, 3), (10, 3), (9, 4), (10, 5), (11, 5)

then (1, 4), (1, 6), (0, 7)

then (2, 4), (2, 6), (1, 7)

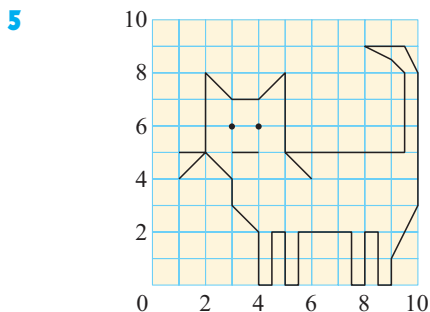
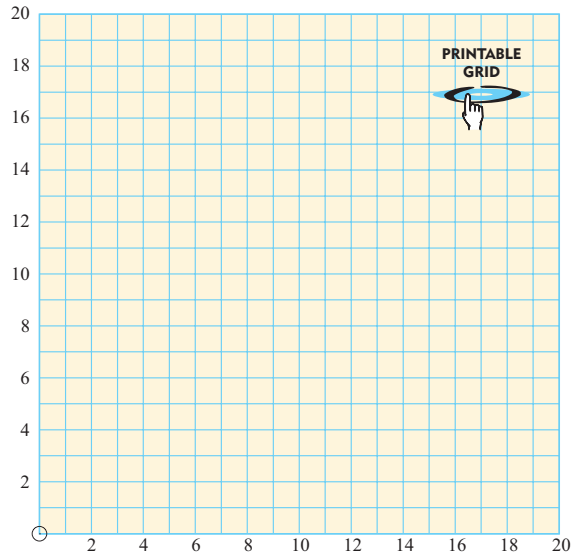


4 a Copy the grid. Join these points in the order they are given.

- (10, 0), (13, 7), (20, 10), (13, 13), (10, 20), (7, 13), (0, 10), (7, 7), (10, 0).

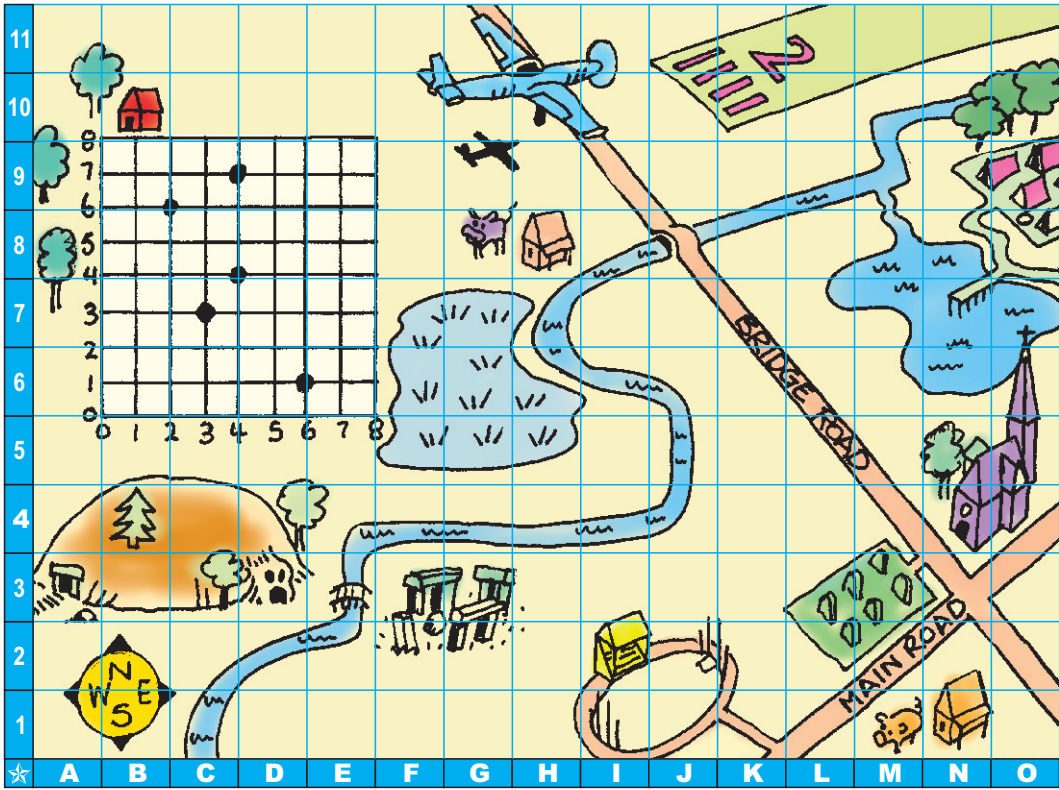
Now join (7, 7) to (13, 13) then join (7, 13) to (13, 7).

b Copy the grid. Draw your own simple symmetrical pattern. Write the instructions to draw it by writing down the coordinates of the points.






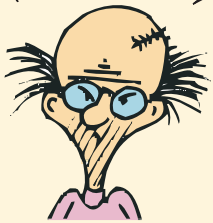
List the coordinates of the points in the order you would join them to draw this diagram.

The whiskers and face will have to be listed separately.



SCALE: 1 BLOCK = 50 METRES LONG



 <p>ARTY MARTY AGED 26 SCARED OF FORESTS. LOVES FISHING. A LONER WHO LOVES PHANTOM COMICS.</p>	 <p>BASHFUL BOB AGED 47 GREW UP ON A FARM.</p>	 <p>CRAZY CHRIS AGED 33 BAD MEMORY, BUT REMEMBERS HOW OLD HE IS.</p>	 <p>SUPER STAN AGED 61 VERY CLEVER. ORGANISED THE ROBBERY AND ESCAPE. TOLD ONE OF THE OTHERS TO HIDE THE MONEY. DOESN'T LIKE TO SHARE.</p>
--	--	--	---

SKILL TESTER

LOCATION

Police have been given rough details of the hideouts of four escaped bank robbers. A witness saw one of the escapees hiding a big bag in the forest. She does not remember the spot. She does remember that the escapee had a strange look on his face.

Police have prepared the coded map alongside. Five possible locations for the hidden money have been marked on the map. Police will use this map to catch the robbers and find the money.

You know the area and have been asked to help the police.

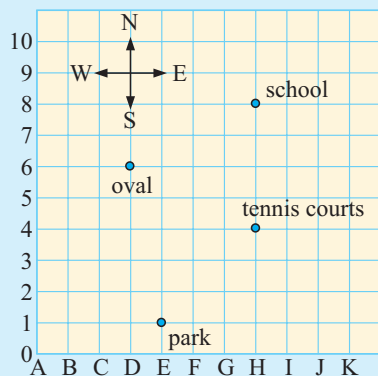
- 1 What are the grid references for the
 - a pig farm house
 - b church entrance
 - c campsite jetty
 - d dairy farm house
- 2 What is located at
 - a K10
 - b M9
 - c J2
 - d M3
- 3 Give the directions from the middle of the swamp of the
 - a grandstand
 - b Rangers hut
 - c runway
 - d southern edge of lake
- 4
 - a Between what two locations is the southern bridge?
 - b What are the grid references for this bridge?
- 5
 - a How far is the northern bridge from the intersection of Bridge Road and Main Road?
 - b What direction is this bridge from the intersection?
- 6 From the entrance to the campsite find the
 - a direction of
 - i the ancient structure
 - ii the Ranger's hut
 - b distance by helicopter to
 - i the ancient structure
 - ii the Ranger's hut
- 7 Work out the shortest distance from the northern bridge to the mine. Go around the swamp through the gap near the forest and then pass the cave. **Hint:** Use a length of cotton to help you.
- 8 Police arrived at the SE corner of the forest. They were then told that CC is at the RH. They will split into two groups. Group 1 will go W and then N around the FP boundary. Group 2 will go N and then W. How far will each group need to go?
- 9 BB was seen at I1. He ran 50 metres N to hide.
 - a Where is he?
 - b How could this information have been confusing?
- 10 AM is hiding near D3. You know there are tunnels in the hill. What will you tell the police to make sure AM does not sneak past them? Use grid references to help you.

Extension

- 11 Where is the money hidden? Write your reasons in sentences.
- 12 Where would SS hide? Write your explanation using grid references and location words.
- 13 Is this map drawn accurately? Give three reasons for your answer.

MENTAL SET 4A

Use this grid to answer questions 1 to 5. The grid shows the positions of a school and its sports grounds.

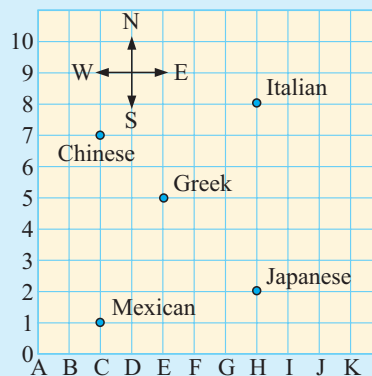


Grid lines are every 100m

- 1 Find the location of the oval.
- 2 Find the direction of the park from the tennis courts.
- 3 What horizontal and vertical steps take you from the school to the oval?
- 4 How far is it from the school to the tennis courts?
- 5 Find the coordinates of the café if it is North-West of the park and South of the oval.
- 6 For a scale of 1 cm = 100 km, 5 cm represents
- 7 If you are going North and turn clockwise through a right angle, what is your new direction?
- 8 If you are walking South and you turn clockwise through 45 degrees, in what direction are you now walking?
- 9 Draw a diagram to represent a turn between 90 degrees and 180 degrees.
- 10 On a site plan with scale 1 cm = 10 m, find the real length of a building with plan length 5 cm.

MENTAL SET 4B

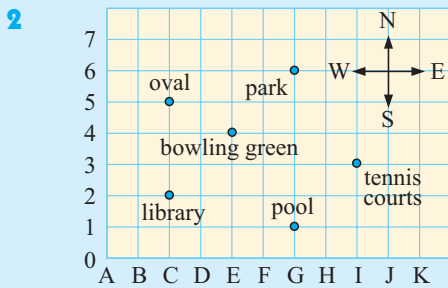
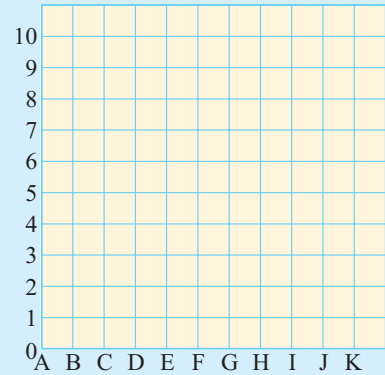
Use this grid to answer questions 1 to 6. The grid shows the positions of stalls at a Food Fair.



- 1 Find the location of the Italian stall.
- 2 Find the direction of the Greek stall from the Japanese stall.
- 3 Using horizontal and vertical steps find how to get from the Greek stall to the Chinese stall.
- 4 If each grid unit is 10 metres, how far is it to walk from the Japanese stall to the Mexican stall, along grid lines?
- 5 Which stall is South-West of the Italian stall?
- 6 Which stalls are the same distance from the Greek stall, 'as the crow flies'?
- 7 For a scale of 1 cm = 50 km, 1 mm represents
- 8 If you are walking South-West and you turn to walk North-West, through what angle have you turned?
- 9 Draw a diagram to represent a quarter turn through 90 degrees.
- 10 Draw a freehand scale diagram to represent the following directions: from where you are now, go 200 m North-West (scale 1 cm = 100 m).

REVIEW EXERCISE 4

- 1
 - a Copy the given grid and mark on it B2, C6, G5, F1.
 - b Join the points in the order given and join F1 to B2.
 - c Write down the correct name of this figure.

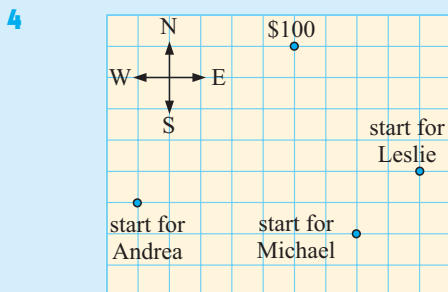
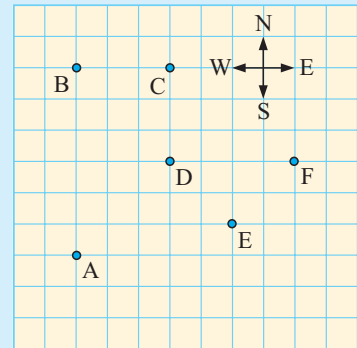


The grid shows the position of the facilities in a local community.

- a Find the grid position of the
 - i oval
 - ii pool
 - iii library
- b Give directions for going from
 - i the park to the tennis courts
 - ii the pool to the oval

- 3 In the diagram one grid step is 1 km.

- a How far is it between
 - i A and B
 - ii D and F
- b Use the eight main compass points to find the direction of
 - i A from B
 - ii E from F
 - iii B from C
 - iv E from B



Grid unit is 10m

A \$100 note is hidden at the point shown. Leslie, Michael and Andrea are each given directions to help find the note.

For example, E20 means go East 20 m. Directions are:

- Leslie: N30, W20, N20, W30, S20
 Michael: W30, N60, W20, S20, E30
 Andrea: N40, E20, N20, E30, S10

- a Who finds the \$100 note?
- b Who walks the greatest distance?
- c Would Leslie find the note if she walked exactly in the North-West direction?

5 Copy and complete: For a scale of 1 cm represents 500 m

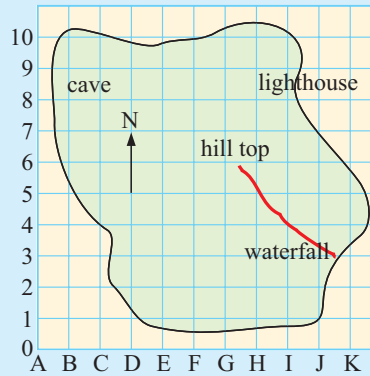
- a 3 cm represents
- b 1 mm represents
- c 2500 m is represented by
- d 250 m is represented by

6 Locate the treasure, giving its grid reference.

We came ashore at C4, went East for 4 km, and then South-East until we reached the coast.

The treasure was here.

Scale: 1 unit = 1 km



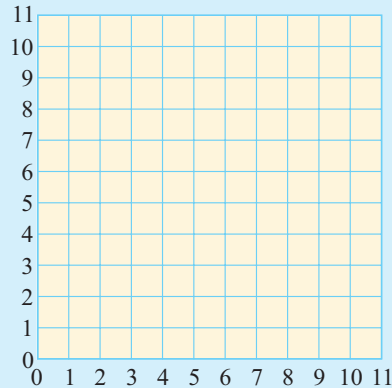
7 For a scale of 1 cm = 200 km, find the actual length of these map distances.

- a _____
- b _____
- c 

- 8
- a If you are walking West and turn anticlockwise through 45 degrees, in what direction are you now walking?
 - b If you are walking North-West and you turn anticlockwise to walk South-East, through what angle have you turned?

9 Copy the grid and mark the points A(1, 1), B(6, 1), C(7, 5) and D(2, 5) on it. Draw the figure with vertices ABCD.

- a What type of polygon is ABCD?
- b Give the coordinates of the point where the diagonals of ABCD intersect. (The diagonals are AC and BD.)



Chapter 5

Fractions

In this chapter you should learn to:



- ✓ represent fractions using two numbers and a bar
- ✓ find the fraction shaded in a figure
- ✓ find fractions which add to one whole
- ✓ find a fraction of a quantity
- ✓ tell the difference between proper and improper fractions
- ✓ use mixed numbers
- ✓ see when two fractions are equivalent
- ✓ find equal fractions
- ✓ write fractions in simplest form
- ✓ see that fractions can be seen as divisions.
- ✓ add and subtract fractions using a diagram
- ✓ solve problems which involve the use of fractions

A

REPRESENTING FRACTIONS

WHAT IS A FRACTION?

A **fraction** is a part of any quantity.

If we cut a chocolate bar into two equal parts, then each of these parts is a half of the chocolate bar.

We write a half as $\frac{1}{2}$.



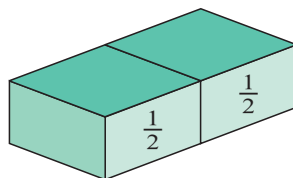
$\frac{1}{2}$ is a fraction which shows that we had a whole, we divided it into two **equal parts**, and we are looking at one of them.

numerator \rightarrow $\frac{1}{2}$ \leftarrow we are looking at 1 part
 denominator \rightarrow $\frac{1}{2}$ \leftarrow the whole is divided into 2 **equal parts**

The **numerator** shows how many parts we are using.

The **denominator** shows how many equal parts there are altogether.

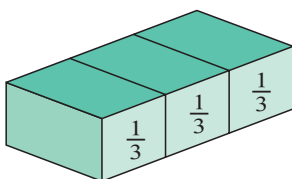
There are two halves in one whole.



$$\frac{1}{2} + \frac{1}{2} = 1 \quad \text{or} \quad \frac{2}{2} = 1$$



Tao, Kim and Lee wanted to share a chocolate bar so they cut it into three equal pieces.

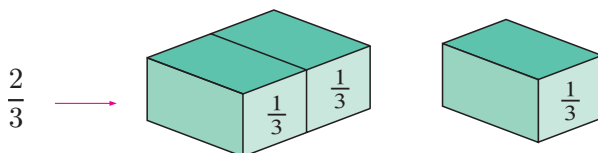


Each piece is one third of the bar. $\frac{3}{3} = 1$



One third is written $\frac{1}{3}$ \leftarrow we are looking at 1 part
 \leftarrow the whole is divided into 3 **equal parts**

Two pieces are two thirds of the bar.



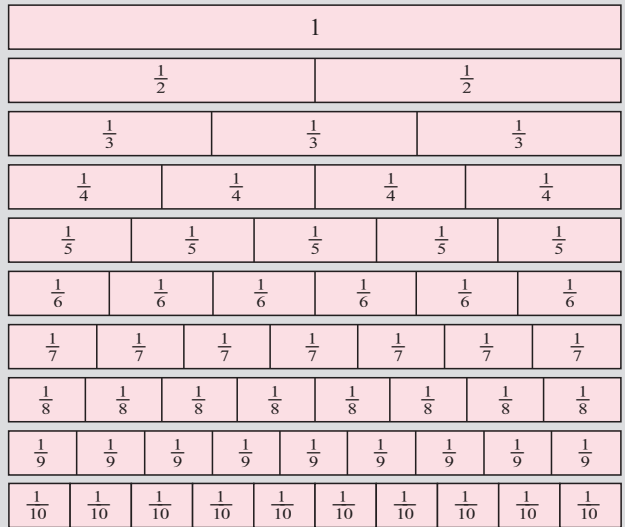
Two thirds is written $\frac{2}{3}$ \leftarrow we are looking at 2 parts
 \leftarrow the whole is divided into 3 **equal parts**

ACTIVITY



The chart alongside shows *strips of equal size* broken up into *different fractions*. This is called a **fraction chart**.

Either print the following table by clicking on the above icon or copy it into your workbook.

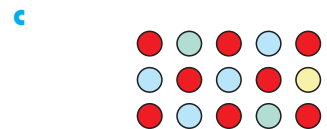


Now complete the table.

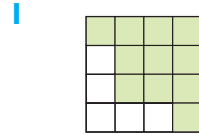
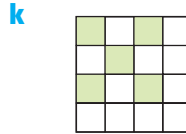
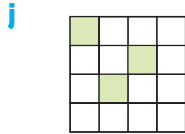
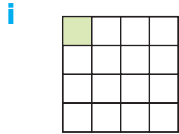
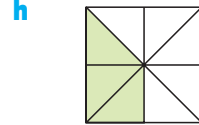
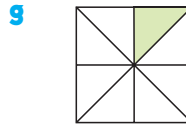
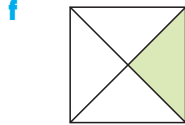
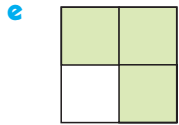
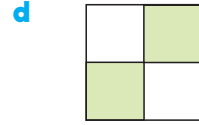
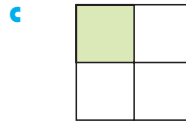
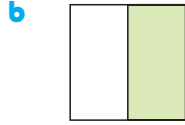
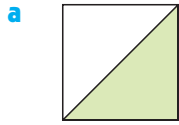
	<i>Number of equal parts</i>	<i>One part as a fraction</i>	<i>Fraction in words</i>	<i>All parts form the fraction</i>
a	1	$\frac{1}{1}$	one whole	
b	2		one half	
c		$\frac{1}{3}$		
d			one quarter	
e			one fifth	
f	7	$\frac{1}{6}$		$\frac{6}{6}$
g			one eighth	
h		$\frac{1}{9}$		$\frac{9}{9}$
i	10			

EXERCISE 5A

1 What fraction of the dots are red?



2 What fraction of the square is shaded?



There are two correct answers for **d**. Can you find both of them?



What fraction of the cats are **a** black **b** white?



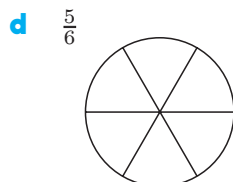
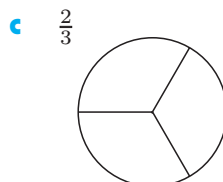
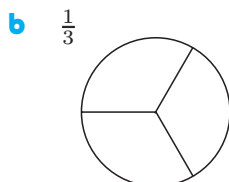
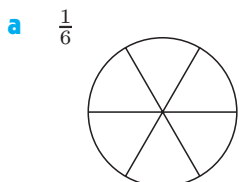
- a i** What fraction of the flowers are in the vase?
- ii** What fraction of the flowers are lying on the table?
- b i** What fraction of the flowers are tulips?
- ii** What fraction of the flowers are daisies?



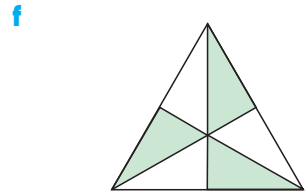
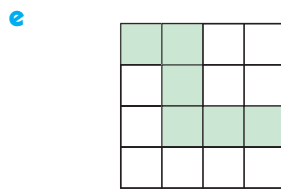
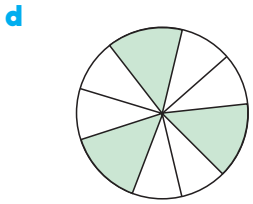
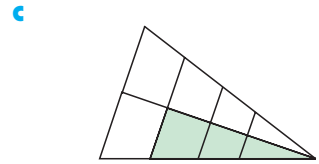
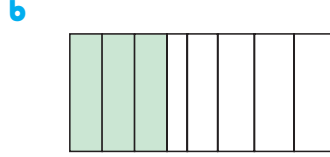
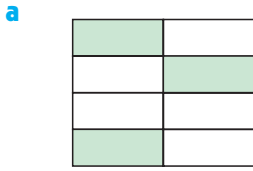
- a i** What fraction of the children are wearing hats?
- ii** What fraction of the children are not wearing hats?
- b i** What fraction of the children are boys?
- ii** What fraction of the children are girls?



6 Copy the circles and shade the fractions given.



7 Which diagrams have $\frac{1}{100}$ shaded?



8 Write a fraction to show

a three quarters

b two thirds

c two fifths

d four fifths

e three eighths

f five eighths

g two sevenths

h three tenths

i one hundredth

9 Write these fractions in words.

a $\frac{2}{3}$

b $\frac{3}{4}$

c $\frac{3}{5}$

d $\frac{7}{8}$

e $\frac{4}{9}$

f $\frac{5}{7}$

g $\frac{5}{12}$

h $\frac{17}{20}$

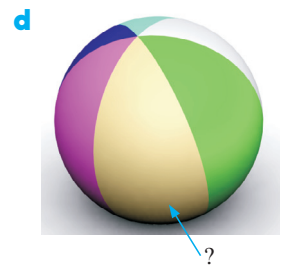
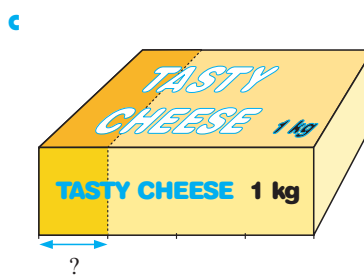
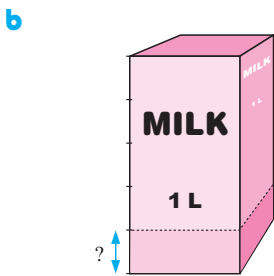
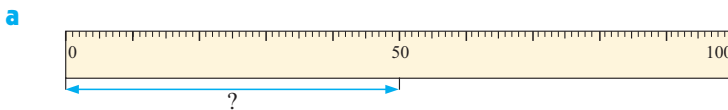
i $\frac{11}{30}$

j $\frac{4}{25}$

k $\frac{3}{100}$

l $\frac{97}{100}$

10 Give the fraction shown in each diagram.



as a fraction of a dollar



as a fraction of a dollar

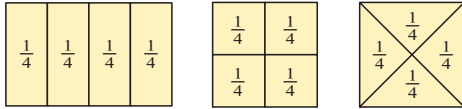
Americans have a coin called a "quarter". What is it a quarter of?



B FRACTIONS THAT ADD TO ONE (WHOLE)

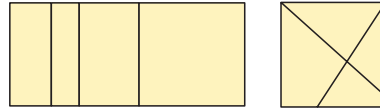
So that we can see equal fractions, a whole needs to be divided into **equal pieces**.

Equal pieces like these.



Each $\frac{1}{4}$ comes from an *equal part*
and $\frac{4}{4} = 1$.

Not like these.

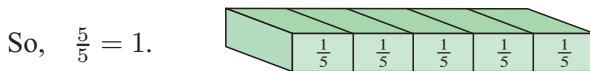


Each square is divided into 4 parts which are *not equal*, so quarters cannot be found.

If a chocolate bar was cut into five equal pieces, then each piece would be one fifth or $\frac{1}{5}$ of the chocolate bar.

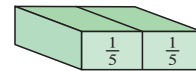
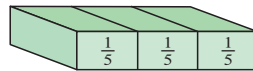


Five pieces, or 5 one fifths make up the whole.



Five fifths make one whole.

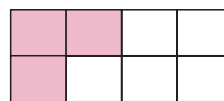
If three fifths of the chocolate bar were eaten, then two fifths would be left.



Notice that $\frac{3}{5} + \frac{2}{5} = \frac{5}{5} = 1$

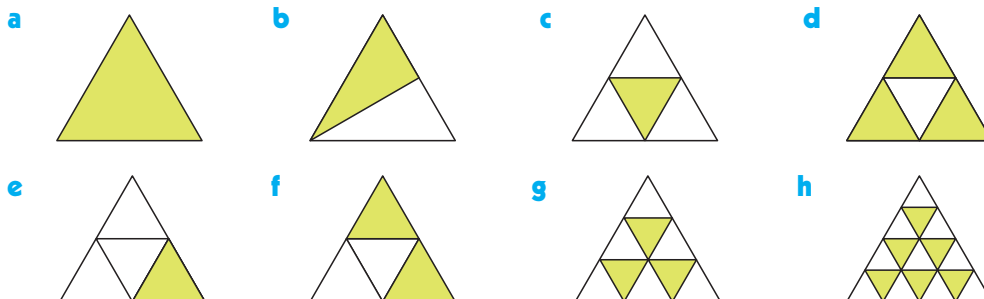
EXERCISE 5B

- 1 Three eighths of the rectangle is shaded. What fraction remains unshaded?



- 2 Look at each triangle.

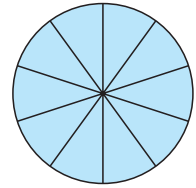
- i What fraction is shaded?
- ii What fraction is not shaded?
- iii Write the two fractions from i and ii to show that they add to 1.
For example, in d $\frac{1}{4} + \frac{3}{4} = 1$.



3 The circle shown is divided into 12 equal parts.

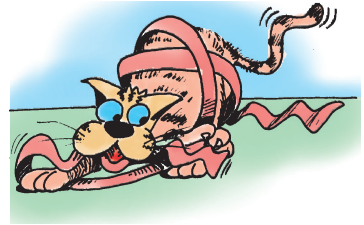
- a What fraction of the circle is each part?
- b Give the fraction of the circle unshaded if these fractions are shaded.

- i $\frac{1}{12}$ ii $\frac{5}{12}$ iii $\frac{7}{12}$ iv $\frac{11}{12}$



4 Della ate $\frac{1}{6}$ of her iceblock. What fraction of the iceblock was left?

5 Tahlia had a piece of ribbon. Her kitten chewed two thirds of it. What fraction of the ribbon was left?



6 George spend $\frac{4}{7}$ of his pocket money. What fraction of his pocket money was left?

7



A carton contains one dozen eggs. If five eggs are taken out of the carton

- a what fraction of the eggs are taken out
- b how many eggs are left
- c what fraction of the eggs are left in the carton?

8 A bag contains eleven apples.

- a Sarah and Jon eat three apples. What fraction of the apples do they eat?
- b They feed five apples to their ponies.
 - i How many apples remain in the bag now?
 - ii What fraction of the bag of apples remains?

9 Julia's ducks eat two fifths of a bag of pellets each week. Julia buys a new bag of pellets at the beginning of the week.

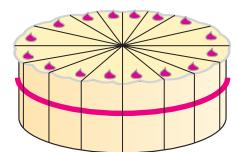
- a What fraction of the bag of pellets remains at the end of one week?
- b Will there be enough pellets left to feed the ducks for another week?



10 A cake is cut into 16 equal pieces.

Copy and complete the table following:

	Number of pieces eaten	Fraction eaten	Number of pieces remaining	Fraction remaining
a	1			
b			3	
c		$\frac{5}{16}$		
d				$\frac{7}{16}$

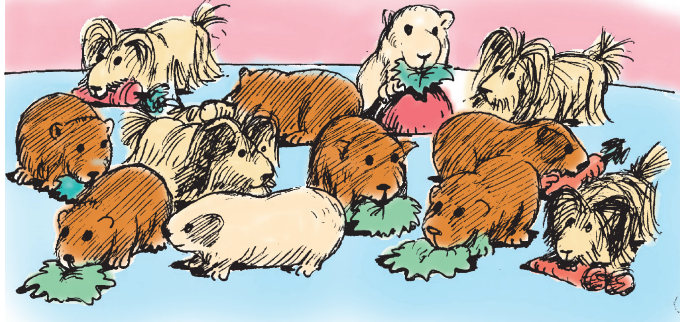


PRINTABLE WORKSHEET PRINTABLE TEMPLATE

C

FINDING A FRACTION OF A QUANTITY

Thomas saw twelve guinea pigs in the pet shop window.



Half of the guinea pigs were grey. How many were grey?

To find $\frac{1}{2}$ of 12 we divide 12 into 2 equal parts.

$12 \div 2 = 6$, so 6 guinea pigs were grey. ($\frac{1}{2}$ of 12 = 6)



One third of the guinea pigs had long hair. How many had long hair?

To find $\frac{1}{3}$ of 12 we divide 12 into 3 equal parts.

$12 \div 3 = 4$, so 4 guinea pigs had long hair. ($\frac{1}{3}$ of 12 = 4)



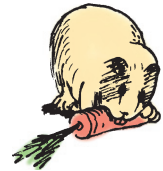
Three quarters of the guinea pigs were eating. How many of them were eating?

To find $\frac{1}{4}$ of 12 we divide 12 into 4 equal parts.

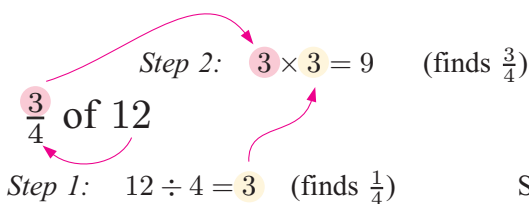
$12 \div 4 = 3$, so one quarter of 12 is 3. ($\frac{1}{4}$ of 12 = 3)

So, three quarters of 12 is $3 \times 3 = 9$. ($\frac{3}{4}$ of 12 = 9)

9 guinea pigs were eating.



or



EXERCISE 5C

- | | | | | | | | |
|---|------------------------|------|------|------|---------|----------|----------|
| 1 | Find $\frac{1}{2}$ of | a 14 | b 20 | c 36 | d 100 | e \$1.20 | f 500 mL |
| 2 | Find $\frac{1}{3}$ of | a 9 | b 15 | c 24 | d 99 | e \$3.30 | f 600 mL |
| 3 | Find $\frac{1}{5}$ of | a 10 | b 20 | c 25 | d 75 | e \$50 | f 15 kg |
| 4 | Find $\frac{1}{10}$ of | a 10 | b 20 | c 40 | d 30 mm | e 50 kg | f \$200 |

- 5** Mrs Finch said she would give one third of Sarah’s class lollypops. There are 24 students in Sarah’s class. How many lollypops would she need to buy?
- 6** On Saturday David’s basketball team scored 40 points. David scored $\frac{1}{5}$ of the points. How many points did David score?
- 7** Copy and complete the table.

a	$\frac{1}{3}$ of 12 =	$\frac{2}{3}$ of 12 =
b	$\frac{1}{4}$ of 40 =	$\frac{3}{4}$ of 40 =
c	$\frac{1}{5}$ of 35 =	$\frac{4}{5}$ of 35 =
d	$\frac{1}{10}$ of 30 =	$\frac{3}{10}$ of 30 =
e	$\frac{1}{8}$ of 16 =	$\frac{5}{8}$ of 16 =

First, divide by the denominator.
Then, multiply by the numerator.



- 8** Copy and complete

a $\frac{2}{3}$ of \$12 = \$12 \div 3 \times \square

b $\frac{3}{4}$ of \$20 = \$20 \div \square \times 3

c $\frac{4}{5}$ of 20 = 20 \div 5 \times \square

d $\frac{2}{5}$ of 35 = 35 \div \square \times 2

e $\frac{3}{4}$ of 36 = 36 \div 4 \times \square

f $\frac{2}{3}$ of 24 = 24 \div \square \times 2

g $\frac{4}{5}$ of \$100 = \$100 \div \square \times \square

h $\frac{7}{10}$ of \$200 = \$ \square \div \square \times 7

i $\frac{3}{10}$ of 50 = \square \div 10 \times \square

j $\frac{4}{7}$ of 28 = \square \div \square \times \square

- 9** Find

a $\frac{2}{5}$ of \$20

b $\frac{3}{4}$ of 80 kg

c $\frac{5}{8}$ of 40 cm

d $\frac{7}{10}$ of \$140

- 10** Anna spent $\frac{3}{4}$ of her pocket money on going to the movies last week. If she got \$16 in pocket money, how much did she spend on going to the movies?
- 11** Unfortunately two thirds of Takuma’s plants died because he forgot to water them. If he planted 15 plants, how many died?

Carefully read these problems, and set out your answers like this.

For **c** $\frac{3}{4}$ of 24
 $= 24 \div 4 \times 3$
 $= 6 \times 3$
 $= 18$ children

- 12** Mr Smith teaches a class of 24 children.

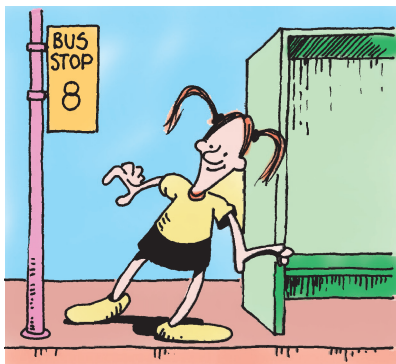
a Half of the children are boys. How many are boys?

b One third of the children did not do their homework. How many did not do their homework?

c Three quarters of the children are wearing school T-shirts. How many are wearing school T-shirts?

- d Five eighths of the children bought lunch from the school tuck shop. How many bought lunch from the tuck shop?
- e After school five sixths of the children will play sport. How many will play sport?

13



Kylie counted 32 cars go past while she waited at the bus stop.

- a If one quarter of the cars were white, how many were white?
- b If one eighth of the cars were red, how many were red?
- c Three quarters of the cars carried passengers. How many carried passengers?
- d Three sixteenths of the cars had interstate number plates. How many cars was that?

14 Jason's father gave him \$100.

Jason gave $\frac{1}{10}$ of the money to his sister,

$\frac{1}{5}$ of the money to his brother and

spent $\frac{7}{20}$ of the money on a computer game.

- a How much money did Jason give his sister?
- b How much money did Jason give his brother?
- c How much money did the computer game cost?
- d i How much did Jason give away and spend?
 ii What fraction of the money was that?
 iii How much money did Jason have left?
 iv What fraction of the \$100 was left?



D IMPROPER FRACTIONS AND MIXED NUMBERS

PROPER AND IMPROPER FRACTIONS

$\frac{1}{2}$ is a **proper fraction**. The numerator is *smaller* than the denominator. numerator \rightarrow 1
denominator \rightarrow 2

$\frac{5}{2}$ is an **improper fraction**. The numerator is *bigger (greater)* than the denominator.

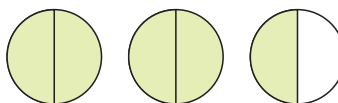
MIXED NUMBERS

A **mixed number** has a whole number part and a fraction part.

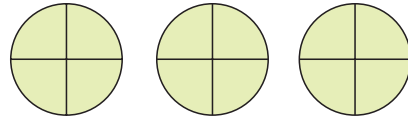
$2\frac{1}{2}$ is a mixed number.

$2\frac{1}{2}$ means two wholes and one half, or 5 halves.

So, $2\frac{1}{2} = 2 + \frac{1}{2} = \frac{5}{2}$.



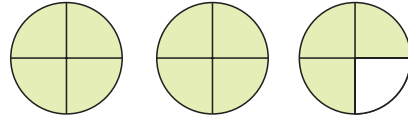
Suppose we had 3 pies and cut them into quarters.



How many quarters is that?

Each pie has 4 quarters, so we have $3 \times 4 = 12$ quarters, and we can write this as $3 = \frac{12}{4}$.

Then Sam ate one quarter of a pie.



Now we have $2\frac{3}{4}$ pies.

How many quarters is that?

Each whole pie has 4 quarters and we have 3 quarters of the third pie, so we have 2 lots of 4 plus 3 quarters = 11 quarters.

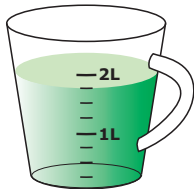
So, $2\frac{3}{4} = \frac{11}{4}$. Count the quarters to check that this is correct.

Notice that $2\frac{3}{4} = \frac{11}{4}$ ← 2 wholes + 3 quarters = 11 quarters
 ↑
 2 wholes is 8 quarters

EXERCISE 5D

1 What mixed number do these diagrams show?

a



b



2 a Eight peaches are cut in halves. How many halves are there?

Copy and complete: $8 = \frac{\quad}{2}$

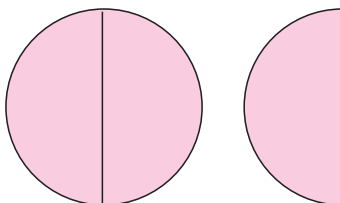
b Five sandwiches are cut in quarters. How many quarters are there?

Copy and complete: $5 = \frac{\quad}{4}$

c How many thirds in three wholes? Copy and complete: $3 = \frac{\quad}{3}$

d How many eighths in 2 wholes? Copy and complete: $2 = \frac{\quad}{8}$

3

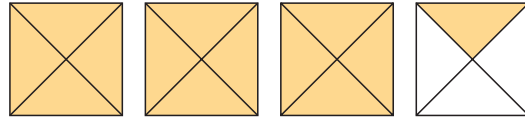


The diagrams show $1\frac{1}{2}$ pizzas.

a How many halves in $1\frac{1}{2}$ pizzas?

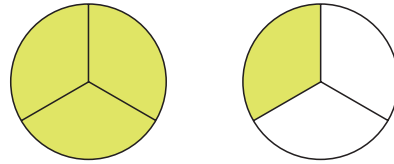
b Copy and complete: $1\frac{1}{2} = \frac{\quad}{2}$

4 a What mixed number is represented by these diagrams?



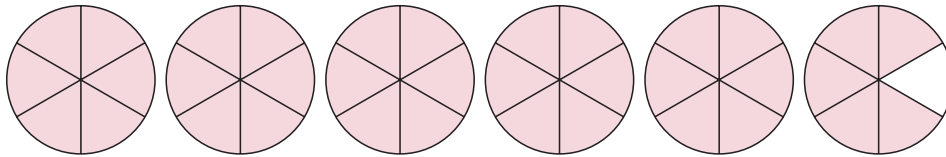
b Copy and complete: $\dots = \frac{\quad}{4}$

5 a What mixed number is represented by these diagrams?



b Copy and complete: $\dots = \frac{\quad}{3}$

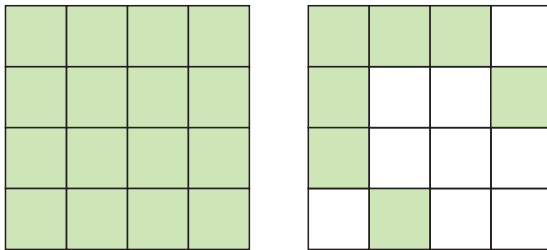
6



a What mixed number is represented by these diagrams?

b Write the mixed number as an improper fraction.

7

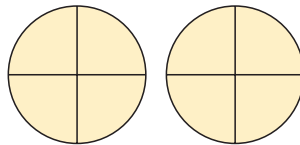


a Write the mixed number represented by the shading.

b Write the mixed number as an improper fraction.

To write $2\frac{1}{4}$ as an improper fraction we say

$$\begin{aligned} 2\frac{1}{4} &= 2 + \frac{1}{4} \\ &= \frac{8}{4} + \frac{1}{4} \\ &= \frac{9}{4} \end{aligned}$$



There are 8 quarters in 2.

So, $2 = \frac{8}{4}$.

or $2\frac{1}{4}$ Step 2: $8 + 1 = 9$ quarters.

Step 1: $2 \times 4 = 8$ quarters.

So $2\frac{1}{4} = \frac{9}{4}$.



8 Write as an improper fraction.

a $1\frac{1}{4}$

b $2\frac{1}{2}$

c $3\frac{1}{3}$

d $1\frac{3}{4}$

e $2\frac{3}{5}$

f $1\frac{1}{10}$

g $2\frac{1}{5}$

h $10\frac{1}{2}$

i $2\frac{2}{3}$

j $3\frac{5}{6}$

PIZZA PORTIONS

Pizzas were each cut into eight equal pieces for a party. After the party there were 17 pieces of pizza left. How many pizzas were left?

Each 8 pieces make up a whole pizza, so how many 8's are in 17?

$$17 \div 8 = 2 + 1 \text{ remainder.}$$

There are 2 whole pizzas and 1 piece ($\frac{1}{8}$ of a pizza) remaining.

$$\text{So, } \frac{17}{8} = 2\frac{1}{8}.$$

Count the pieces to check that this is correct.

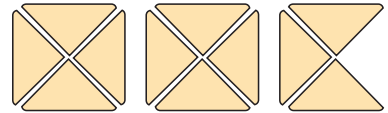
Notice that

$$\frac{17}{8} = 2\frac{1}{8}$$

means $17 \div 8$ 2 wholes $\frac{1}{8}$ remaining



- 9 Sandwiches were cut in quarters for lunch. After lunch 11 quarters remained. How many sandwiches were left?



- 10 Write the following improper fractions as mixed numbers.

a $\frac{2}{2}, \frac{3}{2}, \frac{4}{2}, \frac{5}{2}, \frac{6}{2}, \frac{7}{2}$

b $\frac{3}{3}, \frac{4}{3}, \frac{5}{3}, \frac{6}{3}, \frac{7}{3}, \frac{8}{3}$

c $\frac{4}{4}, \frac{5}{4}, \frac{6}{4}, \frac{7}{4}, \frac{8}{4}, \frac{9}{4}$

- 11 Write the following fractions as mixed numbers.

a $\frac{6}{5}$

b $\frac{8}{5}$

c $\frac{7}{6}$

d $\frac{17}{6}$

e $\frac{11}{8}$

f $\frac{15}{8}$

g $\frac{17}{10}$

h $\frac{21}{10}$

E

EQUIVALENT FRACTIONS

Equivalent fractions (equal fractions) have different numerators and denominators, but the amount they are describing is the same.

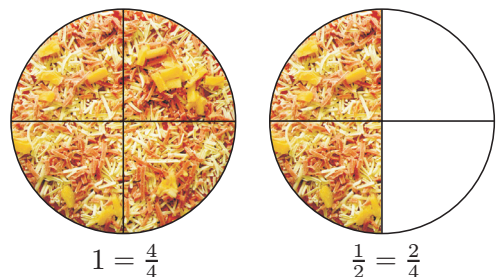
For example,

the diagram shows a pizza cut into quarters.

Half the pizza is the same as two quarters, so we write

$$\frac{1}{2} = \frac{2}{4}$$

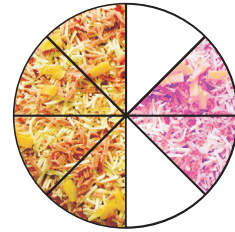
Half the pizza is seen in both cases, but the two fractions have different numerators and denominators.



Also, one half is the same as two quarters or four eighths.

$$\text{So, } \frac{1}{2} = \frac{2}{4} = \frac{4}{8}$$

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$$



$$\frac{1}{4} = \frac{2}{8}$$

Three quarters is the same as six eighths.

$$\text{So, } \frac{3}{4} = \frac{6}{8}.$$

ACTIVITY

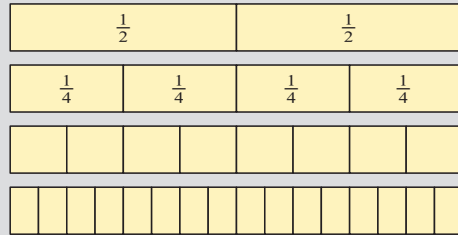
EQUIVALENT FRACTIONS



The four fraction strips shown can be printed from the icon given.

What to do:

- Print the fraction strips and write the fractions in the parts of the third and fourth strips.
- From the first two strips we can see that two $\frac{1}{4}$ s are the same as $\frac{1}{2}$, a *match*. So we write $\frac{2}{4} = \frac{1}{2}$.

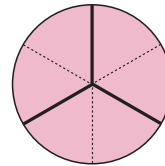


Using all four strips, find as many matches as you can and write them down. Each *match* makes a pair of equivalent fractions.

- What is the largest number of *matches* which can be made from these four strips?

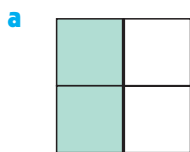
EXERCISE 5E

- The diagram shows a circle marked in sixths. Using the diagram to help you, copy and complete the equivalent fractions.

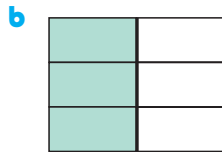


a $\frac{1}{3} = \frac{\quad}{6}$ **b** $\frac{2}{3} = \frac{\quad}{6}$ **c** $\frac{1}{2} = \frac{\quad}{6}$

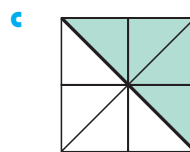
- Using the diagrams to help you, copy and complete the equivalent fractions.



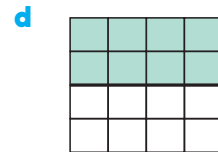
$$\frac{1}{2} = \frac{\quad}{4}$$



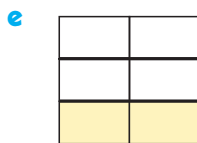
$$\frac{1}{2} = \frac{\quad}{6}$$



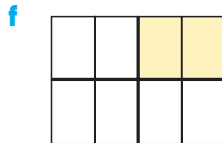
$$\frac{1}{2} = \frac{\quad}{8}$$



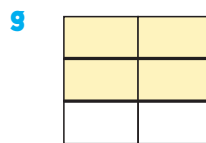
$$\frac{1}{2} = \frac{\quad}{16}$$



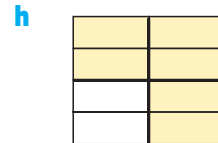
$$\frac{2}{6} = \frac{\quad}{3}$$



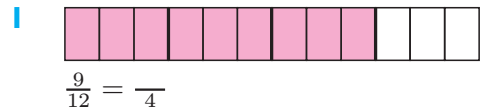
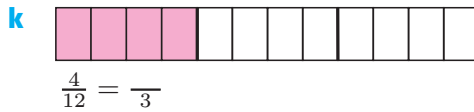
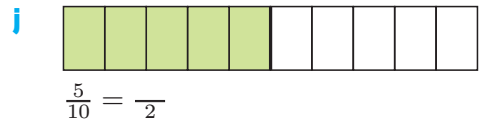
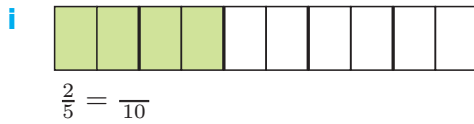
$$\frac{2}{8} = \frac{\quad}{4}$$



$$\frac{4}{6} = \frac{\quad}{3}$$



$$\frac{6}{8} = \frac{\quad}{4}$$



ANOTHER WAY OF LOOKING AT EQUAL FRACTIONS

We can think about equal fractions in this way.

Divide a circle into quarters. Now look at half the circle.



$\frac{1}{2}$ means	we are looking at 1 part	$\xrightarrow{\text{cut each part in 2 (1}\times\text{2)}}$	we are now looking at 2 parts
	whole is divided into 2 parts	$\xrightarrow{\text{cut each part in 2 (2}\times\text{2)}}$	now the whole has 4 parts
	So, $\frac{1}{2} \xrightarrow{\times 2} \frac{2}{4} \xleftarrow{\times 2}$	and $\frac{2}{4} \xrightarrow{\div 2} \frac{1}{2} \xleftarrow{\div 2}$	

Divide a circle into twelfths. Now look at three quarters of the circle.



$\frac{3}{4}$ means	we are looking at 3 parts	$\xrightarrow{\text{cut each part in 3 (3}\times\text{3)}}$	we are now looking at 9 parts
	whole is divided into 4 parts	$\xrightarrow{\text{cut each part in 3 (4}\times\text{3)}}$	now the whole has 12 parts
	So, $\frac{3}{4} \xrightarrow{\times 3} \frac{9}{12} \xleftarrow{\times 3}$	and $\frac{9}{12} \xrightarrow{\div 3} \frac{3}{4} \xleftarrow{\div 3}$	

To find equivalent fractions we multiply or divide the numerator and the denominator by the same number.

3 Copy and complete these equivalent fractions using this quick method.

a $\frac{1}{2} \xrightarrow{\times 10} \frac{\quad}{20} \xleftarrow{\times 10}$

b $\frac{1}{3} \xrightarrow{\times 5} \frac{\quad}{15} \xleftarrow{\times 5}$

c $\frac{2}{3} \xrightarrow{\times 2} \frac{\quad}{6} \xleftarrow{\begin{smallmatrix} \times 2 \\ \div 4 \end{smallmatrix}}$

d $\frac{1}{5} = \frac{\quad}{10}$

e $\frac{2}{5} = \frac{\quad}{15}$

f $\frac{4}{5} = \frac{\quad}{20}$

g $\frac{4}{8} = \frac{\quad}{2} \xleftarrow{\begin{smallmatrix} \div 4 \\ \div 4 \end{smallmatrix}}$

h $\frac{8}{12} = \frac{\quad}{3} \xleftarrow{\begin{smallmatrix} \div 4 \\ \div 4 \end{smallmatrix}}$

i $\frac{9}{18} = \frac{\quad}{2} \xleftarrow{\begin{smallmatrix} \div 9 \\ \div 9 \end{smallmatrix}}$

j $\frac{4}{10} = \frac{\quad}{5}$

k $\frac{12}{16} = \frac{\quad}{4}$

l $\frac{6}{9} = \frac{\quad}{3}$

m $\frac{3}{4} = \frac{\quad}{16}$

n $\frac{2}{9} = \frac{\quad}{18}$

o $\frac{3}{8} = \frac{\quad}{40}$

We can write fractions in order of size if they all have the same denominator.

For example, $\frac{3}{8}$, $\frac{7}{8}$, and $\frac{1}{2}$ can be written as $\frac{3}{8}$, $\frac{7}{8}$ and $\frac{4}{8}$ as $\frac{1}{2} = \frac{4}{8}$.

From smallest to largest the fractions are $\frac{3}{8}$, $\frac{1}{2}$, $\frac{7}{8}$.

4 Write these fractions in order of size from smallest to largest.

a $\frac{5}{6}$, $\frac{1}{2}$, $\frac{1}{6}$

b $\frac{1}{4}$, $\frac{1}{8}$, $\frac{3}{8}$

c $\frac{4}{10}$, $\frac{9}{10}$, $\frac{1}{2}$

d $\frac{7}{9}$, $\frac{4}{9}$, $\frac{2}{3}$

e $\frac{11}{12}$, $\frac{5}{12}$, $\frac{5}{6}$

f $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{8}$

SIMPLEST FORM (LOWEST TERMS)

We can write a fraction in **simplest form** by writing it with the *smallest possible whole number denominator*.

For example, $\frac{1}{2}$ is a fraction in simplest form, but, $\frac{2}{4}$ is not in simplest form.

$\frac{2}{4}$ in simplest form would be $\frac{1}{2}$.

We must find the *largest* number that is a *factor* of both the numerator and the denominator. Then we divide by it.

For example, in $\frac{6}{18}$, 6 is the *largest factor* of the numerator and the denominator.

$$\frac{6}{18} = \frac{1}{3}$$

$\div 6$
 $\div 6$

First check if the numerator is a factor of the denominator.



5 Write these fractions in lowest terms.

a $\frac{2}{6}$

b $\frac{2}{8}$

c $\frac{3}{9}$

d $\frac{4}{12}$

e $\frac{3}{15}$

f $\frac{5}{10}$

g $\frac{4}{10}$

h $\frac{4}{6}$

i $\frac{6}{9}$

j $\frac{8}{20}$

k $\frac{9}{12}$

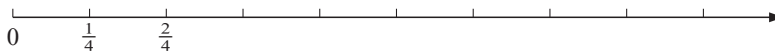
l $\frac{6}{8}$

m $\frac{12}{15}$

n $\frac{8}{12}$

o $\frac{16}{20}$

6 Copy the number line and mark it in quarters. Write the fractions below it.



Now write this number sequence in simplest form.

$$\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{5}{4}, \frac{6}{4}, \frac{7}{4}, \frac{8}{4}$$

7 Write these number sequences in simplest form.

You can use a number line to help you.

a $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{3}$, $\frac{4}{3}$, $\frac{5}{3}$, $\frac{6}{3}$

b $\frac{1}{6}$, $\frac{2}{6}$, $\frac{3}{6}$, $\frac{4}{6}$, $\frac{5}{6}$, $\frac{6}{6}$, $\frac{7}{6}$, $\frac{8}{6}$, $\frac{9}{6}$, $\frac{10}{6}$, $\frac{11}{6}$, $\frac{12}{6}$

Write $\frac{4}{4} = 1$.



F FRACTIONS AS DIVISION

When we write a fraction such as $\frac{3}{4}$ ← bar
 the bar can mean divide, so $\frac{3}{4}$ also means $3 \div 4$.
 4 is called the **divisor**.

If we see $\frac{3}{4}$, we could replace it by $3 \div 4$ and,
 if we see $3 \div 4$, we could replace it by $\frac{3}{4}$.

We can say that $\frac{6}{3} = 6 \div 3 = 2$ and
 $\frac{20}{5} = 20 \div 5 = 4$.

If I divide one pizza equally between 4 people, then
 each person will get one quarter of the pizza.

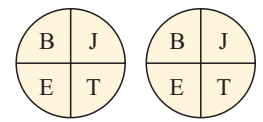
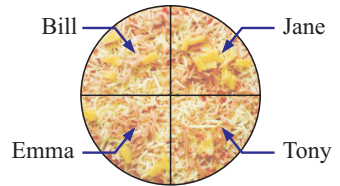
$$\begin{array}{c} 1 \\ \text{pizza} \end{array} \div \begin{array}{c} 4 \\ \text{people} \end{array} = \frac{1}{4} \text{ of a pizza each}$$

I had two pizzas to share equally between 4 people.
 How much would each person receive now?
 Start by dividing each pizza into 4 pieces.

From the diagram you can see that each person would get two pieces, that is, each person
 would get two quarters of a pizza.

$$\begin{array}{c} 2 \\ \text{pizzas} \end{array} \div \begin{array}{c} 4 \\ \text{people} \end{array} = \frac{2}{4} \left(= \frac{1}{2} \right) \text{ of a pizza each}$$

2 ÷ 3 is also
 the fraction $\frac{2}{3}$



EXERCISE 5F

- By drawing diagrams, find out what fraction of a pizza each person would receive. Then write a statement like this.

$$\begin{array}{c} \square \\ \text{pizzas} \end{array} \div \begin{array}{c} \square \\ \text{people} \end{array} = \frac{\square}{\square} \text{ of a pizza each}$$

- 3 pizzas were shared equally between 4 people
 - 2 pizzas were shared equally between 3 people (divide each pizza into 3 equal pieces)
 - 2 pizzas were shared equally between 6 people (divide each pizza into 6 equal pieces)
- Draw a picture or diagram to help you answer these questions.
 - How many halves in $2\frac{1}{2}$?
 - How many thirds in $1\frac{2}{3}$?
 - How many fifths in 2?
 - How many quarters in $2\frac{1}{4}$?

3 Division, such as $6 \div 2$, can also be written as fractions.

$6 \div 2 = \frac{6}{2}$ which means 6 halves. Write these as fractions.

- a** $1 \div 3$ **b** $1 \div 5$ **c** $1 \div 8$ **d** $1 \div 10$ **e** $2 \div 5$
f $3 \div 8$ **g** $7 \div 8$ **h** $9 \div 10$ **i** $15 \div 5$ **j** $9 \div 6$

4 Write as a fraction and also as a whole number.

For example, $14 \div 7 = \frac{14}{7} = 2$

- a** $12 \div 4$ **b** $20 \div 5$ **c** $16 \div 2$ **d** $8 \div 4$ **e** $9 \div 3$
f $18 \div 6$ **g** $24 \div 8$ **h** $20 \div 4$ **i** $30 \div 5$ **j** $56 \div 8$

5 Copy and complete

- a** $\frac{2}{3} = \quad \div$ **b** $\frac{4}{5} = \quad \div$ **c** $\frac{5}{8} = \quad \div$
d $\frac{3}{10} = \quad \div$ **e** $\frac{6}{7} = \quad \div$ **f** $\frac{11}{12} = \quad \div$

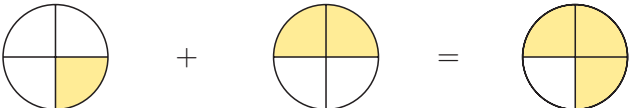
G ADDITION AND SUBTRACTION OF FRACTIONS

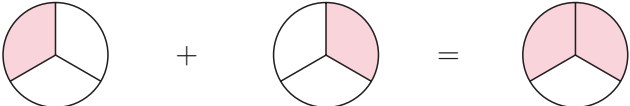
To add or subtract fractions with the same denominators you add or subtract the numerators.

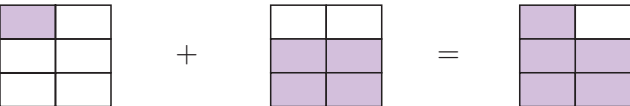
The denominator stays the same. For example, $\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$.

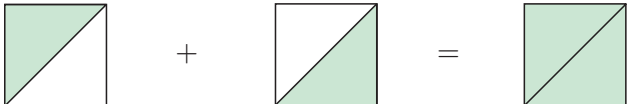
EXERCISE 5G

1 These diagrams show addition and subtraction of fractions. Use them to help you copy and complete the statements. Do not redraw the diagrams.




a  $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

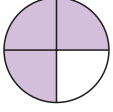
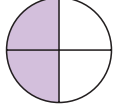
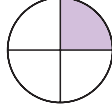
b  $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

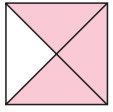
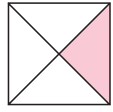
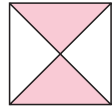
c  $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$

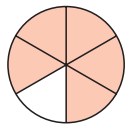
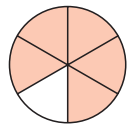
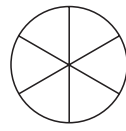
d  $\frac{1}{2} + \frac{1}{2} = 1$

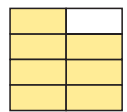
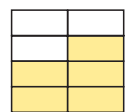
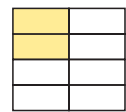
e  $\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

f  -  =  $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$

g  -  =  $\frac{2}{4} - \frac{2}{4} = \frac{0}{4}$

h  -  =  $\frac{2}{4} - \frac{1}{4} = \frac{1}{4}$

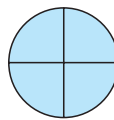
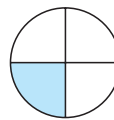
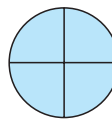
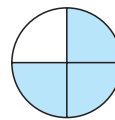
i  -  =  $\frac{5}{6} - \frac{5}{6} = 0$

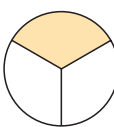
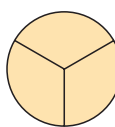

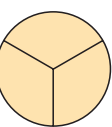
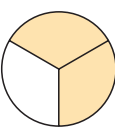
j  -  =  $\frac{10}{12} - \frac{5}{12} = \frac{5}{12}$

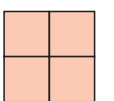
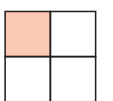
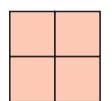
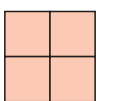
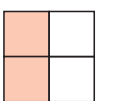
2 Can you find the answers without diagrams to help you?

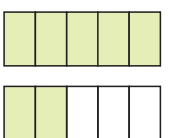
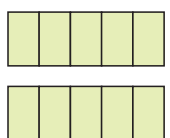
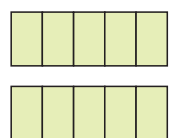
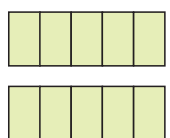
- | | | | |
|--------------------------------------|--------------------------------------|--------------------------------------|--|
| a $\frac{1}{6} + \frac{4}{6}$ | b $\frac{1}{7} + \frac{2}{7}$ | c $\frac{4}{9} + \frac{1}{9}$ | d $\frac{1}{3} + \frac{2}{3}$ |
| e $\frac{2}{5} + \frac{2}{5}$ | f $\frac{1}{5} + \frac{3}{5}$ | g $\frac{4}{7} + \frac{2}{7}$ | h $\frac{3}{10} + \frac{4}{10}$ |
| i $\frac{3}{5} - \frac{2}{5}$ | j $\frac{6}{7} - \frac{1}{7}$ | k $\frac{4}{7} - \frac{2}{7}$ | l $\frac{2}{3} - \frac{1}{3}$ |
| m $\frac{4}{6} - \frac{1}{6}$ | n $\frac{8}{9} - \frac{4}{9}$ | o $\frac{2}{3} - \frac{2}{3}$ | p $\frac{4}{5} - \frac{3}{5}$ |

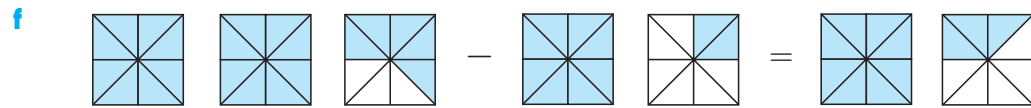
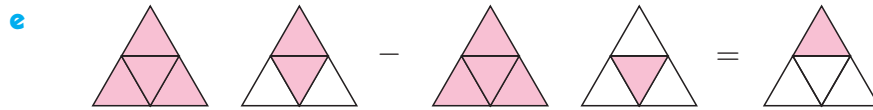
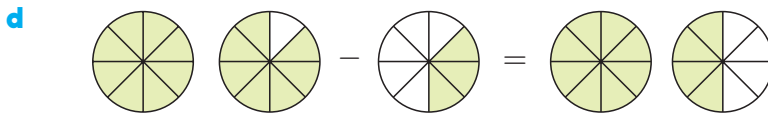
3 Look at the diagrams. Write the addition or subtraction shown, and give an answer as a mixed number. The first one is completed to help you.

 +  =   $1\frac{1}{4} + \frac{2}{4} = 1\frac{3}{4}$

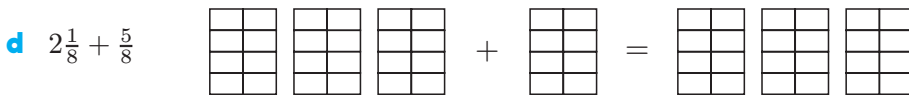
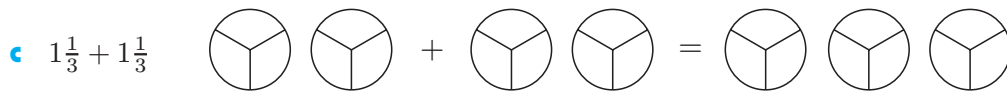
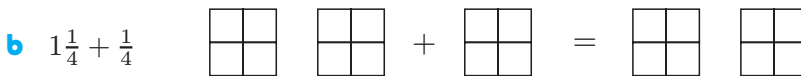
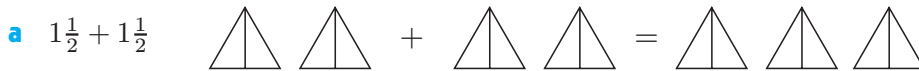
a  +  +  =  

b  +  =   

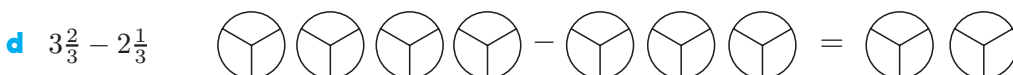
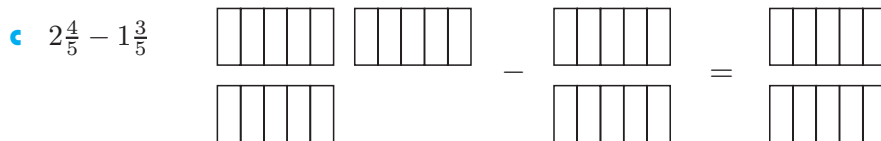
c  +  =  



- 4** In these: **i** Copy and shade the diagrams to show these additions.
ii Write your answer as a whole number or a mixed number.



- 5** In these: **i** Copy and shade the diagrams to show these subtractions.
ii Write your answer as a whole number or a mixed number.



- 6** Sarah and Jane went apple picking.
 Sarah picked $1\frac{3}{4}$ bags and Jane picked $2\frac{1}{4}$ bags.
 How many bags of apples did they pick altogether?



- 7** Joshua baked a cake. Lisa ate $\frac{1}{8}$ of it and Rebecca ate $\frac{3}{8}$ of it.
- What fraction of the cake did the girls eat? Write your answer in simplest form.
 - What fraction of the cake was left?

8



Simon and Shane went hiking. On the first day they travelled $\frac{4}{9}$ of their trip. They had a steep climb on the second day and only travelled $\frac{2}{9}$ of their trip.

- What fraction of their trip was completed after 2 days?
 - What fraction of the trip remained?
- 9** Spiros had $3\frac{2}{3}$ bags of fertilizer. He used $\frac{1}{3}$ of a bag of fertilizer on his tomatoes. How many bags of fertilizer were left?
- 10** Leah wrote $1\frac{1}{4}$ pages of a story before tea, and another $1\frac{1}{4}$ pages after tea. How many pages had she completed?
- 11** Sue-lin wrote two thirds of a page of her story then crossed out one third of the page.
- What fraction of a page remained?
 - If she had to write two pages, how much more did she need to write?
- 12** $1\frac{5}{8}$ tonnes of earth had to be removed to level a housing block. If a truck moved $1\frac{1}{8}$ tonnes in the first load, how much was left? (Write your answer in simplest form.)





SKILL TESTER

FRACTIONS

Carly has invited eleven friends to her party. Five of her friends are boys. All of her guests love to eat. Carly has laid out the table. She has made sure that everyone at the party will get an equal share of the food.

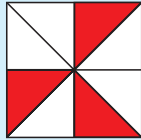
- 1 Carly will need to cut the pizza again.
 - a She will need to cut each piece into equal pieces.
 - b Each piece will be of the whole pizza.
- 2 Carly wanted to share her piece of pizza equally with two of her best friends and still have a piece for herself.
 - a How much of Carly's piece will each of her best friends get?
 - b How much of the whole pizza will each of these pieces be?
- 3 Carly has planned to give each person two glasses of drink.
 - a How many glasses will she need to pour?
 - b How many glasses must she pour from each bottle?
 - c Each glass will be of a bottle and of the three bottles.
- 4 Draw pictures and describe how much fruit each person will have.
- 5 How will the chocolate biscuits be shared?
- 6 Without cutting the party pies and pastries, what possible choices does everyone have?
- 7 Draw three sketches to show how the rectangular icecream cake could be cut up in practice.
- 8 Carly had \$60 to pay for the party. She spent $\frac{1}{3}$ on the pizza, $\frac{1}{4}$ on the cake, $\frac{1}{6}$ on the pies and pastries and $\frac{1}{10}$ on the drinks.
 - a How much was the
 - i drink
 - ii cake
 - iii pizza
 - iv pies and pastries
 - b How much was left for the other items?
 - c Do you think this would be enough? Give your reasons.

Extension

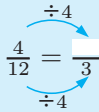
- 9 Carefully draw a sketch to show how Carly will cut her cake. Each person must get the same shape with a whole strawberry.
- 10 Carly's friends joined together to buy her a \$220 CD player. They all paid the same amount. How much was it?
- 11 In simplest form what fraction of the people at the party are girls?
- 12 What else did Carly need to put on the table? How could she solve this problem? Use fractions to explain your answer.

MENTAL SET 5A

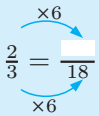
- Write a fraction to show three fifths.
- Write $\frac{9}{2}$ as a mixed number.
- Write $5 \div 8$ as a fraction.
- What fraction of the square is shaded?



- Copy and complete: $\frac{4}{12} = \frac{\square}{3}$



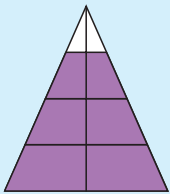
- Copy and complete: $\frac{2}{3} = \frac{\square}{18}$



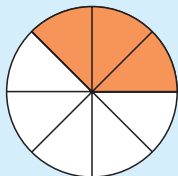
- $\frac{2}{8} + \frac{3}{8} =$
- $\frac{7}{10} - \frac{4}{10} =$
- $1\frac{2}{5} + \frac{1}{5} =$
- $2\frac{3}{7} - \frac{2}{7} =$

MENTAL SET 5B

- Write $\frac{7}{20}$ in words.
- Write $\frac{5}{5}$ in simplest form.
- True or false? $\frac{3}{4}$ of the triangle is shaded.



- What fraction of the circle is shaded?

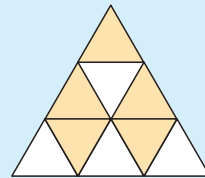


- An apple pie is cut into six equal pieces. What fraction of the pie is each piece?

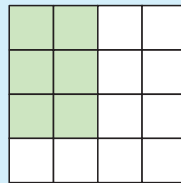
- $\frac{1}{3}$ of 24 =
- Four sandwiches are cut into halves. How many halves are there?
- Copy and complete: $4 = \frac{\square}{2}$
- Find the value of $\frac{11}{12} - \frac{4}{12}$
- Find the value of $2\frac{3}{7} + \frac{2}{7}$

MENTAL SET 5C

- What fraction of the triangle is shaded?



- True or false? $\frac{5}{8}$ of the square is unshaded.



- Theo spent $\frac{5}{9}$ of his pocket money. What fraction of his pocket money is left?
- $\frac{3}{4}$ of 24 =



What mixed number is represented by this diagram?

- From 5 copy and complete:

$$2\frac{3}{4} = \frac{\square}{4}$$

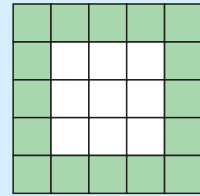
- Copy and complete: $\frac{1}{2} = \frac{\square}{24}$
- Write $\frac{8}{6}$ in simplest form.
- $\frac{11}{12} - \frac{4}{12} =$
- $3\frac{2}{9} + 1\frac{5}{9} =$

REVIEW EXERCISE 5A

1 Write

- a a fraction to show five ninths
- b $\frac{17}{20}$ in words

2 What fraction of the square is unshaded?

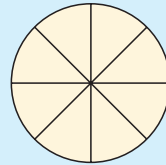


3 A pie is cut into twelve pieces and seven pieces are eaten. What fraction of the pie remains?

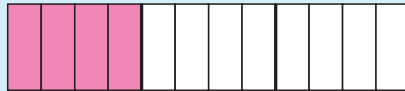
4 Mrs Jones teaches a class of 20 students.

- a Half of the students are boys. How many are boys?
- b One quarter of the students ride bicycles to school. How many ride bicycles to school?

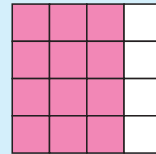
5 Apple pies are cut into eight pieces. How many pieces are there in $3\frac{1}{2}$ pies?



6 Using the diagram to help you, copy and complete the following:



a $\frac{1}{3} = \frac{\square}{12}$



b $\frac{3}{4} = \frac{\square}{16}$

7 By drawing diagrams, find out what fraction of a pizza each person would receive if three pizzas were shared between eight people.

8 Use the diagrams to help you complete the statements involving fractions:

a

$\frac{2}{\square} + \frac{\square}{6} = \frac{\square}{\square}$

b

$\frac{\square}{8} - \frac{\square}{\square} = \frac{\square}{\square}$

9 Find the value of

a $\frac{7}{10} - \frac{4}{10}$

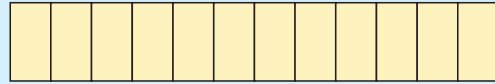
b $\frac{2}{9} + \frac{5}{9}$

c $3\frac{3}{8} + \frac{5}{8}$

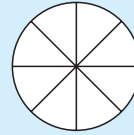
REVIEW EXERCISE 5B

1 For the diagram alongside, write down

- a the number of equal parts
- b each equal part as a fraction
- c the fraction in words



2 Copy the circle and shade $\frac{5}{8}$ of it.



3 A length of pipe is cut into eight equal pieces. What fraction of the pipe is each piece?

4 A jar contains fifteen chocolate bars.

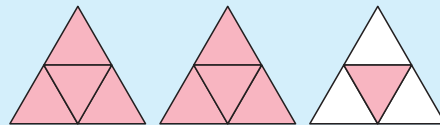
- a Ben and Tessa eat 11 chocolate bars. What fraction of the chocolate bars do they eat?
- b They give three chocolate bars to their friends.
 - i How many chocolate bars remain in the jar now?
 - ii What fraction of the jar of chocolate bars remains?

5 Mr Hewitt coaches 18 students in his tennis clinic.

- a Half of the students are girls. How many are girls?
- b One third of the students play tennis left-handed. How many play tennis left-handed?

6 a What mixed number is represented by this diagram?

- b Write the mixed number as an improper fraction.



7 Copy and complete the following using this quick method:

a $\frac{2}{3} = \frac{\square}{21}$

b $\frac{3}{4} = \frac{12}{\square}$

c $\frac{16}{20} = \frac{4}{\square}$

8 Copy and complete:

a $\frac{3}{7} = \square \div \square$

b $\frac{7}{12} = \square \div \square$

9 Using the diagrams given, write the addition or subtraction shown, and give an answer.

a

b

Chapter 6

Decimals

In this chapter you should learn to:

- ✓ recognise tenths and hundredths
- ✓ find the position of decimal numbers on a number line
- ✓ find the place value of decimal digits
- ✓ compare decimal numbers
- ✓ add and subtract decimal numbers
- ✓ multiply and divide decimal numbers by 10, 100 and 1000
- ✓ use an electronic calculator to add, subtract, multiply and divide decimal numbers
- ✓ change fractions and decimal numbers to percentages

STUDENTS	HEIGHT cms	WEIGHT kgs
SAM	143.5	38.4
BRIDGETTE	146.5	37.9
ANTHEA	149.0	44.1
JUAN	172.5	55.6
TUI	162.5	50.8
JAKE	141.0	32.0
THOMAS	145.5	40.7
JOSE	146.0	35.4
KRYSTAL	150.5	37.1
ASHLEY	138.0	32.5

UNLEADED PETROL PRICES	
CENTS PER LITRE	
STURT	89.7
MARION	91.3
DARLINGTON	89.1
ST MARYS	94.6
ROSEWATER	96.7
MOANA	98.1
SEAFORD	101.3
BRIGHTON	97.4
HOVE	93.8
MILE END	89.7

WOMENS 100 METRE SPRINT	
RAELENE	11.64
OLGA	10.95
MARION	10.95
EKATERINI	11.74
CATHY	11.03
FLORENCE	10.95
TANYA	11.71
VIOLETA	10.62
	11.48

WOMENS DISTANCE IN METRES	
JAVELIN	
CHRISTIE	57.94
TRINE	69.48
YELENA	60.95
LOUISE	53.32
FERNANDA	55.55
MIRELLA	62.35
SUSIE	58.74
KYLE	61.09

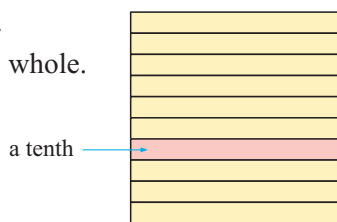
MINERALISED WATER	2.18
DISINFECTANT SURFACE SPRAY	6.53
ANTIBACTERIAL SURFACE SPRAY	7.75
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY	0.96
JUICE ORANGE	0.96
CHICKEN TWIN PACK	2.97
CHEESE GRATED	6.99
	3.37

We can write fractions of whole numbers as **decimal numbers**.

TENTHS AND HUNDREDTHS

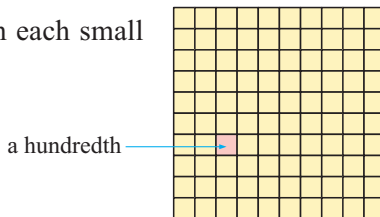
If  represents one whole (or one unit).

We can divide it into 10 equal strips.
Each of these strips is a **tenth** of the whole.
One tenth is written $\frac{1}{10}$.

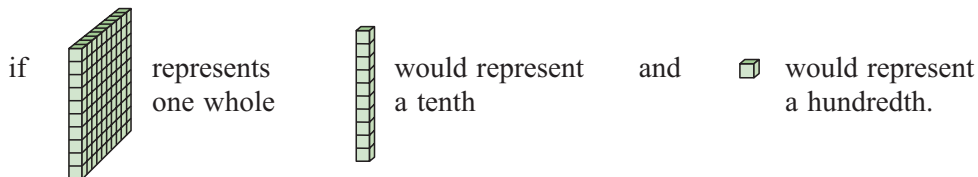


If we further divide each tenth into ten equal amounts, then each small square is a **hundredth** of the whole.

One hundredth is written $\frac{1}{100}$.



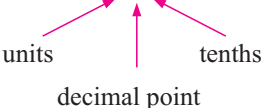
Using **MA blocks**,



A

TENTHS AS DECIMALS

one tenth = $\frac{1}{10}$ as a fraction
or one tenth = 0.1 as a decimal number





The decimal point always comes after the units.

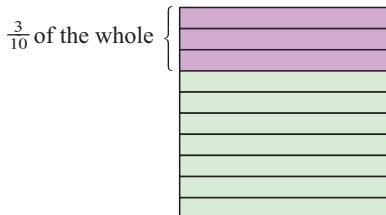
0.1 is read as 'zero decimal one' or 'zero point one'.

Example (using squares and strips)

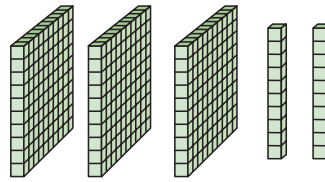
3 parts out of 10 are shaded.

This can be written as $\frac{3}{10}$ or 0.3 as a decimal number.

 3 tenths

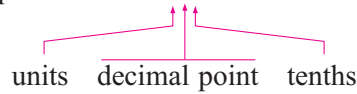


Example (using MA Blocks)



This diagram shows three wholes and two tenths.

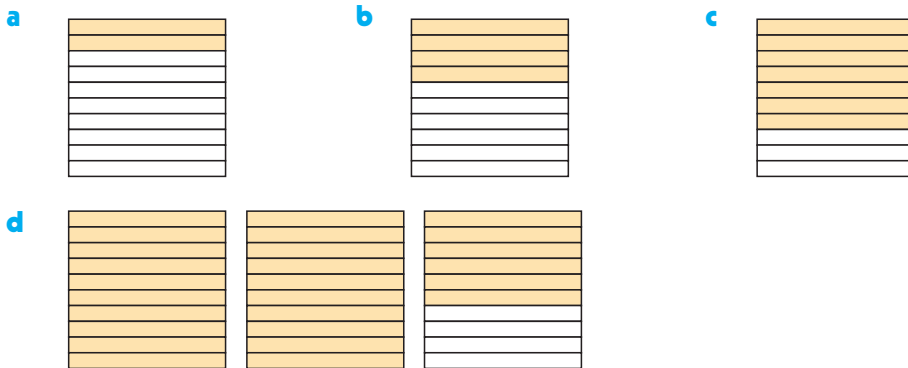
The number represented is 3.2



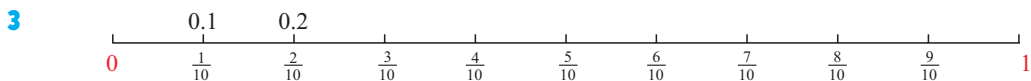
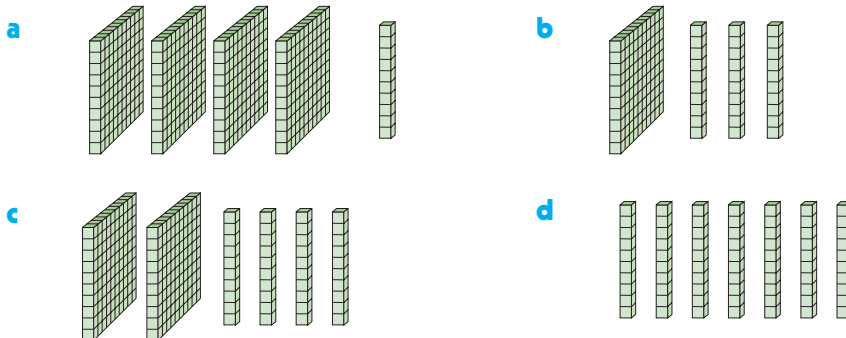
3.2 is read as 'three decimal two' or 'three point two'.

EXERCISE 6A

1 Give the decimal number represented by the shaded part in these diagrams.



2 Write as decimal numbers. ( represents one unit.)

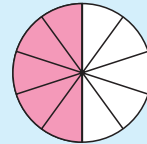


The number line given is marked in tenths using fractions. Copy the number line and finish marking the tenths as decimal numbers above the line.

- 4** Write as decimal numbers. For example, $4\frac{1}{10} = 4.1$
- | | | | |
|--------------------------|--------------------------|--------------------------|---------------------------|
| a $\frac{4}{10}$ | b $\frac{7}{10}$ | c $\frac{9}{10}$ | d $1\frac{1}{10}$ |
| e $2\frac{3}{10}$ | f $3\frac{5}{10}$ | g $8\frac{6}{10}$ | h $11\frac{8}{10}$ |
- 5** Write as fractions. For example, $0.6 = \frac{6}{10}$
- | | | | |
|--------------|--------------|--------------|--------------|
| a 0.2 | b 0.7 | c 0.4 | d 0.5 |
|--------------|--------------|--------------|--------------|
- 6** Write as mixed numbers. For example, $2.7 = 2\frac{7}{10}$
- | | | | |
|--------------|---------------|---------------|---------------|
| a 1.7 | b 3.8 | c 2.9 | d 10.1 |
| e 5.4 | f 12.2 | g 26.3 | h 66.5 |
- 7** Write as decimal numbers.
- | | |
|------------------------------|--------------------------------|
| a zero decimal five | b seven point seven |
| c twelve decimal four | d twenty six point nine |
- 8** Write these decimal numbers in words. Remember, 0.9 is zero decimal nine.
- | | | | |
|--------------|--------------|--------------|---------------|
| a 0.7 | b 4.2 | c 5.9 | d 11.2 |
|--------------|--------------|--------------|---------------|

SPECIAL FACTS FOR YOU TO LEARN

We have seen that $0.5 = \frac{5}{10}$ and $\frac{5}{10} = \frac{1}{2}$. So, $\frac{1}{2} = 0.5$

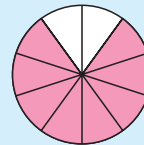
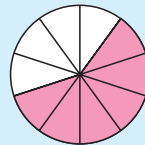
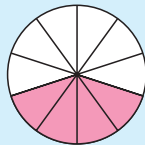
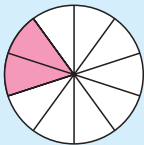


also $\frac{1}{5} = \frac{2}{10} = 0.2$,

$\frac{2}{5} = \frac{4}{10} = 0.4$,

$\frac{3}{5} = \frac{6}{10} = 0.6$,

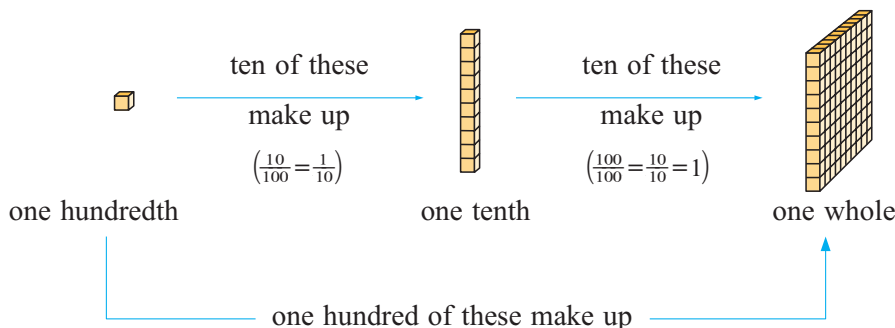
$\frac{4}{5} = \frac{8}{10} = 0.8$



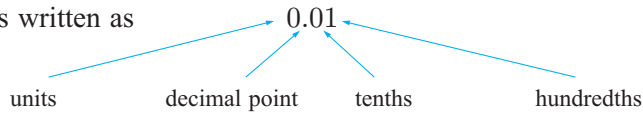
B

HUNDREDTHS

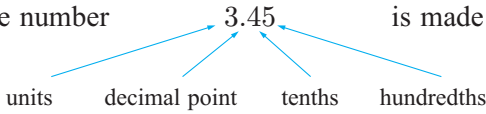
We have seen that one unit is made up of ten equal parts called tenths. Each of these tenths is made up of ten equal parts called hundredths. One hundred hundredths make one whole.



One hundredth is written as



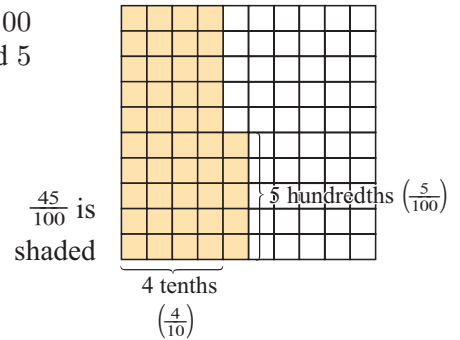
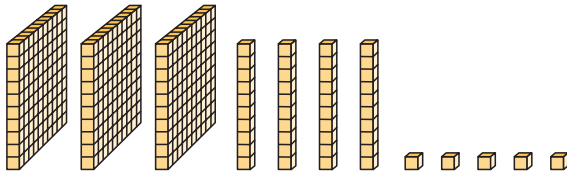
The number 3.45 is made up of 3 units, 4 tenths and 5 hundredths.



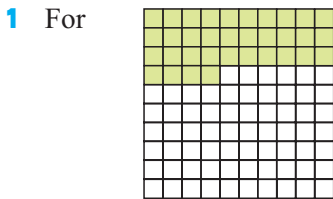
If we place 4 tenths and 5 hundredths on a grid with 100 squares (like our unit grid) we can see that 4 tenths and 5 hundredths is the same as 45 hundredths.

So $0.45 = \frac{4}{10} + \frac{5}{100} = \frac{45}{100}$, and $3.45 = 3\frac{45}{100}$.

We could represent 3.45 by



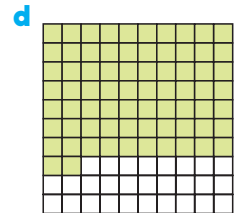
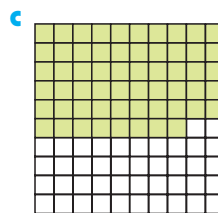
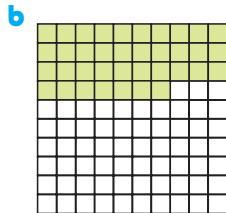
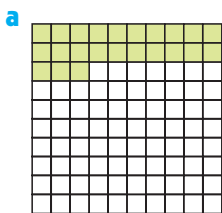
EXERCISE 6B



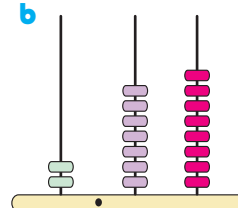
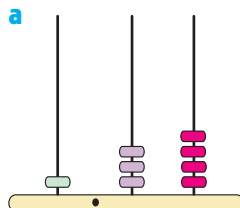
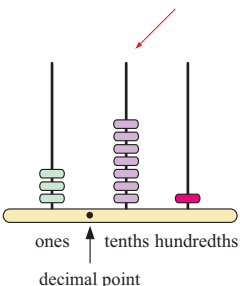
the part shaded is 0.34
 3 tenths 4 hundredths

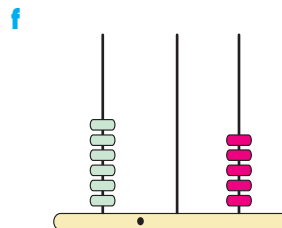
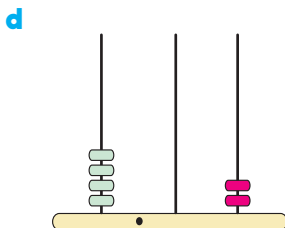
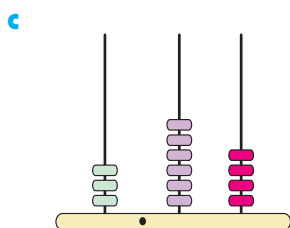
Notice that 0.34 also reads 34 hundredths or $\frac{34}{100}$.

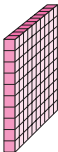
Write the shaded parts as decimal numbers.

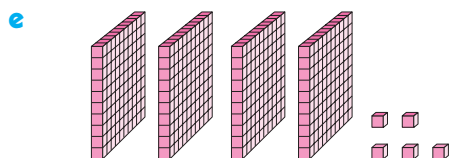
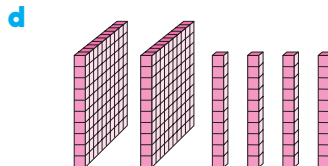
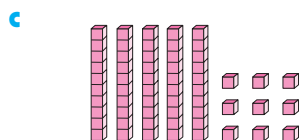
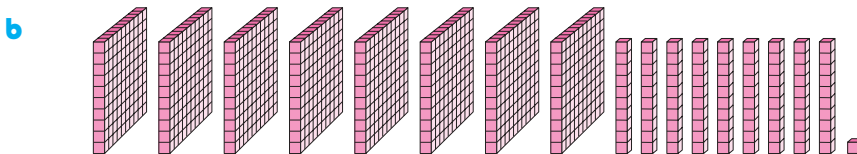
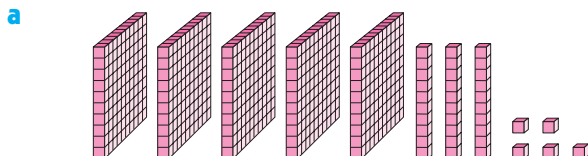


2 The abacus below shows the number 3.71. Give the number shown on each abacus.





3 Write the value shown by the MA blocks as a decimal number. (Use  to represent one unit.)



If there are no tenths, then you must put zero in the 'tenths' place, so 5.09 means $5 + \frac{9}{100}$



4 Draw MA blocks to represent these numbers.

a 1.25

b 0.41

c 2.03

5 Write as a decimal number. For example, $\frac{73}{100} = 0.73$

a $\frac{34}{100}$

b $\frac{98}{100}$

c $\frac{13}{100}$

d $10\frac{25}{100}$

e $\frac{7}{100}$

f $4\frac{19}{100}$

g $11\frac{1}{100}$

h $25\frac{68}{100}$

i $4 + \frac{1}{10} + \frac{2}{100}$

j $\frac{7}{10} + \frac{7}{100}$

k $15 + \frac{5}{10} + \frac{2}{100}$

l $25 + \frac{4}{100}$

6 Write as fractions. For example, $0.47 = \frac{47}{100}$

- | | | | |
|---------------|---------------|---------------|---------------|
| a 0.82 | b 0.11 | c 0.59 | d 0.02 |
| e 0.99 | f 0.64 | g 0.07 | h 0.01 |

7 Write as mixed numbers. For example, $2.06 = 2\frac{6}{100}$

- | | | | |
|----------------|----------------|----------------|-----------------|
| a 1.47 | b 6.94 | c 14.49 | d 26.01 |
| e 22.21 | f 33.33 | g 10.01 | h 166.06 |

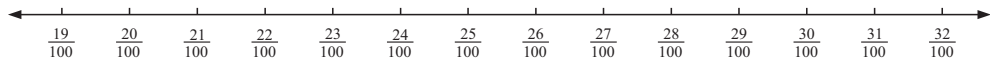
8 Write as decimal numbers.

- | | |
|--|------------------------------------|
| a fifty nine decimal eight two | b seventy point seven seven |
| c fifty three decimal zero five | d seven point three nine |
| e eleven decimal zero eight | |

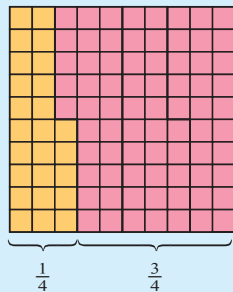
9 Write in words.

- | | | | | |
|---------------|----------------|-----------------|---------------|-----------------|
| a 1.07 | b 12.82 | c 696.96 | d 0.23 | e 500.05 |
|---------------|----------------|-----------------|---------------|-----------------|

10 The number line given is marked in hundredths as fractions. Copy the number line and mark the hundredths as decimal numbers above the line.



SPECIAL FACTS FOR YOU TO LEARN



From the diagram you can see that

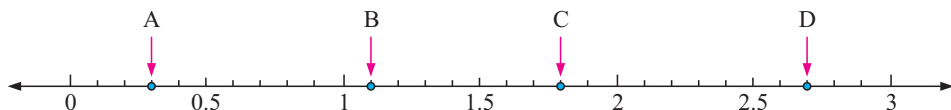
$$\frac{25}{100} = \frac{1}{4} \quad \text{and} \quad \frac{75}{100} = \frac{3}{4}$$

$$\text{So, } \frac{1}{4} = \frac{25}{100} = 0.25 \quad \text{and} \quad \frac{3}{4} = \frac{75}{100} = 0.75$$

C

DECIMALS ON A NUMBER LINE

Each division on this number line represents $\frac{1}{10}$ or 0.1



The values of the points marked on the number line are $A = 0.3$, $B = 1.1$, $C = 1.8$, $D = 2.7$

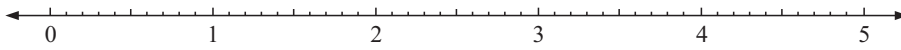
EXERCISE 6C

1 Write the value of the number at N marked on the number lines.

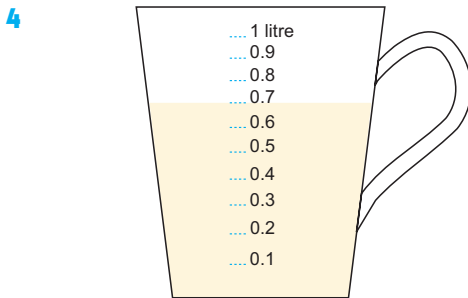
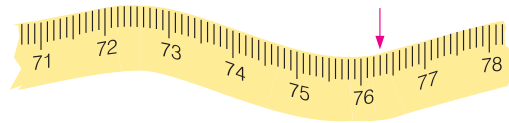


2 Copy the number lines and mark the numbers on them with the letters given.

A = 0.7, B = 1.2, C = 2.0, D = 2.9, E = 3.5, F = 4.4

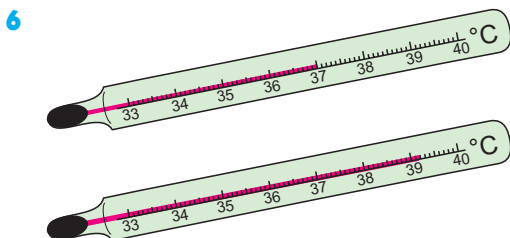
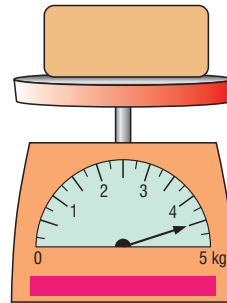


3 Write the length shown on the tape measure.



How much milk is in the jug?

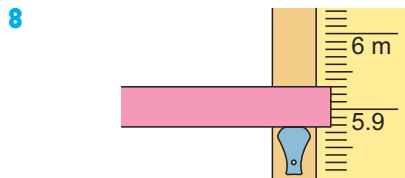
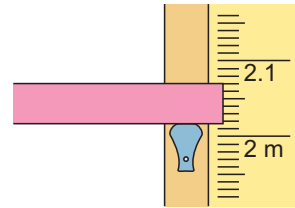
5 What weight is shown on the scales?



a The thermometer shows Sue's normal temperature. What is it?

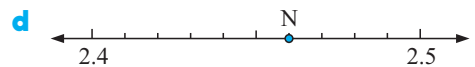
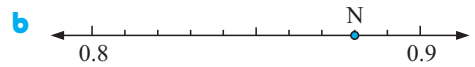
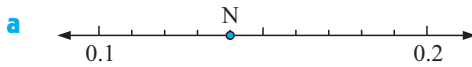
b Jai has a very sore throat. What is his temperature?

7 The bar at the Australian high jump championships is at the level shown. What is this height in metres (as a decimal)?



The Olympic pole vault bar is at this level. What is it in metres (as a decimal)?

9 Write the value of the number at N marked on the number line.



HAVE YOU SEEN ANY DECIMAL NUMBERS TODAY?

1.25 Litres

NATURAL
Natural Mineral Water
Pure Refreshment

Date: 02-Dec-2004 Time: 11:28
Reg 9 Served By:

%DEMINERALISED WATER	2.18
%SURFACE SPRAY	6.53
%MORTEIN SURFACE	7.75
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY	0.96
SPAGHETTI CHEESY.	0.96
JUICE ORANGE	2.97
CHICKEN TWIN PACK	6.99
CHEESE GRATED	3.37
	1.81
	\$35.44
	35.44
TOTAL	\$1.49

IN DOOR
16.7°C
SENSOR MAX-MIN RESET

BP

Unleaded 91
117.9
cents per litre

Premium unleaded
123.9
cents per litre

Diesel
176.9
cents per litre

SUPER SAVING BONUS BUY
200's PRIMS FACIAL TISSUES
\$1.69 PK

SUPER SAVING BONUS BUY
FRESH BONELESS CHICKEN BREASTS
7.89 PK

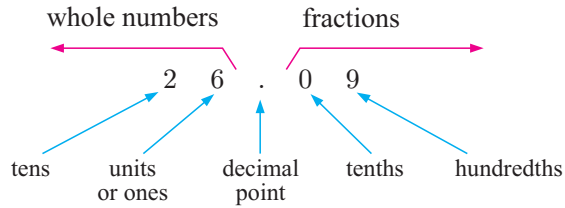
SUPER SAVING BONUS BUY
MEX. APPLE SCHNITZEL
\$5.90 PK

D

PLACE VALUE

When we write a decimal number the decimal point separates the whole numbers from the fractions or parts of a whole.

For example,



$$26.09 = 2 \text{ tens} + 6 \text{ units} + 0 \text{ tenths} + 9 \text{ hundredths}$$

$$\text{or we can write } 26.09 = 20 + 6 + \frac{0}{10} + \frac{9}{100}$$

We can write 26.09 in a place value table like this.

Tens	Units	.	$\frac{1}{10}$ s	$\frac{1}{100}$ s
2	6	.	0	9

This shows us that the value of the digit '6' in 26.09 is 6 units, and the value of the digit '9' is 9 hundredths.

We can write 153449.76 in a place value table like this.

HTh	TTh	Th	H	Tens	Units	.	$\frac{1}{10}$ s	$\frac{1}{100}$ s
1	5	3	4	4	9	.	7	6

If a number does not have any whole number part, we usually write zero before the decimal point. For example, we write 0.7 rather than .7

If a number does not have any hundredths then we usually leave off the '0' in the hundredths column, so we write 26.3 rather than 26.30

Can you see that 6.3 is different from 6.03?

6.3 means 6 units and 3 tenths

but 6.03 means 6 units and 3 hundredths.

If there are no tenths then we must write a '0' in the tenths place.



EXERCISE 6D

- Copy and complete the place value table.

	decimal number	place value			
		tens	ones	tenths	hundredths
a	6.75				
b	3.11				
c	12.06				
d	5.26				
e	0.99				
f	0.47				
g	79.19				
h	30.03				
i	88.8				



2 Use the place value table from question 1 to help you answer these questions.

- a What is the value of the '5' in i 6.75 ii 5.26
- b What is the value of the '7' in i 6.75 ii 0.47 iii 79.19
- c What is the value of the '6' in i 6.75 ii 12.06 iii 5.26

3 Write as decimal numbers.

- a three and four tenths
- b twenty five and thirty seven hundredths
- c eight hundredths
- d nine and one tenth and three hundredths
- e seven tenths and four hundredths
- f thirty, and sixty three hundredths
- g one hundred, and seven hundredths

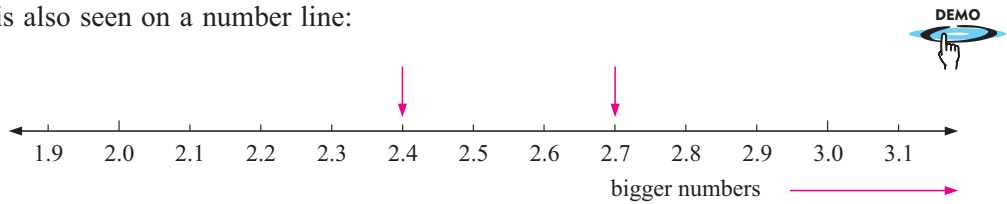
E ORDER OF SIZE

ONE DECIMAL PLACE

We know that $2.4 = 2\frac{4}{10}$ and $2.7 = 2\frac{7}{10}$.

Now $\frac{7}{10}$ is larger than $\frac{4}{10}$, so $2\frac{7}{10}$ is larger than $2\frac{4}{10}$. So, 2.7 is larger than 2.4.

This is also seen on a number line:



EXERCISE 6E

1 Write as mixed numbers, then place these numbers in order of size from smallest to largest. This is ascending order.

- a 3.1, 4.3, 2.9, 2.7, 3.5, 4.0
- b 11.9, 10.8, 11.8, 10.3, 12.1, 11.4

2 Write these numbers in order of size from largest to smallest (descending order).

- a 8.9, 10.7, 11.1, 10.1, 9.8, 10.9
- b 15.6, 16.5, 16.1, 15.7, 16.7, 17.1

3 a The maximum daily temperature was recorded each day for a week during winter.

Sunday	16.7°C
Monday	17.6°C
Tuesday	15.3°C
Wednesday	15.6°C
Thursday	16.5°C
Friday	17.3°C
Saturday	17.9°C

- i Which day had the highest maximum temperature?
- ii Which day had the lowest maximum temperature?
- iii Which days had a maximum less than 16°C?

Maximum means greatest.
Minimum means smallest.



- b** The maximum daily temperature was recorded each day for a week during summer.
- Which day had the highest maximum temperature?
 - Which day had the lowest maximum temperature?
 - Which days had a maximum temperature greater than 33° ?

Sunday	32.1°C
Monday	31.3°C
Tuesday	33.1°C
Wednesday	35.3°C
Thursday	33.3°C
Friday	31.7°C
Saturday	30.7°C

TWO DECIMAL PLACES

We can write decimal numbers like 3.48, 3.45 and 4.17 in order of size also.

4.17 is the largest because its whole number part (4) is greater than 3.



$$3.48 = 3\frac{48}{100} \quad 3.45 = 3\frac{45}{100}$$

Now $\frac{45}{100}$ is smaller than $\frac{48}{100}$, so $3\frac{45}{100}$ is smaller than $3\frac{48}{100}$.

In ascending order, the numbers are 3.45, 3.48 and 4.17

- 4** Place the numbers in ascending order. Writing the decimal part as hundredths may help you.
- 2.36, 2.63, 3.32, 2.23, 3.62, 2.66
 - 34.18, 31.45, 34.21, 31.47, 31.84, 33.88
- 5** Place the numbers in descending order.
- 0.78, 0.69, 0.75, 0.57, 0.72, 0.61
 - 9.86, 9.92, 10.46, 10.52, 10.39, 9.76
- 6** These are the heights of some students in Year 5.
- Arrange the girls in ascending order of height.

Kim	1.56 m
Leah	1.49 m
Jess	1.47 m
Sue	1.35 m
Maria	1.51 m



- Arrange the boys in order of size from shortest to tallest.

John	Yannis	Tan	Tony	Carlo	Martin
1.63 m	1.38 m	1.47 m	1.37 m	1.49 m	1.53 m



- Use your answers to **a** and **b** to help you here.
 - Which student is tallest? **ii** Which student is shortest?
 - Which students are taller than 1.50 metres?
 - Which students are shorter than 1.40 metres?

- 7 These are the times run by the members of the Australian men's 4×400 relay team at the Athens Olympics in 2004.

	<i>Semi-final (sec)</i>	<i>Final (sec)</i>
Steffensen, John	45.29	46.12
Ormrod, Mark	46.44	44.76
Dwyer, Patrick	45.27	45.11
Hill, Clinton	46.06	44.61



- List the times for the semi-final in ascending order.
 - List the times for the final in ascending order.
 - Who ran the fastest time in the semi-final?
 - Who ran the fastest time in the final?
 - Name the athlete(s) who were slower in the final than in the semi-final.
 - Find out which team won the silver medal in this event.
- 8 The times for the two heats of the women's 400 m race semi-finals in the Sydney Olympics 2000 are listed.

HEAT ONE				<i>seconds</i>	HEAT TWO				<i>seconds</i>
1.	Lorraine Graham	JAM	50.28	1.	Cathy Freeman	AUS	50.01		
2.	Katharine Merry	GBR	50.32	2.	Ana Guevara	MEX	50.11		
3.	Heide Seyerling	RSA	51.06	3.	Falilat Ogunkoya	NGR	50.18		
4.	Olga Kotlyarova	RUS	51.21	4.	Donna Fraser	GBR	50.21		
5.	Ladonna Antoine	CAN	51.26	5.	Sandie Richards	JAM	50.42		
6.	Natalya Nazarova	RUS	51.83	6.	Jitka Burianova	CZE	51.18		
7.	Mireille Nguimo	CMR	52.03	7.	Amy Mbacke Thiam	SEN	51.60		
8.	Nova Peris-Kneebone	AUS	52.49	8.	KM Beena Mol	IND	52.04		

- List the eight fastest times of all runners, from fastest to slowest.
- The fastest four athletes in each heat qualified for the final. List the times run by these athletes, from fastest to slowest.
- Which athlete had one of the eight fastest times in the heats, but did not qualify for the final?
- Which athlete competed in the final but did not have one of the 8 fastest times in the heats?
- Find out who won the women's 400 m final.



F

ADDING DECIMAL NUMBERS

We can add decimal numbers by collecting the hundredths together, the tenths together and the whole numbers together.

Remember that 10 hundredths = 1 tenth and 10 tenths = 1 whole.

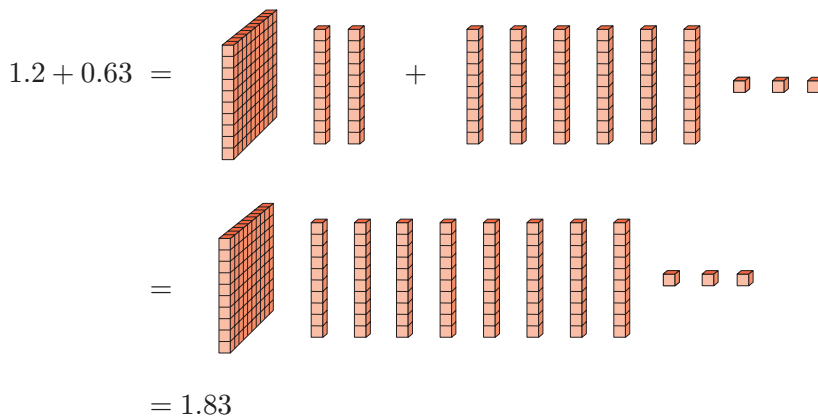
For $1.2 + 0.63$ we could use a place value table.

	<i>Ones</i>	.	<i>Tenths</i>	<i>Hundredths</i>	
	1	.	2	0	← 1.2 is 1.20
+	0	.	6	3	
	1	.	8	3	

We add decimal numbers like we add any other numbers, lining them up in straight columns.



MA blocks also show this result



Since we add decimal numbers in the same way as ordinary whole numbers, we show exchanging figures in the same way (when they occur).

Example: Find $3.26 + 0.76$



	<i>Ones</i>	.	<i>Tenths</i>	<i>Hundredths</i>	
	3	.	2	6	
+	0	.	7	6	
	1	.	1		
	4	.	0	2	← $6 + 6 = 12$ hundredths and 12 hundredths = 1 tenth + 2 hundredths

$2 + 7 + 1 = 10$ tenths
 $= 1$ one and 0 tenths.

EXERCISE 6F**1** Copy and complete

$$\begin{array}{r} \mathbf{a} \quad 2.21 \\ + 0.73 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{b} \quad 2.47 \\ + 1.32 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{c} \quad 0.32 \\ + 6.20 \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{d} \quad 5.20 \\ + 2.98 \\ \hline \end{array}$$

2 Find

a $0.2 + 0.12$

b $0.71 + 0.2$

c $0.4 + 0.52$

d $0.31 + 0.3$

e $2.2 + 1.01$

f $2.2 + 0.15$

g $2 + 0.73$

h $2 + 2.78$

i $3.1 + 1.46$

j $1.74 + 2.2$

k $4.3 + 3.48$

l $2.27 + 5.5$

m $0.01 + 0.12$

n $0.43 + 0.11$

o $1.41 + 0.15$

p $2.62 + 3.26$

q $1.41 + 0.92$

r $2.63 + 0.77$

s $4.15 + 7.96$

t $2.87 + 0.08$

u $1.59 + 2.95$

v $3.64 + 7.82$

w $2.89 + 0.37$

x $4.07 + 7.16$

3 Add these:

$$\begin{array}{r} \mathbf{a} \quad 6.72 \text{ m} \\ 14.85 \text{ m} \\ + 9.06 \text{ m} \\ \hline \end{array}$$

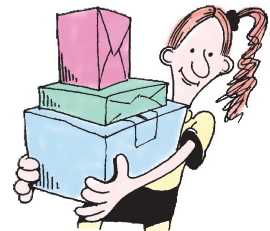
$$\begin{array}{r} \mathbf{b} \quad 15.40 \text{ kg} \\ 7.98 \text{ kg} \\ + 20.46 \text{ kg} \\ \hline \end{array}$$

$$\begin{array}{r} \mathbf{c} \quad 6.85 \text{ litres} \\ 16.92 \text{ litres} \\ 14.87 \text{ litres} \\ + 30.05 \text{ litres} \\ \hline \end{array}$$

4 Sara had two bags of apples. One bag weighed 2.47 kg and the other bag weighed 3.62 kg. What was the total weight of apples?

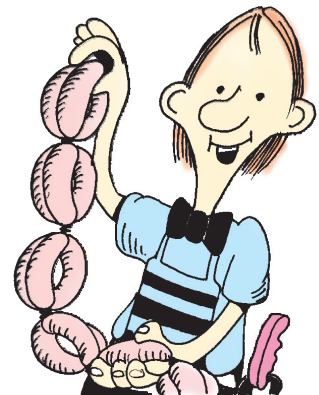
5 See-Kek needed 1.68 metres of ribbon to trim her jacket and 0.55 metres of the same ribbon to tie her hair. How much ribbon did she need to buy?

6 Candice took three parcels to the Post Office. Their weights were 0.98 kg, 2.45 kg and 2.35 kg. What was the total weight of the parcels?



7 Each year Tim's height is measured on his birthday. When Tim was 13 years old his height was 1.46 metres. In the next 3 years he grew 0.13 metres, 0.16 metres and 0.07 metres. How tall was he on his 16th birthday?

8 Ian went to the supermarket to buy 2.5 kg of sausages for a barbeque. The sausages were prepacked on trays. If Ian picked up three trays weighing 0.98 kg, 0.67 kg and 0.75 kg, would that be enough sausages?



9 Four swimmers were practising for the 4×50 metres relay. Geoff swam the first 50 metres in 50.28 seconds, Daniel swam next in 50.65 seconds, John swam third in 49.79 seconds and the last swimmer was Casper whose time was 49.86 seconds.

- Who was the fastest swimmer?
- Who was the slowest swimmer?
- How long did it take to swim the relay?

G

SUBTRACTING DECIMAL NUMBERS

We can subtract decimal numbers by collecting the hundredths together, the tenths together and the whole numbers together.

Remember that 1 tenth = 10 hundredths and one whole = 10 tenths.

Here are two examples that show subtraction for you to look at.

- For $1.65 - 1.21$ we could use a place value table.

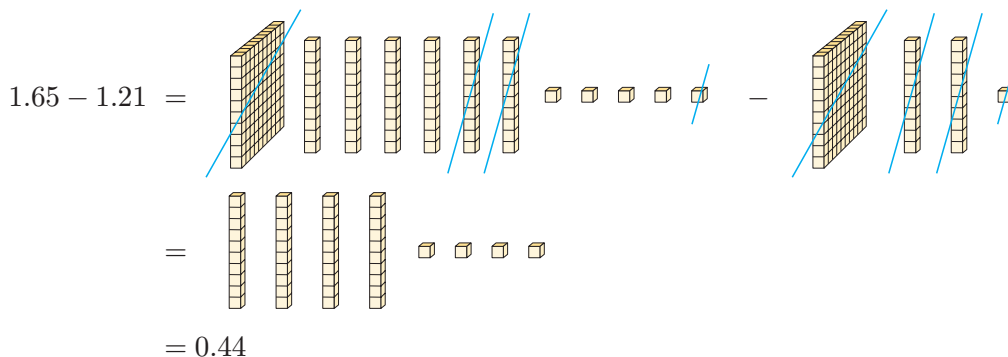
	<i>ones</i>	.	<i>tenths</i>	<i>hundredths</i>
–	1	.	6	5
	1	.	2	1
	0	.	4	4

So, $1.65 - 1.21 = 0.44$

Subtract decimal numbers the same way as you would subtract whole numbers, but keep the decimal point.



MA blocks also show this result.



Examples with trading

- For $3.74 - 1.46$

	<i>ones</i>	.	<i>tenths</i>	<i>hundredths</i>
–	3	.	7 ⁶	4 ¹⁴
	1	.	4	6
	2	.	2	8

So, $3.74 - 1.46 = 2.28$

- For $4.26 - 1.79$

	<i>ones</i>	.	<i>tenths</i>	<i>hundredths</i>
–	4 ³	.	2 ¹¹	6 ¹⁶
	1	.	7	9
	2	.	4	7

So, $4.26 - 1.79 = 2.47$

EXERCISE 6G

1 Find

a $0.21 - 0.1$

d $0.81 - 0.81$

g $3.92 - 0.73$

j $2.67 - 1.2$

m $0.12 - 0.01$

p $3.26 - 2.62$

s $1.41 - 0.15$

v $7.82 - 3.64$

b $0.37 - 0.2$

e $2.23 - 1$

h $2.76 - 2$

k $4.84 - 3.4$

n $0.43 - 0.11$

q $1.41 - 0.92$

t $2.87 - 0.08$

w $2.89 - 1.09$

c $0.57 - 0.4$

f $2.42 - 0.1$

i $3.46 - 1.13$

l $5.62 - 2.5$

o $7.06 - 4.15$

r $2.63 - 0.77$

u $2.95 - 1.59$

x $7.6 - 4.19$

2 a Nicolas was 1.54 metres tall on his 13th birthday and one year later he was 1.61 metres tall. How much did he grow in the year?

b Tommy's back-pack weighed 7.56 kilograms. After he took his sports shoes out the pack only weighed 6.48 kilograms. How much did the sports shoes weigh?

c Sue-Lin cut a piece of fabric 3.75 m long from a roll containing 5.6 m of fabric. How much fabric was left on the roll?

d Sarah swam 100 metres in 76.85 seconds. If she swam the first 50 metres in 37.47 seconds, how long did the second lap take?

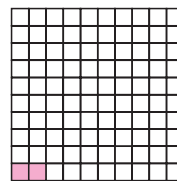
**H MULTIPLICATION BY 10, 100 AND 1000**

We can show 0.02 as 2 coloured squares on our grid. (Our grid represents 1 whole.)

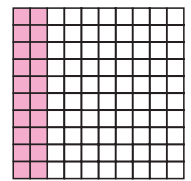
0.02×10 is shown as 2×10 coloured squares or 20 coloured squares.

So $0.02 \times 10 = 0.2$

When we multiply by 10 the decimal point is moved *one* place (right) to make the number bigger.



0.02

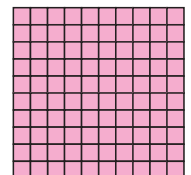
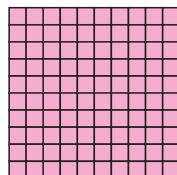
 $0.02 \times 10 = 0.2$

0.02×100 is shown as 2×100 coloured squares or 200 coloured squares which is 2 wholes.

So $0.02 \times 100 = 2$

We leave off the decimal point here, as there are no numbers following it.

When we multiply by 100 the decimal point is moved *two* places (right) to make the number bigger.

 $0.02 \times 100 = 2$

You may need to add extra zeros, for example, 1.5×100
 $= 1.50 \times 100$
 $= 150$

EXERCISE 6H**1** Find

- | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|
| a 0.03×10 | b 0.07×10 | c 0.5×10 | d 0.8×10 |
| e 0.92×10 | f 1.63×10 | g 2.08×10 | h 31.7×10 |

2 Find

- | | | | |
|----------------------------|----------------------------|----------------------------|----------------------------|
| a 0.03×100 | b 0.07×100 | c 0.92×100 | d 1.63×100 |
| e 2.08×100 | f 0.5×100 | g 0.8×100 | h 31.7×100 |

3 Find

- | | | | |
|---------------------------|----------------------------|---------------------------|----------------------------|
| a 10×0.3 | b 100×1.8 | c 10×0.25 | d 100×3.79 |
| e 10×42.9 | f 100×0.82 | g 10×0.09 | h 100×0.02 |

When we multiply by 1000 the decimal point is moved *three* places (right) to make the number bigger.

For example, 2.4×1000 and 0.07×1000
 $= 2.400 \times 1000$ $= 0.070 \times 1000$
 $= 2400$ $= 70$

4 Find

- | | | |
|-----------------------------|-----------------------------|------------------------------|
| a 2.5×1000 | b 0.25×1000 | c 0.025×1000 |
| d 1000×3.5 | e 1000×0.35 | f 1000×0.035 |
| g 42.8×1000 | h 2.48×1000 | i 1000×0.248 |

DIVISION BY 10, 100 AND 1000

Dividing by 10 is the opposite of multiplying by 10.

To divide by 10, move the decimal point *one* place left.

Example, $0.2 \div 10 = 0.02$

To divide by 100, move the decimal point *two* places left.

Example, $02. \div 100 = 0.02$

To divide by 1000, move the decimal point *three* places left.

Example, $2400. \div 1000 = 2.4$

**5** Find

- | | | | |
|-------------------------|------------------------|-------------------------|-------------------------|
| a $5 \div 10$ | b $2 \div 10$ | c $6.6 \div 10$ | d $8.8 \div 10$ |
| e $13.7 \div 10$ | f $0.3 \div 10$ | g $0.02 \div 10$ | h $0.15 \div 10$ |

6 Find

a $563 \div 100$

b $320 \div 100$

c $196.5 \div 100$

d $56 \div 100$

e $21.2 \div 100$

f $45.7 \div 100$

g $8.6 \div 100$

h $0.18 \div 100$

7 Find

a $1217 \div 1000$

b $5620 \div 1000$

c $720 \div 1000$

d $146.7 \div 1000$

e $21 \div 1000$

f $46 \div 1000$

g $9 \div 1000$

h $2.7 \div 1000$

I**USING A CALCULATOR***Answer*To find $3.24 + 5.69$ press 3.24 $\boxed{+}$ 5.69 $\boxed{=}$ 8.93To find $7.08 - 4.62$ press 7.08 $\boxed{-}$ 4.62 $\boxed{=}$ 2.46To find 3.85×17 press 3.85 $\boxed{\times}$ 17 $\boxed{=}$ 65.45To find $67.2 \div 16$ press 67.2 $\boxed{\div}$ 16 $\boxed{=}$ 4.2**EXERCISE 6I****1** Use your calculator to find

a $4.88 + 5.09$

b $4.3 + 3.77$

c $6.64 + 7.36$

d $1.95 + 9.51$

e $5.09 - 4.88$

f $4.3 - 3.77$

g $7.36 - 6.64$

h $9.51 - 1.95$

i 23×1.95

j 5.65×19

k 46×2.85

l 3.09×31

2 **a** $\frac{23}{100}$ is also $23 \div 100$ or 0.23 Use your calculator to check this.**b** Use your calculator to find

i $\frac{30}{100}$

ii $\frac{3}{10}$

What do you notice?

3 Use your calculator to help solve these problems:

- a** I measure 2.35 metres as the length of the curtain and add 0.18 metres for the hem. How much material do I need for the curtain?
- b** I have a piece of wood 3.20 metres long and cut 1.56 metres from it. How much is left?
- c** When I went on holidays my suitcase weighed 12.28 kg, my backpack weighed 3.46 kg and my camera bag weighed 0.72 kg. Find the total weight of my luggage.



J

PERCENTAGE

Percentages are another way of writing fractions and decimals.

Percent means 'out of every hundred'.

One percent is $\frac{1}{100}$, written as 1%.

One whole (or one unit) is 100%.

$$\text{So} \quad 1\% = \frac{1}{100} = 0.01$$

$$50\% = \frac{50}{100} = 0.5$$

$$100\% = \frac{100}{100} = 1$$

100% is the whole amount and 50% is a half of it.



EXERCISE 6J

1 Write as percentages.

a $\frac{3}{100}$

b $\frac{17}{100}$

c $\frac{36}{100}$

d $\frac{50}{100}$

e $\frac{75}{100}$

f $\frac{99}{100}$

g 1

h 2

2 Write as fractions.

a 7%

b 20%

c 37%

d 63%

e 81%

f 100%

g 103%

h 200%

3 Write as percentages.

a 0.03

b 0.17

c 0.36

d 0.5

e 0.75

f 0.99

g 1.0

h 3.0

4 Write as decimal numbers.

a 7%

b 20%

c 37%

d 63%

e 81%

f 100%

g 103%

h 200%

SPECIAL FACTS FOR YOU TO LEARN

$$1\% = \frac{1}{100} = 0.01$$

Remember: $\frac{1}{4} = 0.25 = 25\%$

$$\frac{1}{5} = 0.2 = 20\%$$

$$25\% = \frac{25}{100} = 0.25$$

$$\frac{1}{2} = 0.5 = 50\%$$

$$\frac{2}{5} = 0.4 = 40\%$$

$$50\% = \frac{50}{100} = 0.5$$

$$\frac{3}{4} = 0.75 = 75\%$$

$$\frac{3}{5} = 0.6 = 60\%$$

$$75\% = \frac{75}{100} = 0.75$$

$$\frac{4}{5} = 0.8 = 80\%$$

$$100\% = 1$$

OTHER DENOMINATORS (Extension)

Not all fractions have 100 in the denominator.

We can use our skills from **Section E - Equivalent Fractions** in **Chapter 5** to write fractions as hundredths and then as percentages.

Look at these.

$$\frac{1}{4} = \frac{25}{100} = 25\%$$

$$\frac{1}{2} = \frac{50}{100} = 50\%$$

$$\frac{3}{4} = \frac{75}{100} = 75\%$$

- 5** Write these fractions **i** with 100 in the denominator **ii** as percentages

a $\frac{1}{10}$

b $\frac{3}{10}$

c $\frac{7}{10}$

d $\frac{9}{10}$

e $\frac{1}{5}$

f $\frac{2}{5}$

g $\frac{3}{5}$

h $\frac{4}{5}$

i $\frac{1}{20}$

j $\frac{3}{20}$

k $\frac{4}{25}$

l $\frac{17}{25}$

- 6** Write these percentages as fractions in simplest form.

For example, $20\% = \frac{20}{100} = \frac{1}{5}$.

a 10%

b 50%

c 80%

d 25%

e 75%

f 15%

g 65%

h 95%

- 7** Approximately 15 people out of every hundred are left-handed. Write this as a percentage.
- 8** Goods and Services Tax (GST) of 10% is added to the price of most goods when they are sold. What fraction is added on for GST? (Answer in simplest form.)
- 9**
- Nindi scored 9 marks out of 10 in his Mental test. What was his mark as a percentage?
 - Sarah was awarded a High Achievement Certificate for scoring 49 out of 50 in her Mathematics examination. Write this mark as a percentage.
- 10** Twenty five percent of the students in Year 5 were learning to play a musical instrument.
- Write twenty five percent as a fraction in simplest form.
 - If there were 72 students in Year 5, how many were learning to play a musical instrument?



ACTIVITY

THE GAME OF EQUALITY

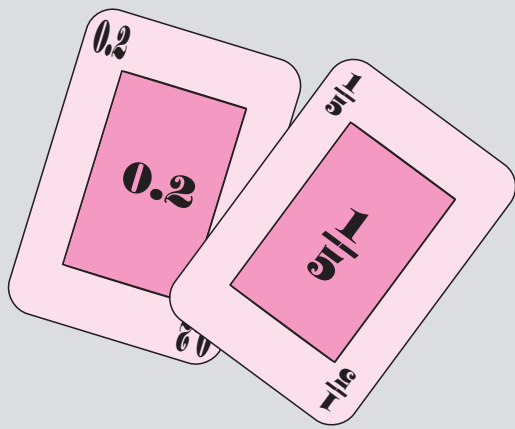


Make your own set of 56 playing cards from cardboard.

Mark each of the fractions and decimal numbers listed in the table on two cards so the cards can be read top and bottom.



Shuffle your cards, face down. Place the top card facing up on the table, then deal the rest of the cards, face down, to two or more players so that all players have the same number of cards. (If any cards are left they should be placed face up under the card on the table.)



Decimal	Fraction	Decimal	Fraction
0.01	$\frac{1}{100}$	0.5	$\frac{1}{2}$
0.05	$\frac{5}{100}$	0.6	$\frac{3}{5}$
0.1	$\frac{1}{10}$	0.7	$\frac{7}{10}$
0.2	$\frac{1}{5}$	0.75	$\frac{3}{4}$
0.25	$\frac{1}{4}$	0.8	$\frac{4}{5}$
0.3	$\frac{3}{10}$	0.9	$\frac{9}{10}$
0.4	$\frac{2}{5}$	1.0	1

Players take turns to take the card from the top of their pile, turn it face up and place it on the pile of cards already on the table.

If the number on their card has a value equivalent to the top card on the pile (for example 0.4 and $\frac{2}{5}$), then the players say 'Same'. Whichever player is quickest to say 'Same' picks up the pile of cards from off the table and puts them face down under their own cards. They then put the card from the top of their pile face up on the table and the next player has their turn.

The winner is the person with the most cards when no further play can take place.

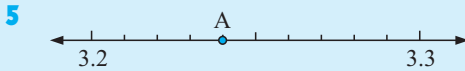


MENTAL SET 6A

- 1 Write $\frac{9}{10}$ as a decimal.
- 2 Write 2.6 as a mixed number.
- 3 Write 5.24 as an improper fraction.



N is

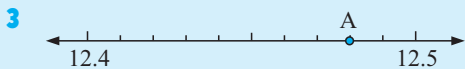


A is

- 6 $327 \div 100$
- 7 $3.24 + 0.06 =$
- 8 $4.7 - 1.5 =$
- 9 $7 \times 1.05 =$
- 10 $1.72 \times 100 =$

MENTAL SET 6B

- 1 Write 5.4 as a mixed number.
- 2 Write twelve decimal zero four as a decimal number.

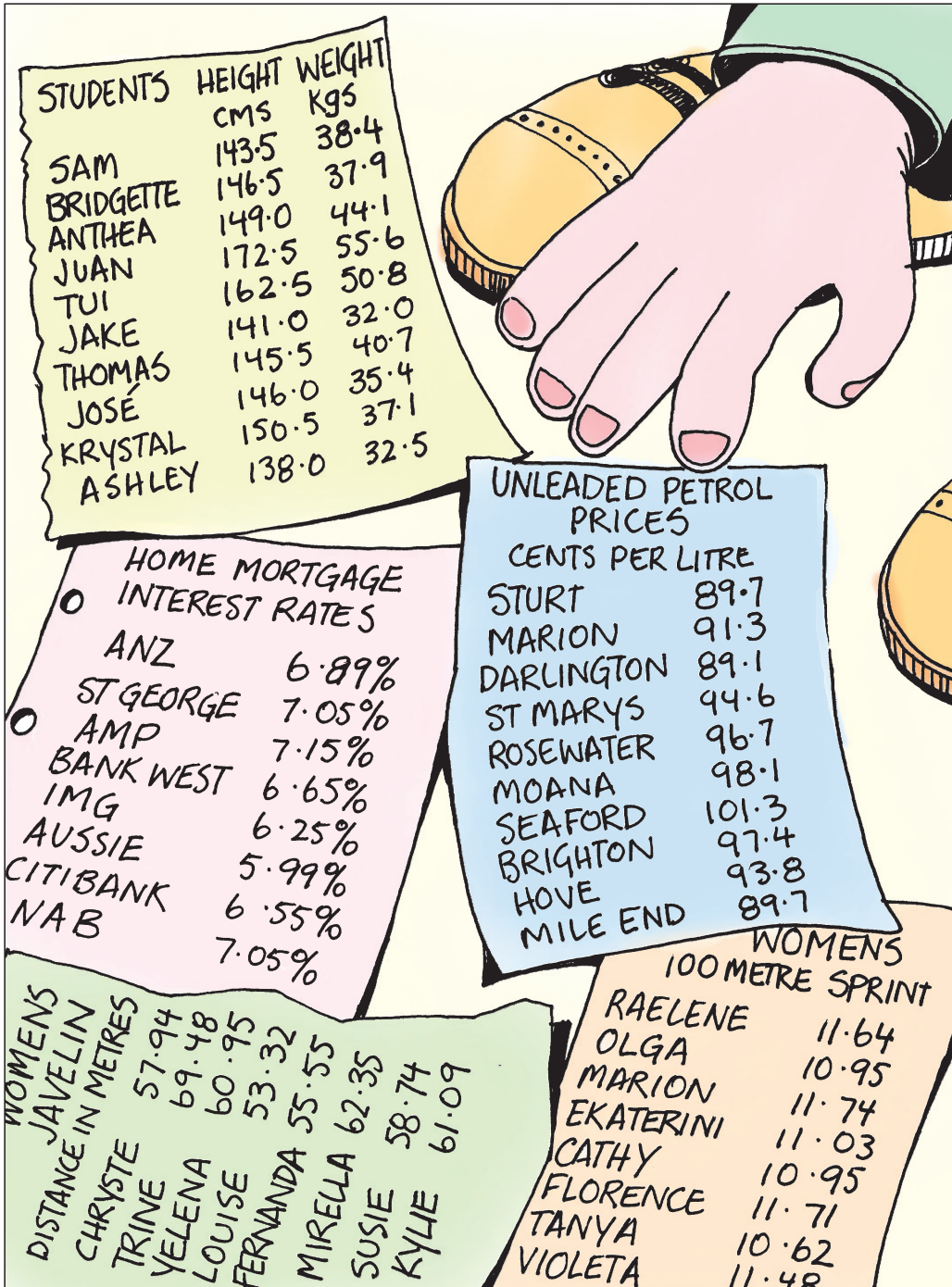


A is

- 4 What is the value of 4 in 12.04?
- 5 Write down the smallest of 9.68, 8.69, 8.96, 9.86
- 6 $5.84 - 5 =$
- 7 $2 - 1.3 =$
- 8 $\frac{74}{100}$ as a percentage is
- 9 0.96 as a percentage is
- 10 Write 25% as a fraction in simplest form.

MENTAL SET 6C

- 1 Write $5\frac{34}{100}$ as a decimal number.
- 2 Write 0.24 in words.
- 3 Write $12 + \frac{2}{10} + \frac{3}{100}$ as a decimal number.
- 4 What is the value of the '7' in 2.74?
- 5 Write down the largest of 3.40, 4.36, 6.34, 6.43
- 6 $4.2 + 0.7 =$
- 7 $9.2 - 0.3 =$
- 8 $9 \times 1.02 =$
- 9 $74 \div 1000 =$
- 10 0.63 as a percentage is



STUDENTS	HEIGHT CMS	WEIGHT KGS
SAM	143.5	38.4
BRIDGETTE	146.5	37.9
ANTHEA	149.0	44.1
JUAN	172.5	55.6
TUI	162.5	50.8
JAKE	141.0	32.0
THOMAS	145.5	40.7
JOSÉ	146.0	35.4
KRYSTAL	150.5	37.1
ASHLEY	138.0	32.5

HOME MORTGAGE INTEREST RATES	
ANZ	6.89%
ST GEORGE	7.05%
AMP	7.15%
BANK WEST	6.65%
IMG	6.25%
AUSSIE	5.99%
CITIBANK	6.55%
NAB	7.05%

UNLEADED PETROL PRICES	
CENTS PER LITRE	
STURT	89.7
MARION	91.3
DARLINGTON	89.1
ST MARYS	94.6
ROSEWATER	96.7
MOANA	98.1
SEAFORD	101.3
BRIGHTON	97.4
HOVE	93.8
MILE END	89.7

WOMENS JAVELIN	
DISTANCE IN METRES	
CHRYSIE	57.94
TRINE	69.48
YELENA	60.95
LOUISE	53.32
FERNANDA	55.55
MIRELLA	62.35
SUSIE	58.74
KYLIE	61.09

WOMENS 100 METRE SPRINT	
RAELENE	11.64
OLGA	10.95
MARION	11.74
EKATERINI	11.03
CATHY	10.95
FLORENCE	11.71
TANYA	10.62
VIOLETA	11.48

SKILL TESTER

DECIMALS

DECIMAL DATA

The author has dropped some pages of data which he wants to trial for a maths book. He is not sure if the questions are hard enough. Use a calculator to help the author answer the questions.

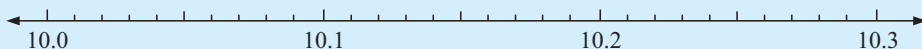
- 1 What is the difference between the
 - a shortest and tallest student
 - b lightest and heaviest student
- 2 What is the total mass of all the students?
- 3 Where is the petrol price
 - a highest
 - b lowest?
- 4 Find the biggest difference in petrol prices between service stations.
- 5 Who ran the fastest women's 100 metre sprint time?
- 6 List the names of the sprinters in the order in which they finished the race.
- 7 What was the difference between the fastest and the slowest time?
- 8 By what distance did Trine beat Susie in the women's javelin competition?
- 9 Rank in order from cheapest to dearest the lenders and their home mortgage interest rates
- 10 What is the % (percentage) difference in the rates between
 - a IMG and St George
 - b Bank West and NAB
 - c Citibank and ANZ

Extension

- 11 List the distances thrown in the women's javelin competition in ascending order.
- 12 Arrange the students' names in order from
 - a shortest to tallest
 - b lightest to heaviest

REVIEW EXERCISE 6A

- 1 Write
 - a $3\frac{3}{10}$ as a decimal
 - b 4.6 as a mixed number
 - c 75% as a fraction in simplest form
- 2 Draw MA blocks to represent 3.04
- 3 Write as a decimal number.
 - a $2 + \frac{5}{10} + \frac{7}{100}$
 - b five decimal zero two
- 4 Copy the number line and mark on it the letters given.



A is 10.04

B is 10.13

C is 10.22

- 5 These are the weights of some students in Year 5. Arrange the students in order of weight from heaviest to lightest.

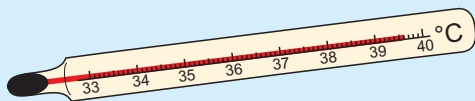
Jane	Peter	Lauren	Kim	Debbie
24.6 kg	26.3 kg	24.5 kg	23.2 kg	23.8 kg

- 6 Find the value of
- a $2.36 + 5.17$ b $8.61 - 3.75$ c 100×4.65
- 7 Write
- a $\frac{56}{100}$ as a decimal b 60% as a decimal number
- c 4.0 as a percentage
- 8 Bianca needed to buy 1.5 kg of mince meat. There were 4 trays of mince meat on the shelf. They were marked 0.86 kg, 0.68 kg, 0.78 kg and 0.81 kg.
- a Which two trays should she buy to be closest to 1.5 kg?
- b How much over/short of 1.5 kg was she?

REVIEW EXERCISE 6B

- 1 Write
- a 7.63 in words b 0.7 as a fraction
- c $3 + \frac{2}{10} + \frac{7}{100}$ as a decimal number

2



Stephen is suffering from a virus. What is his temperature?

- 3 What is the value of the '3' in
- a 7.32 b 39.64 c 2.03
- 4 Write as decimal numbers.
- a four and three tenths b twenty one and forty three hundredths
- c nine and five hundredths d six tenths and two hundredths

- 5 In the 100 m final at the school athletics carnival Year 5 students recorded the following results:

Anton	Maria	Eli	Jai	John
14.6 secs	14.9 secs	15.2 secs	15.8 secs	15.0 secs

- a Who won the 100 m final? b Who came last in the race?
- c By how much did the winner beat the second placed runner?
- 6 Find the value of
- a $3.62 + 9.78$ b $12.74 - 6.83$ c 100×3.27
- 7 Write
- a 55% as a fraction in simplest form
- b $\frac{7}{25}$ i with 100 in the denominator ii as a percentage.
- 8 Jose cut three pieces of string each 2.25 metres long from a ball containing 8 metres of string. How much string was left on the ball?

Chapter 7

Money

In this chapter you should learn to:



- ✓ recognise what part of \$1 is 5 cents, 10 cents, 20 cents and 50 cents
- ✓ count money
- ✓ write money amounts in words and in figures
- ✓ add and subtract money amounts
- ✓ multiply and divide money amounts
- ✓ solve problems involving money
- ✓ use an electronic calculator to do money problems
- ✓ construct and interpret budgets

A

MONEY

When Australia first started using decimal **currency** in 1966, 1-cent, 2-cent, 5-cent, 10-cent, 20-cent and 50-cent coins were released, and \$1, \$2, \$10 and \$20 notes were the first notes.

One dollar and two dollar notes were later replaced by coins.

One and two cent coins are no longer used, but

one hundred one cent coins = 100 cents or 1 dollar (\$).

We could write one cent as \$0.01 because one cent is $\frac{1}{100}$ of a dollar.

Currency is the money in use.



So 1 cent = $\frac{1}{100}$ of a dollar or \$0.01



2 cents = $\frac{2}{100}$ of a dollar or \$0.02



5 cents = $\frac{5}{100}$ of a dollar or \$0.05



10 cents = $\frac{10}{100}$ of a dollar or \$0.10



20 cents = $\frac{20}{100}$ of a dollar or \$0.20



50 cents = $\frac{50}{100}$ of a dollar or \$0.50



These coins are no longer in use.

When we are writing amounts of money as a decimal of a dollar we write *two* numbers after the decimal point.

A dollar sign is written like this \$.

For example, 60 cents is written \$0.60, *not* \$0.6

Twelve dollars and thirty five cents is written \$12.35



When a dollar sign is used, a cent sign is left off.

Examples: 65 cents and \$0.65 are correct. \$0.65¢ is incorrect.

INVESTIGATION

WORLD CURRENCIES



Our currency is the Australian dollar. Can you think of currencies used in other countries?

How many can you find?

A website like

http://fx.sauder.ubc.ca/currency_table.html

will help you, or search 'world currencies' or world + currencies on a search engine. Create a table to show your findings.

Country	Currency	Symbols used
Australia	Aus dollar	\$ ¢
US	:	:
Japan	:	:

EXERCISE 7A

1 How much money is shown? Write the amount in dollars using a decimal point.

a



b



c



d



e



f



g



h



i



j



k



2 Draw simple sketches of the coins and notes that would make up these amounts of money.

For example, \$6.75 would look like



- | | | | |
|-------------------|-------------------|------------------|-------------------|
| a 80 cents | b 15 cents | c \$1.20 | d \$2.75 |
| e \$3.05 | f \$4.50 | g \$5.45 | h \$13.95 |
| i \$27.10 | j \$46.90 | k \$84.65 | l \$102.30 |

3 Write these amounts in words.

- | | | | |
|-----------------|-----------------|-----------------|------------------|
| a \$0.80 | b \$0.35 | c \$3.85 | d \$10.10 |
|-----------------|-----------------|-----------------|------------------|

You can write a cheque to pay someone an amount of money. The cheque has the amount written in words and numerals.

For example:



4 Write these amounts in words.

- | | | | |
|------------------|-------------------|-------------------|-------------------|
| a \$22.45 | b \$13.05 | c \$17.50 | d \$21.65 |
| e \$85.90 | f \$110.10 | g \$332.50 | h \$906.45 |

- 5** Write these amounts as numerals.
- a** seventeen dollars ten cents
 - b** seventy dollars twenty five cents
 - c** two hundred and fifty three dollars forty cents
 - d** six hundred dollars and eighty cents
 - e** nine hundred and seventy eight dollars forty five cents.

300 cents is the same as 3 lots of 100 cents or \$3.

625 cents is the same as 6 lots of 100 cents and 25 cents extra, or \$6.25



- 6** Write these amounts as dollars using a decimal point where necessary.
- | | | |
|------------------------------------|--|---------------------|
| a 55 cents | b 90 cents | c 10 cents |
| d 200 cents | e 155 cents | f 365 cents |
| g 570 cents | h 1000 cents | i 2000 cents |
| j five dollars twenty cents | k thirty two dollars ninety cents | |

- 7** Write these dollar amounts as cents.

For example, $\$14.20 = \$14.20 \times 100 \text{ cents}$
 $= 1420 \text{ cents}$

- | | | | |
|------------------|------------------|------------------|------------------|
| a \$1.25 | b \$4.30 | c \$2.85 | d \$15.05 |
| e \$10.20 | f \$25.35 | g \$46.15 | h \$70.40 |

- 8** What percentage of 1 dollar is
- | | |
|-------------------|--------------------|
| a 1 cent | b 5 cents |
| c 20 cents | d 50 cents? |

Remember that
 1 dollar is 100 cents
 and $1\% = \frac{1}{100}$.



- 9** Draw *two* different sets of coins that would amount to
- | | | |
|-------------------|-----------------------|-----------------|
| a 45 cents | b eighty cents | c \$1.50 |
| d \$2.10 | e \$3.40 | f \$4.05 |
- 10** Draw the *smallest* number of coins and notes that would make these amounts.
- | | | |
|-------------------|-------------------|------------------|
| a 50 cents | b 80 cents | c \$1.20 |
| d \$3.95 | e \$7.40 | f \$12.10 |
- 11** I have five coins in my pocket and three of them are the same. If I have \$1.80, what are the coins?
- 12** Joanna, Kylie and Ben each have 40 cents. Joanna has the greatest number of coins and Ben has the least number of coins. None of Kylie's coins are the same as Joanna's or Ben's. What coins does each child have?

INVESTIGATION

MAKING A DOLLAR



How many different ways can you use 5 cent, 10 cent, 20 cent and 50 cent coins to make 1 dollar?

Record each different combination of coins carefully on a poster.

B ADDING AND SUBTRACTING WITH MONEY

ESTIMATING MONEY

Estimating **to the nearest dollar** is very useful for working out an approximate total when you are buying a number of items. You can also find approximately how much change you should get when you buy something.

EXERCISE 7B

1 Round these amounts to the nearest dollar.

- a** 85 cents **b** \$8.65 **c** \$13.45 **d** \$19.90 **e** \$23.25
f \$29.95 **g** \$71.05 **h** \$24.55 **i** \$176.60 **j** \$245.85

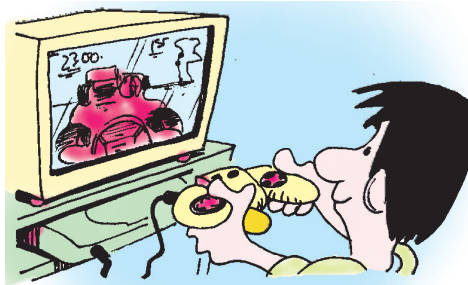
2 Estimate approximate total cost for these items.

- a** 2 litres of milk costing \$2.65, a loaf of bread at \$2.25 and a jar of jam at \$1.95.
b 3 kg oranges costing \$3.85, 1 kg bananas at \$2.95 and 1 kg apples at \$3.45.
c 500 g cheese costing \$4.65, a jar of peanut paste at \$4.25, 1 kg sultanas at \$3.10 and a box of washing powder at \$8.70.

Suppose you purchase a jigsaw puzzle for \$18.85 and you pay for it with a \$50 note. To the nearest dollar, \$18.85 is \$19, and so you expect around $\$50 - \$19 = \$31$ change.

3 Estimate the change you should get to the nearest dollar if

- a** you give \$20 for a toy costing \$13.75
b you give \$50 for a calculator costing \$23.95
c you give \$100 for an electronic game costing \$73.25
d you give \$200 for a basket full of groceries costing \$138.80



ADDITION AND SUBTRACTION

Amounts of money are added and subtracted in the same way as decimal numbers.

An amount such as 65 cents may need to be written as a decimal number first.

For example, 65 cents = \$0.65.

4 Add these amounts of money.

a $\$1.65 + \2

b $\$1.05 + \5.60

c $75 \text{ cents} + \$2.10$

d $\$23.50 + \4.25

e $\$11.80 + \10.45

f $\$317.85 + \82.95

g $\$18.75$

h $\$14.80$

i $\$148.55$

$\$6.35$

$\$23.75$

$\$211.65$

$+ \$13.45$

$+ \$16.10$

$+ \$39.40$

j $\$6.50$

k $\$34.20$

$\$11.65$

$\$213.15$

$\$9.35$

$\$118.85$

$+ \$11.20$

$+ \$119.35$

5 In a taxi I have to pay \$2.75 flag fall plus \$8.60 for the distance travelled. How much do I pay altogether?



6 Subtract these amounts of money.

a $95 \text{ cents} - 60 \text{ cents}$

b $\$1.20 - 45 \text{ cents}$

c $\$3 - \1.10

d $\$5 - \4.25

e $\$10.35 - \2.10

f $\$45.50 - \17.05

g $\$375.30$

h $\$443.95$

i $\$500.00$

$- \$206.45$

$- \$99.40$

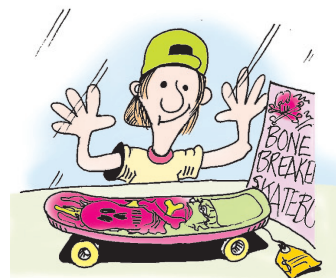
$- \$399.05$

7 a Katy had a \$2 coin and spent 75 cents. How much change did she receive?

b Michael had a \$5 note and spent \$3.20. How much change did he receive?

c Sam had \$26.35 and bought a T-shirt for \$18.95. How much money did he have left?

d Henry saw a skateboard costing \$55.95 in the sport's store window. He had saved \$48.30. How much more money did Henry need before he could buy the skateboard?



e Eloise bought a coat costing \$75.40. She gave the shop assistance a \$50 note and two \$20 notes. How much change did she receive?

8 Jacob had \$30 to spend on meat for the weekend. He found that lamb chops cost \$11.90 per kilogram, sausages cost \$4.70 per kilogram and chicken cost \$12.25 per kilogram.

a By rounding to the nearest dollar, estimate the total cost of one kilogram of each of these meats. Will Jacob have enough money to buy this quantity of meat?

b Find the total cost of 1 kilogram of each of these meats.

c Find the change Jacob will get from \$30.

- 9 If Pieter had \$100, calculate the change he would receive if he
- paid his camp fees of \$98.85
 - bought a pair of shoes costing \$72.60
 - bought CDs costing \$65.35
 - bought two car racing magazines costing \$8.90 and \$12.50.

C

MULTIPLYING AND DIVIDING

MULTIPLYING MONEY

If Michael wanted to buy four 2-litre bottles of fruit juice each costing \$2.85, how much would he have to pay?



Method 1: Michael could add up four lots of \$2.85 and get \$11.40. This would not be difficult. But, what if he wanted to buy 44 bottles?

$$\begin{array}{r}
 \$2.85 \\
 \$2.85 \\
 \$2.85 \\
 + \$2.85 \\
 \hline
 \$11.40
 \end{array}$$

Method 2: Michael could count out

four lots of \$2	=	\$8.00
four lots of 80 cents	=	\$3.20
four lots of 5 cents	=	\$0.20
<hr/>		
The total would be		\$11.40

Method 3: Michael could work out

$$\begin{array}{r}
 2 \ . \ 8 \ 5 \\
 \times \ 3 \ \ 2 \ 4 \\
 \hline
 \$11 \ . \ 4 \ 0
 \end{array}$$

This last method is best.

The multiplication is the same as it is for whole numbers, but the decimal point must be kept in the same place in the answer as it is in the question.

You can check where the decimal point goes by working out an approximate answer.

\$2.85 is approximately \$3, so $4 \times \$2.85$ would be approximately $4 \times \$3 = \12 .

\$11.40 is approximately \$12. Clearly the answer would not be \$1.14 or \$114.00!

EXERCISE 7C**1 Example:** $8 \times \$2.85$ *Answer:* \$2.85 is \$3 to the nearest dollar. So, $8 \times \$2.85$ is about $8 \times \$3$ or \$24.

Find an approximate answer for

- a** $7 \times \$1.95$ **b** $3 \times \$2.15$ **c** $4 \times \$3.05$
d $5 \times \$2.85$ **e** $8 \times \$7.30$ **f** $9 \times \$5.70$

- 2 a** If I had 10 lots of \$2.45, how much money would I have?
b If I had 100 lots of \$3.60, how much money would I have?
c Jeremy had ten times as much money as Lee. If Lee had \$1.80, how much did Jeremy have?

- 3 Find**
- | | | |
|-----------------------------|------------------------------|------------------------------|
| a $5 \times \$1.65$ | b $3 \times \$2.25$ | c $7 \times \$7.05$ |
| d $12 \times \$1.95$ | e $4 \times \$7.50$ | f $8 \times \$5.85$ |
| g $27 \times \$4.15$ | h $13 \times \$11.25$ | i $35 \times \$19.75$ |

- 4 a** Find the cost of 7 icecreams at \$1.85 each and 2 bottles of soft drink at \$1.75 each.
b How much change would there be from \$20?

- 5** Shaun bought 2 kilograms of apples at \$2.45/kg and 3 kilograms of bananas at \$2.65/kg.

- a** How much did he spend?
b How much change did he receive from \$20?



- 6** Carlo bought 43 litres of petrol at \$1.05
- a** How much did the petrol cost?
b How much change did he receive from \$50?

The symbol @ is often used instead of the word 'at' when bills are being calculated.

For example, 2 kg oranges @ \$1.95 = \$3.90 ← $2 \times \$1.95$
 1 kg pears @ \$2.25 = \$2.25
 4 kg potatoes @ \$1.65 = \$6.60 ← $4 \times \$1.65$
 Total \$12.75

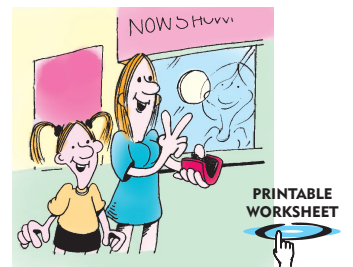
- 7 Find the totals:**
- | | |
|-------------------------------|----------------------------|
| a 5 icecreams @ \$2.25 | b 8 books @ \$21.40 |
| 6 drinks @ \$1.95 | 3 calculators @ \$25.95 |
| 4 bags of crisps @ \$1.65 | 4 pens @ \$2.25 |
| | 7 notepads @ 85 cents |

- 8** Find the total cost of 9 pairs of socks each costing \$5.95.

- 9** If it costs \$12.85 for an adult and \$7.95 for a child to go to the movies, how much will it cost for a group of three adults and five children?

- 10** Jessica bought five T-shirts costing \$22.25 each and two pairs of jeans costing \$34.50 each.

- a** How much did these clothes cost her?
b Jessica also wanted to buy a pair of sports shoes priced at \$85. If she started off with \$250, would she have enough money to buy them?



DIVIDING MONEY

For amounts of money with dollars and cents, we can write the amount as cents, then divide.

For example, $\$2.85 = 285$ cents

$$\text{so } \$2.85 \div 3 = 285 \div 3 = 95 \text{ cents}$$

11 Find

a $75 \text{ cents} \div 3$

b $120 \text{ cents} \div 4$

c $250 \text{ cents} \div 5$

12 Find

a $\$1.20 \div 4$

b $\$2.20 \div 4$

c $\$2.45 \div 5$

d $\$6.40 \div 8$

e $\$4.90 \div 7$

f $\$7.60 \div 8$

13 Three friends paid \$165 to hire a car for the weekend. If they each paid the same amount, how much did it cost each of them?

14 Aunt Edie sent \$540 to be divided equally between her 4 nieces for Christmas. How much did each receive?

15 Claude received a \$200 bonus. He kept \$80 for himself. He divided the remainder between his 5 children. How much did each child receive?

We can divide decimal numbers in the same way as whole numbers.

We keep the decimal point in the same place in the answer as it is in the question.

For example, $\$35.25 \div 5$
 $= \$7.05$

$$5 \overline{) 35.25} \begin{array}{r} 7.05 \\ \underline{35} \\ 25 \\ \underline{25} \\ 0 \end{array}$$

16 Find

a $\$24.60 \div 6$

b $\$45.15 \div 7$

c $\$87.25 \div 5$

d $\$133.80 \div 4$

e $\$26.00 \div 8$

f $\$225.75 \div 3$

D

PROBLEM SOLVING

EXERCISE 7D

- Josh had \$6.50, Sam had \$14.25, Steve had \$6.05 and Kosta had \$5.
 - Who had the most money?
 - Who had the least money?
 - What was the difference between the greatest and least amounts?
- During one week the school canteen made these amounts of money.
 Monday \$645.10 Tuesday \$715.05 Wednesday \$620.45
 Thursday \$599.15 Friday \$634.80
 - Write the days in ascending order of money amounts.
 - Which day was most money taken?
- A shop owner bought a bicycle for \$200. He sold it for \$280.90. How much *profit* did the shop owner make?



A **profit** is made when the *selling price* is more than the *cost price*.

- 4 Takehiro bought a skateboard costing \$189.50. He fell off it and broke his arm so he sold the skateboard for \$120.

Find the *loss* Takehiro made on his sale.

- 5 Which is larger, $\frac{1}{3}$ of \$24 or $\frac{1}{4}$ of \$28?
- 6 Which is more expensive, and by how much?

A taxi ride costing \$15.65 or
four bus tickets costing \$3.95 each.

- 7 Which is cheaper, and by how much?

A six-pack of cola costing \$11.50 or
six cans each costing \$2.25.

A **loss** is made when the *selling price is less* than the cost price.



Remember, to find $\frac{1}{4}$ we divide by 4.

- 8 **a** Find the cost of tickets to the fireworks for these families.

Fireworks Tickets	
Adult	\$12.95
Child	\$5.60

- i** the Jones family has 3 adults
- ii** the James family has 2 adults and 2 children
- iii** the Smith family has 1 adult and 5 children
- iv** the Novak family has 7 children

- b** Which family group paid most for tickets?
 - c** Write the amounts spent on tickets in descending order.
 - d** If the Jones family paid for their tickets with a \$50 note, how much change did they receive?
- 9 Marika bought 10 kg of apples @ \$1.25 per kg and 8 kg of plums @ \$1.45 from a local orchard. She sold all the apples @ \$2.15 per kg, but she only sold *half* the plums @ \$1.95 per kg.
- a** How much did she pay for all the fruit?
 - b** How much did she receive from selling the fruit?
 - c** Did she make a profit or a loss?
 - d** How much profit/loss did she make?

E USING A CALCULATOR

Answer

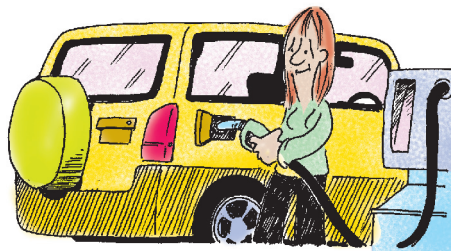
To find	$\$56.85 + \112.20	press	56.85	$\boxed{+}$	112.2	$\boxed{=}$	\$169.05
To find	$\$432.10 - \97.45	press	432.1	$\boxed{-}$	97.45	$\boxed{=}$	\$334.65
To find	$\$1.14 \times 56$	press	1.14	$\boxed{\times}$	56	$\boxed{=}$	\$63.84
To find	$\$457.50 \div 15$	press	457.5	$\boxed{\div}$	15	$\boxed{=}$	\$30.50
To find	9% of \$240	press	9	$\boxed{\%}$	$\boxed{\times}$	240	$\boxed{=}$ \$21.60

EXERCISE 7E

- 1 Use a calculator to find the answers.
 - a $\$24.65 + \269.40
 - b $\$382.45 - \39.20
 - c $\$23.45 \times 15$
 - d $\$208 \div 13$
- 2 Find
 - a 5% of \$263
 - b 2% of \$650
 - c 10% of \$463.50
 - d 25% of \$868.40
- 3 Karsten wanted to buy a bicycle costing \$398.95. The sale price was \$369.50. Find how much he saved if he bought it at the sale.
- 4 The cost of hiring a bus for a school trip was \$183.20. If 16 students went on the trip, how much did each student pay for bus hire?
- 5 A camera was priced at \$455.00. The salesman said he would take 10% off the price if Kylie paid cash for the camera.
 - a Find 10% of \$455.00.
 - b Find how much Kylie would pay for the camera.
 - c If the salesman had taken 15% off the price, how much would Kylie have paid?
- 6 Each time Maria bought petrol for her car she recorded the number of litres bought and the price per litre. These are her records for March.



Date	Quantity (litres)	Cost (cents/litre)	Total Cost
Mar 1st	35	96.7	
Mar 9th	48	98.9	
Mar 17th	42	99.5	
Mar 26th	45	101.2	



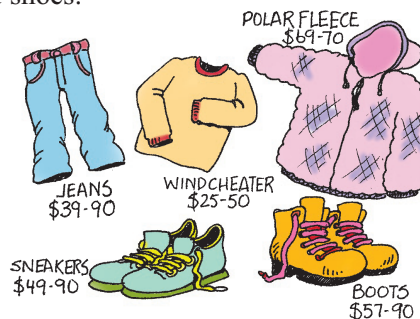
- a Copy and complete the table.
- b Find the total amount Maria spent on petrol in March.

F**BUDGETS**

Samantha has grown taller and needs new clothes. Her feet have grown too. Samantha's mother sets aside \$300 for Samantha's new clothes and shoes.

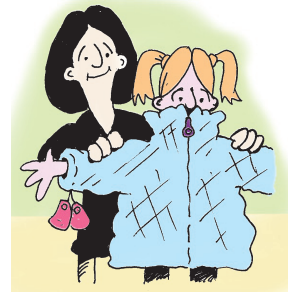
Samantha makes a list of the items she needs which should cost less than \$300. This plan for spending is her **budget**.

- Samantha needs to buy
- 2 pairs of jeans
 - 1 windcheater
 - 1 polar fleece jacket
 - 1 pair of boots
 - 1 pair of sneakers



EXERCISE 7F

- 1
 - a Using the list on the previous page, find the total cost of the items that Samantha needs to buy.
 - b Is Samantha within her budget of \$300?
 - c
 - i Samantha would also like to buy a shirt costing \$19.95. Can she do this and be within her budget?
 - ii If Samantha chose a cheaper polar fleece jacket priced at \$65.50, instead of the one listed above, could she buy the shirt and be within her budget?



- 2 Jeremy and Carlo have saved \$500 to spend on camping equipment. They look through sales brochures and find these prices.

tent	\$195.00	sleeping bags	\$53.60	gas stove	\$49.95
rubber mattresses	\$21.35	chairs	\$19.90	cooler	\$29.90
folding table	\$18.60	gas light	\$39.60		

- a What is the most expensive item on their list?
- b What is the cheapest item on their list?
- c Find the total cost of the items if they purchase 2 chairs, sleeping bags and mattresses and one of everything else. Are they within their budget? What do you suggest they do?



- 3 Trang has a weekly budget of \$500. She is saving to buy a car. She rents a flat for \$175 per week and shares it with a friend. They each pay half the rent. These are Trang's expenses for a week.

Food	\$75.00
Clothing	\$40.00
Entertainment	\$50.00
Savings	\$120.00
Electricity	\$25.00
Telephone	\$25.00
Bus Fares	\$22.50
Rent	
Other expenses	

- a Find Trang's share of the rent.
- b Find the total of the expenses listed, including rent.
- c What amount can be filled in for 'Other expenses' to stay within the budget?
- d List some expenses that could make up 'Other expenses'.





Pete's Pleasing Pet Prices

Parrot	\$65.00
Turtle	\$45.00
Mouse	\$4.50
Kitten	\$25.00
Guinea pig	\$11.00
(breeding pair)	\$18.00
Puppy	\$289.00
Python (per metre)	\$320.00
Bird cages	\$40.00 to \$127.00
Glass tanks	\$30.00 to \$295.00
Pet baskets	\$34.95
Collars	from \$9.99
Leads	from \$21.99
Brushes	\$5.95
Squeaky toys	\$2.95
Kitty litter (5kg)	\$12.99

* for every \$50 you spend

SKILL TESTER

MONEY

Sam and Tabatha have money to spend in the pet shop.

- 1 Tabatha has all her money in notes. She has a fifty, 3 twenties, 8 tens and 7 fives. How much does she have in total?
- 2 Sam has only 8 notes which total \$300. Write *three* different combinations of what the notes could be.
- 3 Who has the most money? By how much?
- 4 If Sam bought a puppy, how much more would he need for a basket, a collar, a lead and some pet food?
- 5 Tabatha thought about buying a kitten, a bowl, a brush, a pet basket, \$10 of pet food, 10 litres of kitty litter and two squeaky rubber toys. How much would all this cost her?
- 6 If Tabatha bought a parrot and the most expensive cage, how much change would she get if she also bought the kitten and a squeaky toy.
- 7 Pete sold all the animals shown.
 - a How much did he collect?
 - b How much pet food did he give away?
- 8 How much more would Sam need if he wanted to buy the 2.5 m python?
- 9 Prepare a shopping list of what animals and *extras* you could buy for \$300.
- 10 Research the costs of other essentials such as vaccination, registration, desexing and food.

MENTAL SET 7A

- 1 Give the amount of money shown.



- 2 Write \$56.70 in words.
- 3 Write 325 cents as dollars.
- 4 Estimate \$79.10 to the nearest dollar.
- 5 How much change do you receive from \$2 if you spent \$1.45?
- 6 Find 100×36 cents.
- 7 Divide \$1 by 5.
- 8 Find the cost of 10 CD's @ \$27.90 each.
- 9 Estimate the total cost of 5 kg bananas @ \$1.85 per kg.
- 10 Find $\$13.50 + \20.45 .

MENTAL SET 7B

- 1 Give the amount of money shown.



- 2 Write in numerals. eighteen dollars and five cents
- 3 Write \$20.45 in words.
- 4 Estimate \$124.85 to the nearest dollar.
- 5 How much change would you receive from \$2 if you spent 85 cents?
- 6 Find $10 \times \$96.45$
- 7 Divide \$2 by 4.
- 8 Write 50 cents as a decimal of \$1.
- 9 Estimate the total cost of 4 books @ \$21.20 each.
- 10 Find $\$20.50 - \13.45

REVIEW EXERCISE 7A

- I had \$2.35 pocket money and spent \$1.85. How much money did I have left?
- List the *smallest* number of coins and notes that would make
 - 75 cents
 - \$3.85
 - \$12.40
- If 100 pens cost \$45, find the cost of 1 pen.
- If I bought a pair of batting gloves costing \$45.95 and a cricket bat costing \$187.50, how much would I pay?
- Jasmin bought a bracelet costing \$15.95. How much change did she receive from \$20?
- Estimate the cost of three salad rolls at \$2.80 each, four drinks at \$1.95 each and two pies at \$2.10 each.
- Three friends have a party. They pay equal amounts to cover its cost. If the party costs \$618, how much does each person pay?
- If it costs \$18.50 for an adult and \$9.50 for a child to go to a football match, how much will it cost for a group of two adults and three children?



REVIEW EXERCISE 7B

- Belinda had \$40.85 and bought a sun hat for \$21.95. How much money did she have left?
- List the *smallest* number of notes and coins that would make
 - \$2.80
 - \$37.50
- Estimate the change you should get to the nearest dollar if you give \$50 for a pair of sandals costing \$27.95.
- Sara had to pay a telephone bill of \$125.15, an electricity bill of \$263.70 and a gas bill for \$143.75. How much did Sara have to pay in total?
- Aniko and Pero went to the Royal show. Each child had a budget of \$25 for rides. The sign alongside shows the ticket prices.
 - Which ride is cheapest?
 - Which ride is most expensive?
 - Find the cost of five rides on the Big Whizz.
 - Pero had one of each of the rides. Will he overspend his budget if he has a second ride on the Big Whizz?
 - Aniko went on the Big Whizz twice and the Super Tumble once. She had two other rides and stayed within her budget. What were the other two rides?

BIG WHIZZ

Children \$5.40

UP 'N' DOWN

Children \$4.80

SUPER TUMBLE

Children \$5.00

SCREAMER

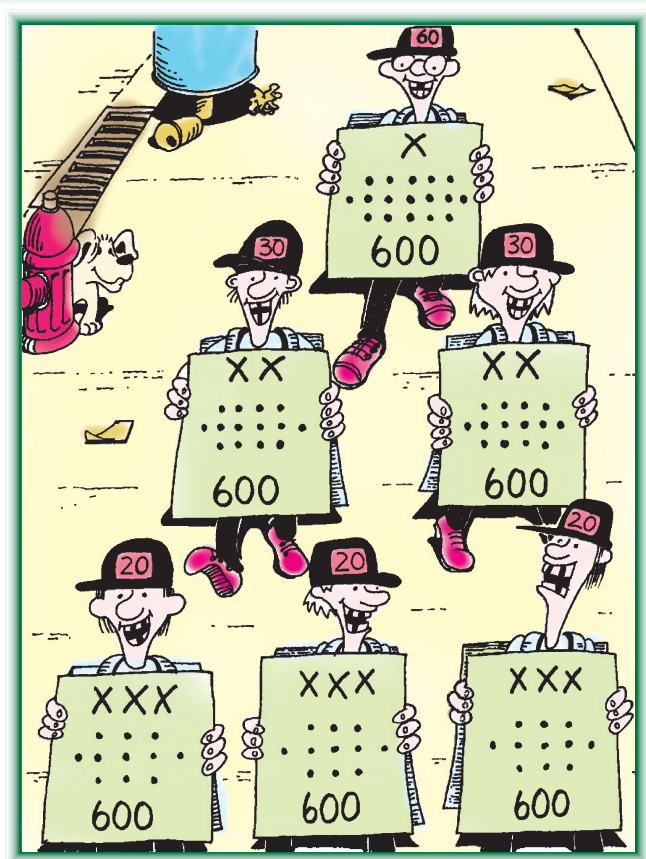
Children \$4.50

Chapter 8

Patterns and algebra

In this chapter you should learn to:

- ✓ write a word formula for a pattern
- ✓ write the members of a number sequence
- ✓ use a number crunching machine
- ✓ write word equations
- ✓ solve equations by guess
- ✓ interpret straight line graphs



FIBONACCI

Patterns of numbers are seen in nature.

In the thirteenth century (AD) Leonardo **Fibonacci** (Fib-on-archy) of Italy, noticed that the number pattern

1, 1, 2, 3, 5, 8, 13, 21, 34, 55, etc occurred commonly in plants.

All these numbers are called the **members** of the pattern.

Notice that the pattern starts with two 1's and each member after that is obtained by adding the two numbers before it.

$$1 + 1 = 2$$

$$1 + 2 = 3$$

$$2 + 3 = 5$$

$$3 + 5 = 8$$

$$5 + 8 = 13, \text{ etc}$$

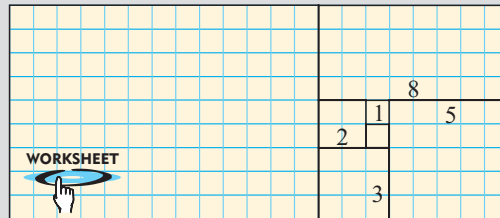


ACTIVITY



You can use grid paper to show the Fibonacci number pattern. Click on the icon to obtain the worksheet. The first four rectangles have been drawn for you. How many complete Fibonacci squares can you fit on this page?

FIBONACCI RECTANGLE



Fibonacci noticed this pattern in

- the seed structure of a sunflower
- the seed pattern in pine cones



- the number of petals in flowers.

3 petals: lily, iris

5 petals: buttercup

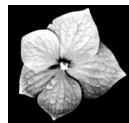
8 petals: delphinium

13 petals: cineraria

21 petals: aster

34 petals: pyrethrum

89 petals: michelmas
daisy



For example, all asters have 21 petals and 21 is a Fibonacci number.

ACTIVITY

FLOWER POWER



Gather several buds which are almost ‘out’ for a particular type of flower, such as a rose. Check to see if the number of petals is always the same and whether it is a Fibonacci number.



A

NUMBER PATTERNS

The members of a number pattern follow a rule.
The rule is repeated to make each number in the pattern.

Number patterns can be made by **adding** or **subtracting** a constant number.

The **interval** between the numbers is the same.

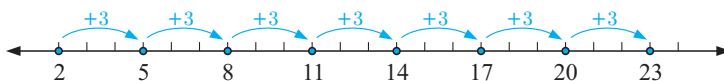
Look at these examples.

- 2 5 8 11 14

As you add 3 each time the numbers become larger.

The pattern is **increasing**.

This number line shows the pattern of ‘adding 3’.

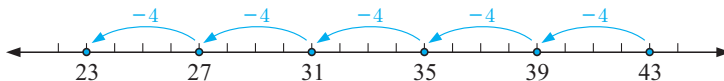


- 43 39 35 31 27 23

As you subtract 4 each time the numbers become smaller.

The pattern is **decreasing**.

This number line shows the pattern of ‘subtracting 4’.



The dots on the end show that the number pattern continues in this same way.



EXERCISE 8A

- Write down the first *six* members of a number pattern which
 - starts with a 3 and 2 is added each time
 - starts with a 4 and 3 is added each time
 - starts with a 2 and 7 is added each time
- Write down the first *six* members of a number pattern which
 - starts with 41 and 2 is subtracted each time
 - starts with 57 and 5 is subtracted each time
 - starts with 103 and 4 is subtracted each time

3 Find the interval in each of these patterns.

a 6, 8, 10, 12, 14,

b 15, 13, 11, 9, 7,

c 56, 61, 66, 71, 76,

d 253, 243, 233, 223, 213,

e 114, 117, 120, 123, 126,

f 120, 115, 110, 105, 100,

Number patterns can also be made by **multiplying** or **dividing** by a constant number.

For example,

• 3 6 12 24 48 This pattern is increasing
 $\begin{array}{ccccccccc} & & \nearrow & & \nearrow & & \nearrow & & \nearrow & & \\ & & \times 2 & & \times 2 & & \times 2 & & \times 2 & & \end{array}$

• 384 192 96 48 24 This pattern is decreasing.
 $\begin{array}{ccccccccc} & & \searrow & & \searrow & & \searrow & & \searrow & & \\ & & \div 2 & & \div 2 & & \div 2 & & \div 2 & & \end{array}$

4 Write down the first *five* members of a number pattern which

- a starts with 5 and is multiplied by 2 each time
 b starts with 2 and is multiplied by 3 each time
 c starts with 3 and is multiplied by 10 each time

Repetition of + or \times usually gives an increasing pattern.

Repetition of - or \div usually gives a decreasing pattern.

5 Write down the first *five* members of a number pattern which

- a starts with 320 and is divided by 2 each time
 b starts with 243 and is divided by 3 each time



6 Look at the given terms of each number pattern. Find the process (+, -, \times , \div) and the constant number that will enable you to work out each term from the one before it. Find the missing member.

a 3 9 15 27 33

b 2 6 10 18 22

c 33 31 27 25

d 43 38 28 23

e 7 14 28 112

f 5 15 135 405

g 448 224 56 28

h 405 135 45

7 Look at the patterns in question 6. List the increasing patterns.

Challenge

You can use combinations of +, -, \times and \div to make number patterns.

For example,

$$\begin{array}{ccccccccc} & & \nearrow & & \searrow & & \nearrow & & \searrow & & \nearrow & & \\ & & +4 & & -2 & & +4 & & -2 & & +4 & & \\ & & & & & & & & & & & & \end{array}$$

In this pattern the numbers are increasing then decreasing alternately.

Make up a pattern of your own using two processes (+, -, \times or \div).

Ask a friend to work out what the pattern is.

PATTERNS IN MULTIPLICATION

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

$\times 2$

$\leftarrow \times 5$

Look carefully at the multiplication table shown above. The row showing multiplication by 5 is shaded. Every numeral in this row ends in 0 or 5.

The column showing multiplication by 2 is also shaded. Every number in this column is an even number.

Use the multiplication table to answer questions 8, 9 and 10.

- 8 Look at the column showing multiplication by 3. Write down the last digit of every multiple of 3. What do you notice?
- 9 Look at the row showing multiplication by 8. Write down the last digit of every multiple of 8. What do you notice?
- 10 Look at the column showing multiplication by 9. Look at the last digit of each numeral. Compare it with column 1. What do you notice?

B PATTERNS WITH MATCHSTICKS

Look at this matchstick pattern.



The number of matches needed to make each pattern is

4 8 12 16

Often we use a **table** to display (show) our discovery.

<i>Pattern number</i>	1	2	3	4	....
<i>Number of matchsticks needed</i>	4	8	12	16	....

$\xrightarrow{+4}$ $\xrightarrow{+4}$ $\xrightarrow{+4}$

Did you notice that to get the next number in the pattern we *add 4 to the number before it*.

EXERCISE 8B

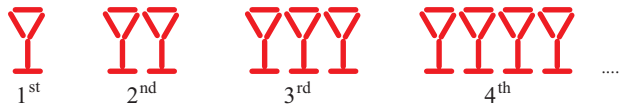
1 Look at this matchstick pattern.



- a Draw the next *two* members.
- b Copy and complete the table.

<i>Pattern number</i>	1	2	3	4	5	6
<i>Number of matchsticks needed</i>						

2 Look at this matchstick pattern.



- a Draw the next *two* members.
- b Copy and complete the table.

<i>Pattern number</i>	1	2	3	4	5	6
<i>Number of matchsticks needed</i>						

3 Sally made this matchstick pattern.



- a Draw the next *two* members.
- b Copy and complete the table.

<i>Pattern number</i>	1	2	3	4	5	6
<i>Number of matchsticks needed</i>						

4 Tom looks at fence patterns.



- a Draw the next *two* members.
- b Copy and complete the table, guessing the last two members.

<i>Number of panels</i>	1	2	3	4	5
<i>Number of timbers needed</i>					

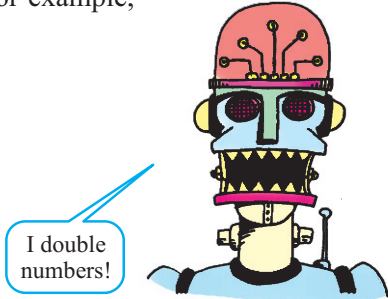
5 Make your own pattern, like the ones given above.

Test it on friends by asking them to

- a draw the next *two* members.
- b complete the table, like in the questions above.

C NUMBER CRUNCHING MACHINES

A machine is used to do the same activity over and over again. Number crunching machines perform operations on numbers we feed into them. For example,



If 5 is fed in, the machine multiplies it by 2 ($5 \times 2 = 10$) and 10 is the output.

If we feed in 1, 2 and 3, the machine spits out 2, 4 and 6.

The machine's instruction, "multiply by 2", is called the **rule**.

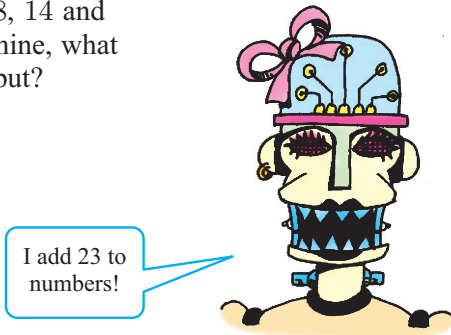
We can place these results in an **Input-Output table**.

For example:

<i>Rule:</i> $\times 2$	
<i>Input</i>	<i>Output</i>
1	2
2	4
3	6
4	8
5	10

EXERCISE 8C

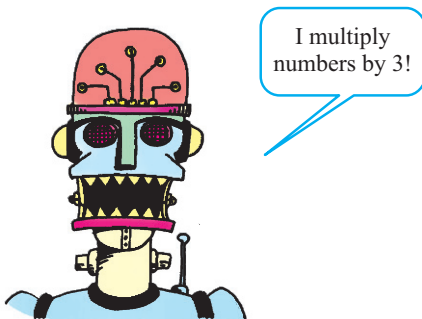
- If you put 1, 4, 8, 14 and 25 into this machine, what numbers are output?



Copy and complete:

<i>Rule:</i> $+23$	
<i>Input</i>	<i>Output</i>
1	
4	
8	
14	
	48
33	

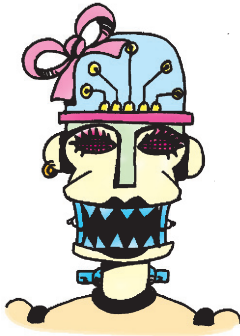
-
-



Copy and complete the *Input-Output* table:

<i>Rule:</i> $\times 3$	
<i>Input</i>	<i>Output</i>
2	
5	
6	
13	
	60

3

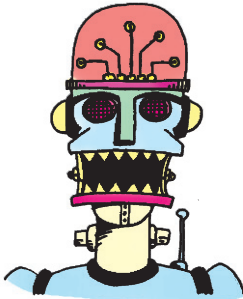


I multiply numbers by 2 and then add 3!

Copy and complete the *Input-Output* table:

Rule: $\times 2$, then $+3$	
Input	Output
1	
3	
6	
	29
17	

4

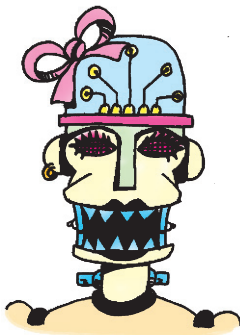


I add 5 and then multiply numbers by 2!

Copy and complete the *Input-Output* table:

Rule: $+5$, then $\times 2$	
Input	Output
2	
7	
	36
15	
22	

5



I multiply numbers by 3 and then take 4!

Copy and complete the *Input-Output* table:

Rule:,	
Input	Output
2	
5	
	26
	35
16	

D

OTHER PATTERNS

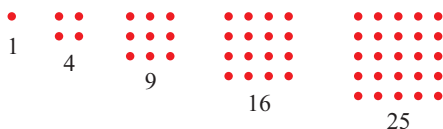
EXERCISE 8D

1 The pattern $a\ e\ i\ o\ u\ a\ e\ i\ o\ u\ a\ e\ i\ o\ u\ \dots$ is made up by *repetition* of the vowels. The five vowels are repeated over and over. Explain how each pattern below has been formed.

a $aa\ ab\ ac\ ad\ ae\ af\ ag\ ah\ \dots$

b $ab\ bc\ cd\ de\ ef\ fg\ gh\ hi\ \dots$

2



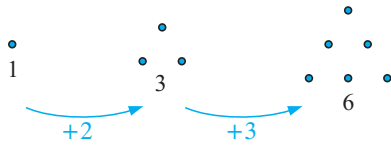
etc. are square numbers.

This first square number is $1 \times 1 = 1$, the second is $2 \times 2 = 4$, etc. Find the

a 6th square number

b 10th square number.

3 **Triangular numbers** can be shown as triangular patterns. The first three triangular numbers are:

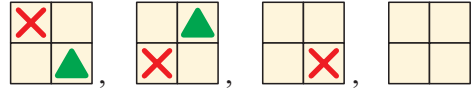


To form the pattern we add a number that is 1 bigger than the number added the previous time.

Find the next three triangular numbers.

4 You can make patterns with symbols, too.

a Complete the 3rd and 4th member.



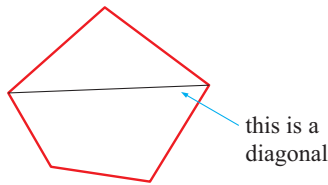
b Find the next two members if the symbols used are \triangle , \circ and \square .



5 Make your own pattern using symbols. Test it on a friend.

Extension

6



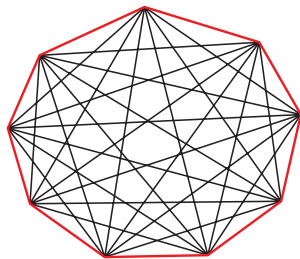
A diagonal of a polygon is a straight line joining two of its corner points (vertices).

a Draw with a ruler the diagonals of these polygons.

- i** a quadrilateral
- ii** a pentagon
- iii** a hexagon
- iv** a heptagon
- v** an octagon

b Carefully count the number of diagonals for each figure in **a**.

c Copy and complete the table.



<i>Number of sides</i>	<i>Number of diagonals</i>
3	
4	
5	
6	
7	
8	

d Is there a pattern in the second column of the table? Write it down in words.

e Predict the number of diagonals for a polygon with

- i** 9 sides
- ii** 10 sides
- iii** 13 sides

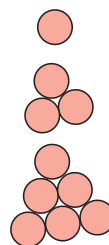
- 7 Johnny Thon stacks apples in triangles. Viewed from above, a 2-layer stack looks like this.



layer 1: 1 apple

layer 2: 3 apples

layer 3: 6 apples



- a How many apples would be in
b Copy and complete the table.

Layer number	Number of apples
1	1
2	4
3	
4	
5	
6	

- c Write down, in words, the pattern you find in the second column.
d Predict the number of apples in the
i 7th layer ii 10th layer
e How many apples are needed to make an apple pyramid of
i 5 layers ii 10 layers

E

FINDING MISSING NUMBERS

Can you guess the number that belongs in place of the square?

If $\square + 3 = 11$, we know that $8 + 3 = 11$,
so the number that belongs in place of the square is 8.

If $\square \div 3 = 8$, we know that $24 \div 3 = 8$,
so the number that belongs in place of the square is 24.

\square is called a
symbol. It takes
the place of a
number.



EXERCISE 8E

- 1 Find the number that goes in place of the square.

a $2 + \square = 5$

b $4 + \square = 8$

c $\square + 11 = 25$

d $13 + \square = 19$

e $8 + \square = 15$

f $\square + 22 = 29$

g $9 + \square = 19$

h $13 + \square = 20$

i $\square + 12 = 24$

j $17 + \square = 37$

k $18 + \square = 22$

l $\square + 30 = 50$

- 2 Find the number that goes in place of the square.

a $5 - \square = 3$

b $9 - \square = 3$

c $11 - \square = 5$

d $14 - \square = 9$

e $13 - \square = 4$

f $15 - \square = 9$

g $\square - 4 = 6$

h $\square - 7 = 9$

i $\square - 13 = 1$

j $18 - \square = 12$

k $22 - \square = 11$

l $24 - \square = 16$

3 Find the number that goes in place of the square.

- | | | |
|----------------------------------|----------------------------------|----------------------------------|
| a $6 \times \square = 30$ | b $3 \times \square = 21$ | c $7 \times \square = 14$ |
| d $9 \times \square = 27$ | e $\square \times 4 = 28$ | f $\square \times 5 = 35$ |
| g $\square \times 7 = 63$ | h $\square \times 8 = 56$ | i $\square \times 9 = 72$ |

4 Find the number that goes in place of the square.

- | | | |
|--------------------------------|--------------------------------|--------------------------------|
| a $30 \div \square = 3$ | b $49 \div \square = 7$ | c $\square \div 7 = 8$ |
| d $24 \div \square = 8$ | e $15 \div \square = 5$ | f $18 \div \square = 2$ |
| g $\square \div 7 = 4$ | h $36 \div \square = 6$ | i $\square \div 6 = 7$ |

5 Find the number that goes in place of the triangle.

- | | | |
|---|--------------------------------------|---|
| a $\Delta + \Delta = 12$ | b $\Delta + \Delta = 54$ | c $\Delta + \Delta + \Delta = 18$ |
| d $18 - \Delta = \Delta$ | e $40 - \Delta = \Delta$ | f $\Delta + \Delta + \Delta = 39$ |
| g $\Delta + 1 = \Delta + \Delta$ | h $\Delta \times \Delta = 36$ | i $\Delta \times \Delta \times \Delta = 8$ |

The problems following are harder because we need to think through two steps.

Can we find the number in place of the square in $2 \times \square + 1 = 5$?

If $2 \times \square + 1 = 5$, $2 \times \square$ must be 4 because $4 + 1 = 5$

So, $2 \times \square = 4$ and $\square = 2$ as $2 \times 2 = 4$.

6 Find the number in place of the square by using two steps.

- | | | |
|--|--------------------------------------|---|
| a $3 \times \square + 2 = 11$ | b $4 \times \square - 5 = 7$ | c $5 \times \square + 11 = 16$ |
| d $6 \times \square - 1 = 65$ | e $\square \times 7 + 1 = 50$ | f $\square \times 8 - 5 = 19$ |
| g $\square \times 11 - 12 = 10$ | h $\square \times 9 + 3 = 66$ | i $11 \times \square + 12 = 100$ |

ACTIVITY



1 Can you find the number or numbers which will make these sentences true?

- | | |
|--|---|
| a $\square + \square = \square$ | b $\square \times 1 = \square$ |
| c $\square \times 1 = 1$ | d $\square \times \square = \square$ |
| e $\square \div 1 = \square$ | |

2 Find two different whole numbers which make both of these true at the same time.

For example, $\square + \Delta = 7$ and $\square \times \Delta = 12$

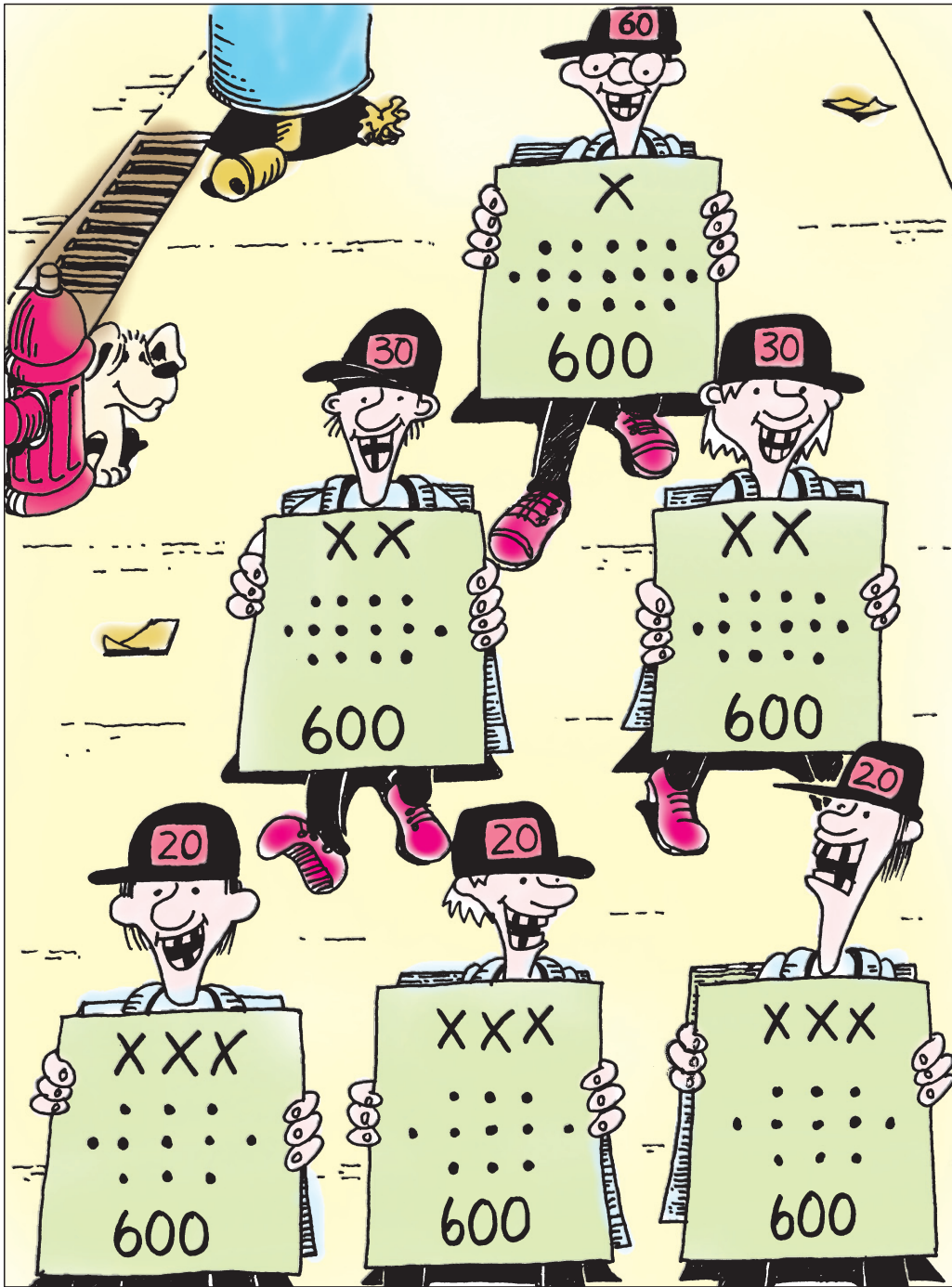
Answer: 3 and 4 as $3 + 4 = 7$ and $3 \times 4 = 12$

- | | | | |
|--|--|--|--|
| a $\square + \Delta = 3$
$\square \times \Delta = 2$ | b $\square + \Delta = 5$
$\square \times \Delta = 6$ | c $\square + \Delta = 13$
$\square \times \Delta = 40$ | d $\square + \Delta = 17$
$\square \times \Delta = 70$ |
| e $\square + \Delta = 16$
$\square \times \Delta = 63$ | f $\square + \Delta = 21$
$\square \times \Delta = 96$ | g $\square - \Delta = 2$
$\square \times \Delta = 15$ | h $\square - \Delta = 1$
$\square \times \Delta = 56$ |
| i $\square + \Delta = 4$
$\square - \Delta = 2$ | j $\square + \Delta = 11$
$\square - \Delta = 3$ | k $\square + \Delta = 8$
$\square \div \Delta = 3$ | l $\square - \Delta = 8$
$\square \div \Delta = 5$ |

EQUATION CHALLENGE

In each problem the same number must be put in place of the square. In **a**, you can't have $2 + 3 = 5$.





SKILL TESTER

NUMBER PATTERNS

What to do:

- 1 Carefully study the picture on the page opposite.
- 2 Look for patterns.
- 3 Read all the questions on this page then study the picture again.
- 4 Answer the questions.

The picture

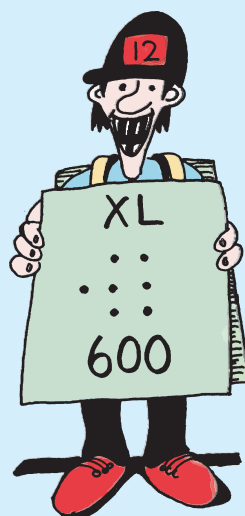
Imagine that the people in the picture are walking towards you. They are carrying “sandwich boards” with number patterns. Imagine that nine people with “sandwich boards” have already walked past you. They form part of the pattern shown in the picture.

The questions


- 1 How many rows of people have walked past?
- 2 How were they grouped?
- 3 What was the total number of **a** missing teeth **b** fingers showing on all the people who went past?
- 4 What was the total number of dots (•) on the boards of all the nine people who went past?
- 5 Which of the following numbers could you expect to see on the hats of the people who passed by?
a 5 **b** 7 **c** 10 **d** 12 **e** 15 **f** 17
- 6 Is the picture on this page one of the nine people who went past? Give five reasons for your answer.

Extension

- 7 Give a mathematical reason why the 600 is on the bottom of the board.
- 8 Why would it have been difficult to draw four more rows of people carrying “sandwich boards” with number patterns? Give four reasons.

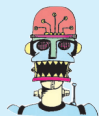


MENTAL SET 8A

- 1 Write down the first four members of a number pattern which starts with a 5 and 2 is added each time.
- 2 Find the interval in the pattern
35, 32, 29, 26, 23,
- 3 43, 36,, 22, 15.
The missing number is
- 4 
1st 2nd 3rd

Draw the next member.

- 5 *Input* = 4
Output =




I add 3 then multiply by 2

For questions 6 - 9, find the number that goes in the box.

- 6 $3 + \square = 7$
- 7 $12 - \square = 9$
- 8 $\square \times \square = 81$
- 9 $\square \div 9 = 7$
- 10 Use two steps to find the number in the box. $3 \times \square + 4 = 19$ the

MENTAL SET 8B

- 1 Write down the first four members of a number pattern which starts with a 3 and is multiplied by 2 each time.
- 2 5, 9, 13,, 21.
Find the missing number.
- 3 Is the pattern "Start with 243 and divide by 3 each time" an increasing or a decreasing pattern?
- 4 
1st 2nd 3rd

How many matches are needed for the fourth member?

- 5 *Input* = 5
Output =

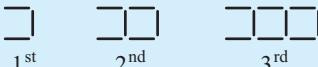


I multiply by 2 then take 4.

For questions 6 - 9, find the number that goes in the box.

- 6 $\square + 15 = 37$
- 7 $7 - \square = 2$
- 8 $\square \times 12 = 96$
- 9 $72 \div \square = 9$
- 10 Using two steps, find the number in the box. $\square \times 6 + 3 = 51$

MENTAL SET 8C

- 1 The number pattern discovered by Fibonacci is:
1, 1, 2, 3, 5, 8, 13, 21, 34, 55,
- Find the next member.
- 2 2, 4, 8, 16,
The next two members of the number pattern are
- 3 2, 6, 18,, 162.
The missing number is
- 4 Find the interval in the pattern
13, 24, 35, 46, 57,
- 5 
1st 2nd 3rd

How many matches are needed for the sixth member?

For questions 6 - 9, find the number that goes in the box.

- 6 $14 + \square = 23$
- 7 $\square - 11 = 14$
- 8 $8 \times \square = 56$
- 9 $\square \div 4 = 6$
- 10 Using two steps, find the number in the box. $7 \times \square - 8 = 20$

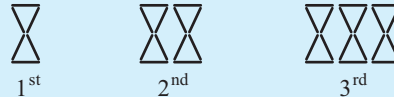
REVIEW EXERCISE 8A

- 1 Write down the first four members of a number pattern which
 - a starts with a 5 and 4 is added each time
 - b starts with 875 and is divided by 5 each time

2 Find the missing members of

- a 8, 16, 32,, 128,
- b 71, 63,, 47,

3 Ben made this matchstick pattern.

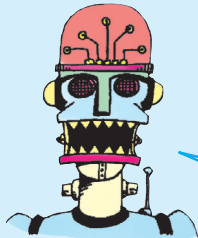


- a Draw the next two members.
- b Copy and complete the table.

Pattern number	1	2	3	4	5
Number of matchsticks needed					



4 Copy and complete the *Input/Output* table.



I multiply numbers by 3 then take 2.

Rule:,	
Input	Output
3	
5	
8	
	34
	46

5 Draw a quadrilateral, a pentagon and a hexagon. Choose *one* vertex. Draw diagonals from that vertex to the other vertices.

a Copy and complete the table.

Number of sides of polygon	Number of diagonals from one vertex
4	
5	
6	
7	
8	



- b Is there a pattern in the second column of the table? Write it down in words.
- c Predict the number of diagonals from *one* vertex for a polygon with
 - i 9 sides
 - ii 20 sides
 - iii 100 sides.

6 Find the number that goes in the box.

- a $\square + 11 = 24$
- b $27 - \square = 9$
- c $\square \times 6 = 54$
- d $48 \div \square = 4$

REVIEW EXERCISE 8B

- 1 Write down the first four members of a number pattern which
- a starts with 112 and 7 is subtracted each time
 - b starts with 4 and is multiplied by 10 each time

- 2 Find the missing members of
- a 6, 15, 24,, 42,

- b 567, 189,, 21, 7

- 3 Dee-Yee made this matchstick pattern.



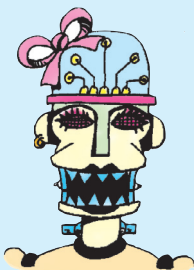
- a Draw the next member.
- b Copy and complete the table.

<i>Pattern number</i>	1	2	3	4	5
<i>Number of matchsticks needed</i>					



- 4 Copy and complete the *Input/Output* table.

I add 2 then multiply by 4.



<i>Rule:</i>,	
<i>Input</i>	<i>Output</i>
2	
5	
7	
	48

- 5 a Write the next two rows of this pattern.
- b Describe in words what you would do to form each new row.

```

      1   1
     1  2  1
    1  3  3  1
   1  4  6  4  1
    
```

- 6 Find the number that goes in the box.

a $\square + 9 = 24$ b $42 - \square = 27$ c $\square \div 7 = 9$ d $\square \times 4 - 5 = 31$

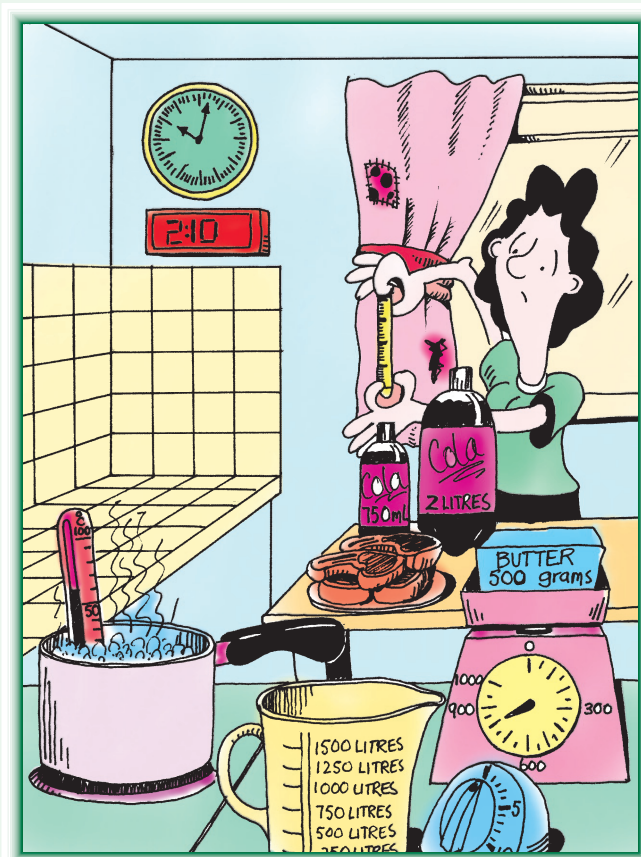
- 7 Find the value of the symbol in each number sentence.

a $\nabla + \nabla = 62$ b $30 - \nabla = \nabla$ c $\nabla \times \nabla = 100$

Chapter 9

Measurement

In this chapter you should learn to:



- ✓ measure and estimate lengths
- ✓ convert between units of length
- ✓ find and estimate perimeters
- ✓ find areas of rectangular figures
- ✓ find volumes of objects made up from cubes
- ✓ see what capacity means and use units of capacity
- ✓ convert between units of capacity
- ✓ estimate and use units of mass
- ✓ convert between units of mass

Each day we use many different measuring devices.

Some of them are: a ruler, a measuring tape and a stop watch at school, a measuring cup, scales and a timer in the kitchen and a speedometer and an odometer in the car. In this chapter we look at

- length and perimeter
- area
- volume and capacity
- mass and weight
- meter reading

A

LENGTH

We measure length in **metres, centimetres, millimetres** and **kilometres**.

The basic unit of length is the **metre**.

ACTIVITY

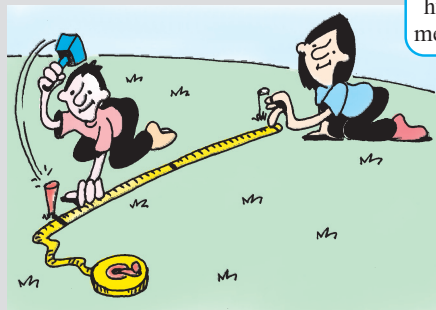
METRE RULES AND RULERS



You will need: a classroom metre rule, a school ruler

What to do:

- Look carefully at a metre rule.
 - How many centimetres (cm) of this length $\rule{1cm}{0.4pt}$ are marked on the metre rule?
 - How many millimetres (mm) of length \sphericalangle are marked on the metre rule?
- Copy and complete: 1 metre = cm = mm
- How many cm are marked on your school ruler?
 - How many millimetres are on a 30 cm ruler?
- Place a metre rule on the floor. Can you step off one metre with an
 - an ordinary step
 - a jump
 - a running step?



centi means hundredth, *milli* means thousandth



LENGTH UNITS

We usually measure the lengths of things in one of these **units**.

1 centimetre = 10 millimetres	Shorthand for units:	metre	m
1 metre = 100 centimetres		centimetre	cm
1 metre = 1000 millimetres		millimetre	mm
1 kilometre = 1000 metres		kilometre	km

ACTIVITY

KILOMETRES



What to do:

- 1 Next time you go for a drive with an adult, get them to measure one kilometre from home. Note the finishing position.
- 2 At school, mark off 100 m using an athletics tape measure. Walk 100 m at your normal pace and count the number of steps.
- 3 Record your steps in the form: 100 m = steps
- 4 In the school grounds, walk a much longer distance counting your steps. Estimate the number of kilometres between your starting and finishing points.



kilo means 1000



ESTIMATES

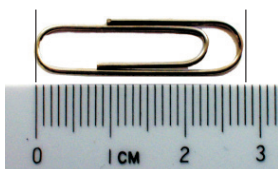
Here are some things to help you visualise some of the units of length.

1 mm	the thickness of a 5-cent coin	
1 cm	the width of a finger nail	
1 m	half the height of a door	
1 km	twice around an AFL oval boundary	

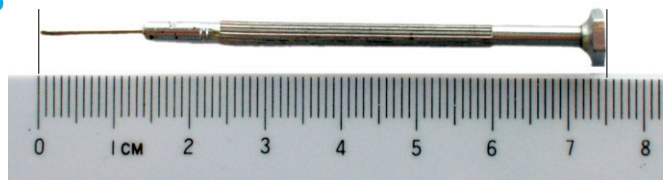
EXERCISE 9A

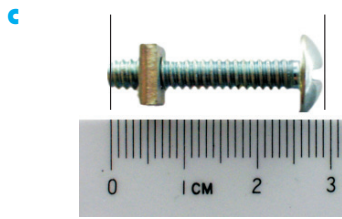
- 1 Measure these objects in millimetres.

a



b





2 Use your ruler to measure the length of these lines in millimetres.



Now measure the lengths in centimetres.

3 Write in millimetres.

- | | | | |
|--------------------|--------------------|--------------------|---------------------|
| a 2 cm | b 2 cm 7 mm | c 3 cm 4 mm | d 7 cm 1 mm |
| e 5 cm 6 mm | f 9 cm 8 mm | g 4 cm 4 mm | h 11 cm 5 mm |

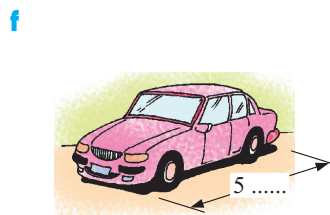
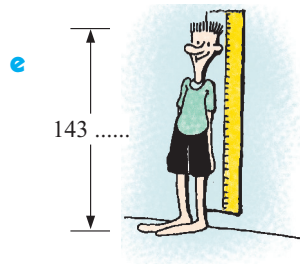
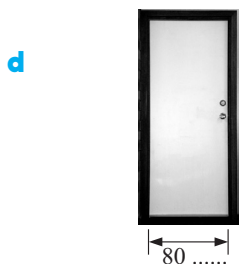
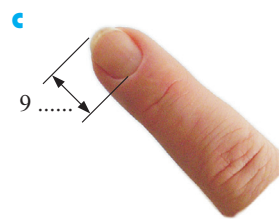
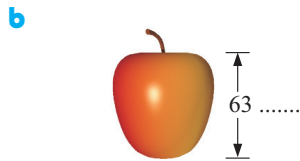
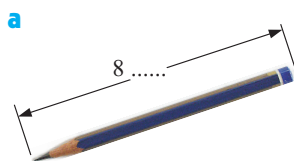
4 Write in centimetres and millimetres by copying and completing.

- | | |
|---|---|
| a 27 mm = 20 mm + 7 mm
= cm mm | b 35 mm = mm + 5 mm
= cm mm |
| c 41 mm = mm + mm
= cm mm | d 78 mm = cm mm |

5 Choose the correct unit of length (m, cm, mm or km) for these.

- a** the thickness of a match is about 2
- b** the length of a pair of scissors is about 12
- c** the width of my pen is about 6
- d** the distance between the two towns is about 17
- e** the height of the tree is about 13
- f** the length of my little finger is about 4

6 When John drew these objects he left the units off. What should they be?



7 You can use these three measuring devices.

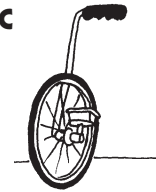
A



B



C



Which one should you use to measure

- a the length of a whiteboard
- b the width of an eraser
- c the length of a basketball court
- d the distance around the school oval
- e the distance jumped by an athlete
- f the length of a toothpick
- g the length of a speed boat
- h the length from the tee to the pin on a golf hole

ACTIVITY

ESTIMATING AND MEASURING LENGTHS



What to do:

- 1 Look at objects in the classroom. Estimate their lengths, or widths or thicknesses. Choose some large and some small objects. Write your answers in a table like the one given below.

Object	Estimate	Actual Measurement
length of a pen	8 cm	91 mm
height of a door		
width of a window		
length of a room		

← Example

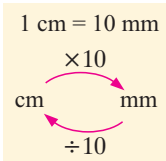
How good is your estimation of length?

B

CONVERSION OF LENGTH UNITS

Remember:

1 cm = 10 mm, 1 m = 100 cm, 1 m = 1000 mm, 1 km = 1000 m.



To change **cm to mm** we *multiply* by 10.

To change **mm to cm** we *divide* by 10.

Examples:

- 8 cm = 8×10 mm = 80 mm
- 56 mm = $56 \div 10$ cm = 5.6 cm

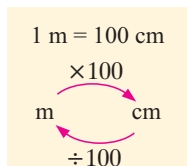
EXERCISE 9B

1 Copy and complete

- a 5 cm = mm
- b 20 cm = mm
- c 125 cm = mm
- d 6.5 cm = mm
- e 14.2 cm = mm
- f 54.5 cm = mm

2 Copy and complete

- a** 10 mm = cm **b** 5 mm = cm **c** 2 mm = cm
d 1 mm = cm **e** 15 mm = cm **f** 35 mm = cm

To change **m to cm** we *multiply* by 100.To change **cm to m** we *divide* by 100.

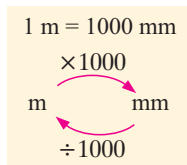
- Examples:**
- $2.5 \text{ m} = 2.50 \times 100 \text{ cm} = 250 \text{ cm}$
 - $468 \text{ cm} = 468. \div 100 \text{ m} = 4.68 \text{ m}$

3 Copy and complete

- a** 4 m = cm **b** 40 m = cm **c** 0.4 m = cm
d 1.6 m = cm **e** 2.7 m = cm **f** 14.8 m = cm

4 Copy and complete

- a** 100 cm = m **b** 500 cm = m **c** 230 cm = m
d 10 cm = m **e** 1 cm = m **f** 7 cm = m

To change **m to mm** we *multiply* by 1000.To change **mm to m** we *divide* by 1000.

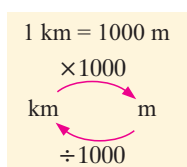
- Examples:**
- $6.2 \text{ m} = 6.200 \times 1000 \text{ mm} = 6200 \text{ mm}$
 - $5800 \text{ mm} = 5800. \div 1000 \text{ m} = 5.8 \text{ m}$

5 Copy and complete

- a** 2 m = mm **b** 20 m = mm **c** 5.6 m = mm
d 1.2 m = mm **e** 0.8 m = mm **f** 0.5 m = mm

6 Copy and complete

- a** 1000 mm = m **b** 4800 mm = **c** 2200 mm =
d 500 mm = m **e** 350 mm = **f** 50 mm =

To change **km to m** we *multiply* by 1000.To change **m to km** we *divide* by 1000.

- Examples:**
- $4.2 \text{ km} = 4.2 \times 1000 \text{ m} = 4200 \text{ m}$
 - $650 \text{ m} = 650. \div 1000 \text{ km} = 0.65 \text{ km}$

7 Copy and complete

- a** 5 km = m **b** 12 km = m **c** 1.2 km = m
d 0.8 km = m **e** 0.55 km = m **f** 0.02 km = m

8 Copy and complete

- a** 8000 m = km **b** 5000 m = km **c** 1200 m = km
d 500 m = km **e** 200 m = km **f** 10 m = km

9 Write as metres using a decimal point.

- a 156 cm b 70 cm c 1550 mm d 285 mm

C PERIMETER

The **perimeter** of a shape is the distance around it.

Look at the word 'Perimeter'.
'Peri' means 'around'.
A 'meter' measures something.

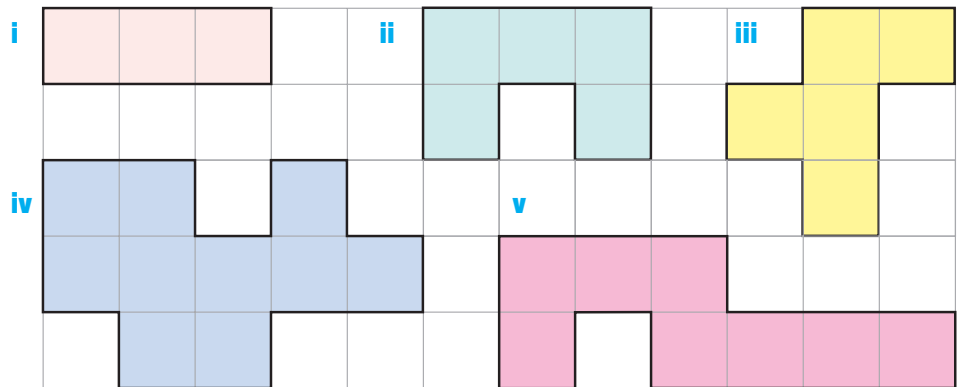
We can use a ruler or other length measuring equipment to find the perimeter of a shape.



EXERCISE 9C

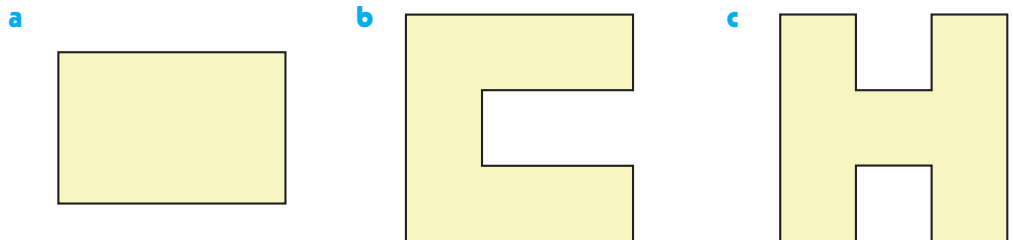
1 These shapes are on 1 cm by 1 cm grid paper.

a Find the perimeter of each shape.

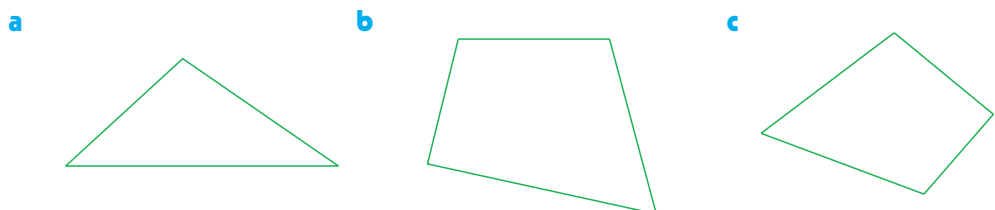


b Which shape has the longest perimeter?

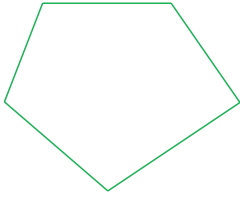
2 Use your ruler to measure these shapes (in cm) and then find the perimeter.



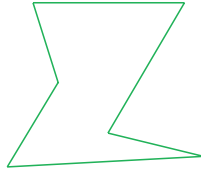
3 Use your ruler to measure these shapes (in mm) and then find the perimeter.



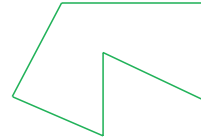
d



e



f



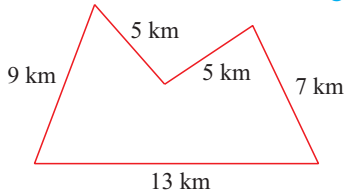
4 Which of the shapes in question 3 has

a the shortest perimeter

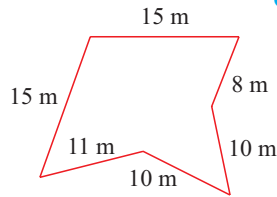
b the longest perimeter

5 Find the perimeter of

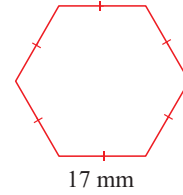
a



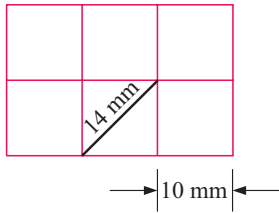
b



c

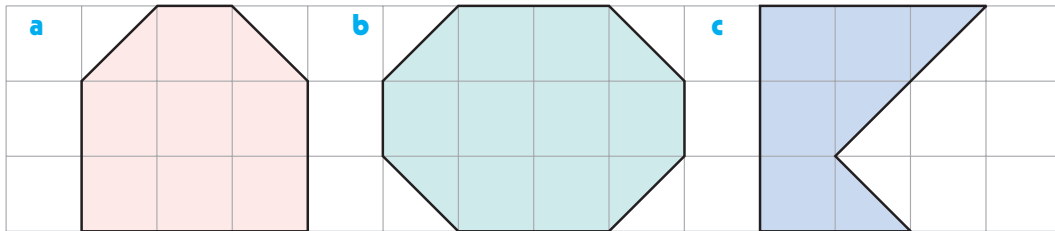


6



On 1 cm by 1 cm grid paper, the diagonal distance across a square is very close to 14 mm.

Find in mm, the perimeter of these shapes.



ACTIVITY

ESTIMATING AND MEASURING PERIMETERS



You will need: A 30 m (or more) tape measure, pencil and paper.

What to do:

1 For each shape below:

- sketch the shape
- estimate the perimeter using suitable units and record your estimate
- measure the perimeter accurately.

a the classroom floor

b a cricket pitch

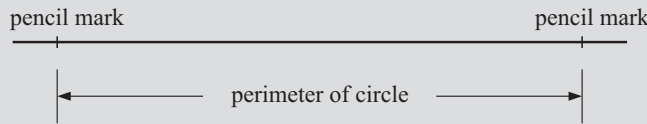
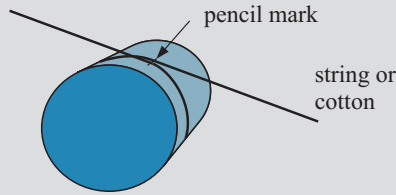
c a netball court

d a desk top

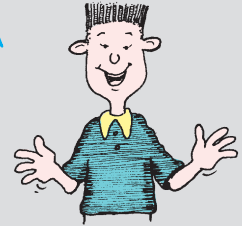
e a school garden plot

ACTIVITY

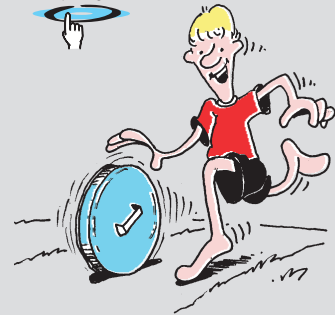
PERIMETERS OF CIRCLES



The perimeter of a circle has a special name. It is called the *circumference*.



The perimeter (circumference) of a circular object can be measured using a piece of string or cotton. The string is wrapped tightly around the object. It is then unwrapped and measured on a ruler, metre rule or tape measure.



What to do:

- 1 Estimate the perimeter of circular objects such as tin cans, bottles or rubbish bins.
- 2 Use the method described above to measure the perimeters of your objects.
- 3 Copy and complete a table like this one.

<i>Object</i>	<i>Estimate of perimeter</i>	<i>Measurement</i>

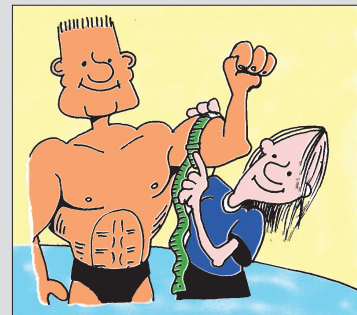
ACTIVITY

BODY MEASURING



Measure these distances around your body with a tape measure:

- around the head just above the nose
- around your wrist at the thinnest part
- around your knee when you are in a sitting position
- around your biceps muscle when your arm is straight. Now try it when it is flexed like a right angle.

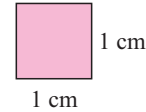


D

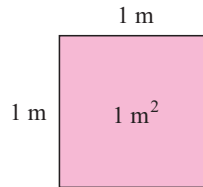
AREA

The **area** of a shape is the size of its surface.

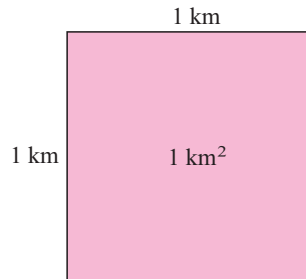
A **square centimetre** is 1 cm by 1 cm. Its area is written as 1 cm^2 .



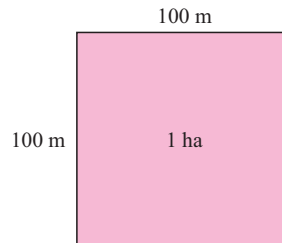
A **square metre** is 1 m by 1 m.



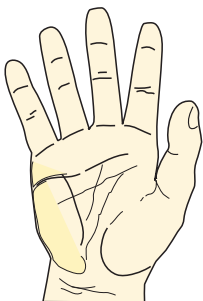
A **square kilometre** is 1 km by 1 km.



Land sizes are often given in **hectares (ha)** where a hectare is 100 m by 100 m.



Some examples of measured area are



The area of a person's hand is about 120 cm^2



The area of a tennis court is about 261 m^2 .

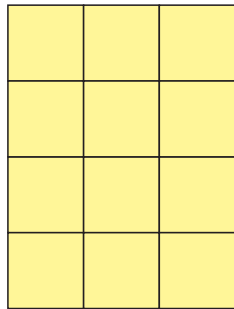


The area of Australia is approximately $7\,629\,000 \text{ km}^2$.

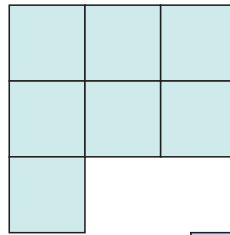
EXERCISE 9D

1 a Find the area of these shapes in square centimetres (cm²).

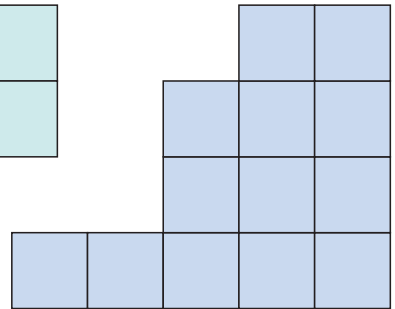
i



ii



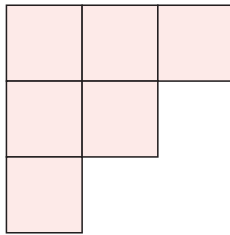
iii



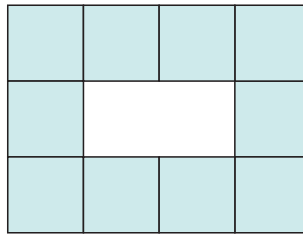
b Which shape has the largest area?

2 Find the area of the shaded shapes.

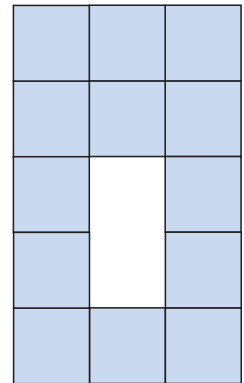
a



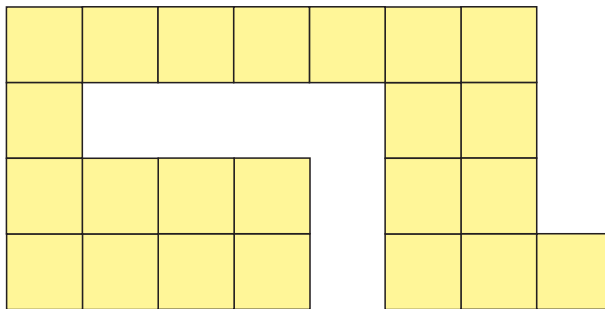
b



c



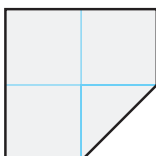
d



3 Use cm² paper to sketch *two* different rectangles with an area of 6 cm².

4 Use cm² paper to sketch *three* different rectangles with an area of 12 cm².

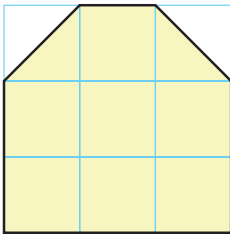
5



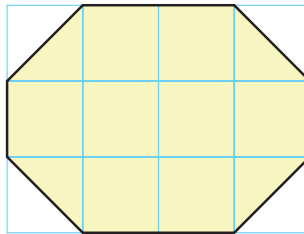
Why does this shape have an area of $3\frac{1}{2}$ cm²?

6 Find the area of these shaded shapes.

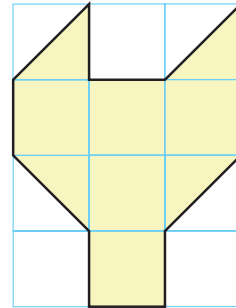
a



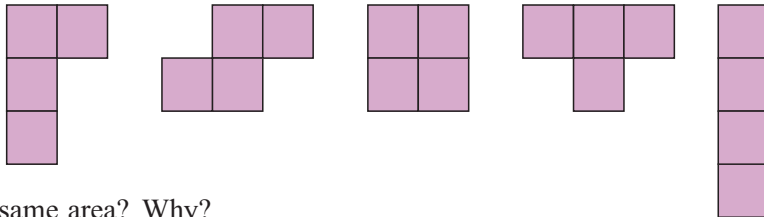
b



c

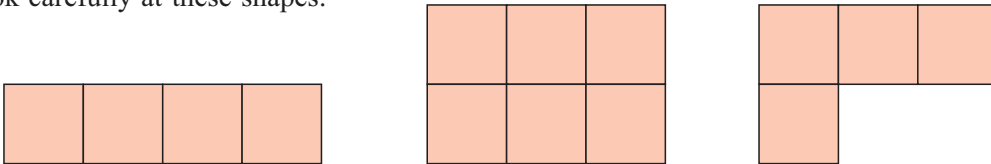


7 Look carefully at these shapes.



- a Do they have the same area? Why?
- b Do they have the same perimeter? Be careful and count sides.

8 Look carefully at these shapes.



- a Do they have the same perimeter?
- b Do they have the same area?

ACTIVITY

SQUARE METRES



Make a square metre using newspaper sheets. Use masking tape to join the sheets.

What to do:

- 1 Find how many people can stand on the square metre.
- 2 Find how many copies of this book can lie flat on a square metre. Do not go over the edges.
- 3 Does a door of your classroom have an area which is
 - a more than a square metre
 - b less than two square metres?
- 4 Estimate how many square metres the whiteboard would be.



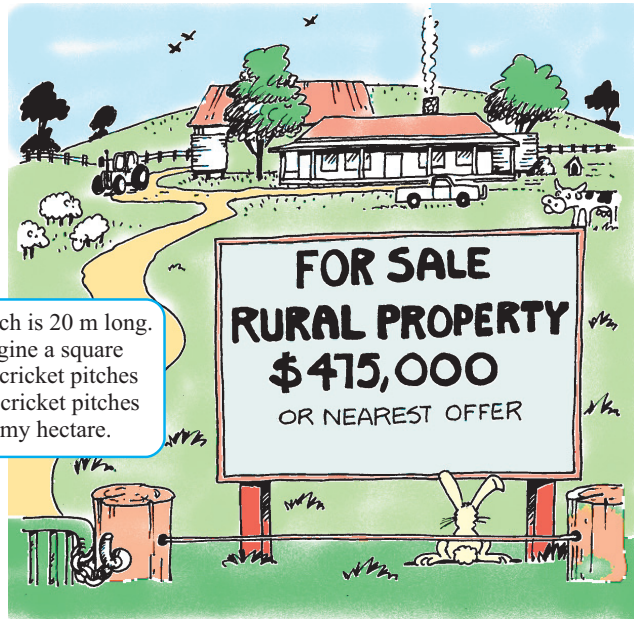
HECTARES

Hectares are used to measure land sizes for small to medium sized properties.

1 **hectare** is the area enclosed by a square which measures 100 m by 100 m. It is actually 10 000 square metres.

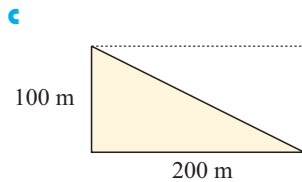
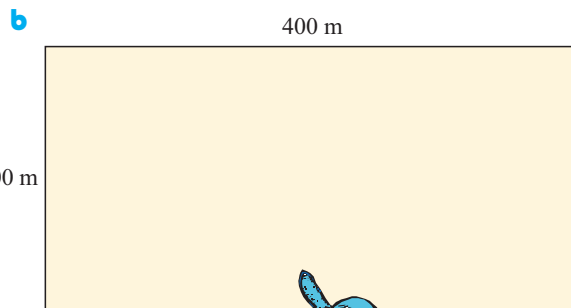
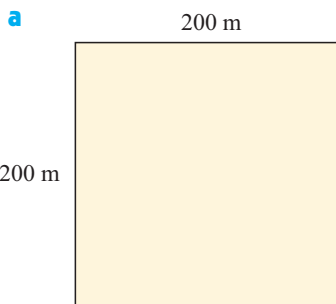
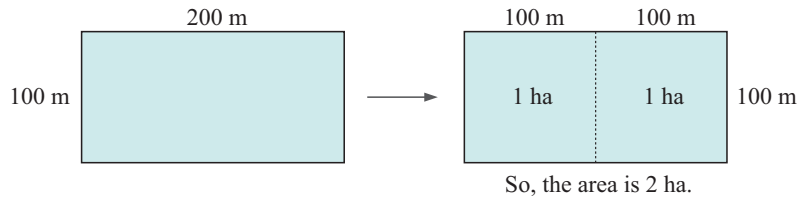


A cricket pitch is 20 m long.
So, I imagine a square which is 5 cricket pitches long and 5 cricket pitches wide as my hectare.



9 Find the number of hectares for these small properties.

Example:



Think about the rectangle first.



10 What units (cm^2 , m^2 , ha) would you use to measure these areas?

a your classroom floor

c a shoe box lid

e a front lawn

g a farm

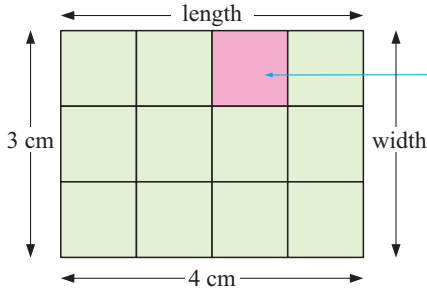
b a basketball court

d the school grounds

f a golf course

h the top face of a match box

AREAS OF RECTANGLES



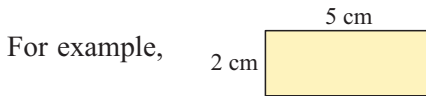
This rectangle is made up of 12 squares which are 1 cm by 1 cm.

So, the rectangle's area is 12 cm^2 .

Each small square is 1 cm^2 in area.

Notice that $3 \times 4 = 12$.

So, we can calculate the area of a rectangle by multiplying its length by its width.



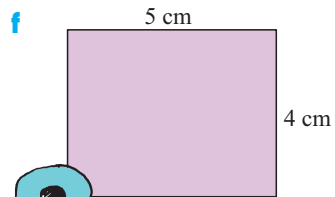
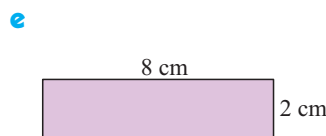
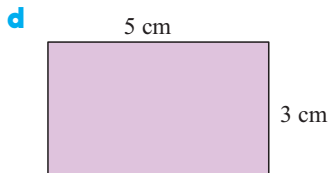
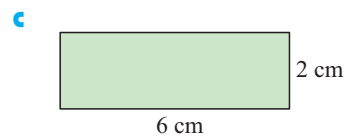
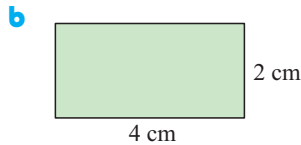
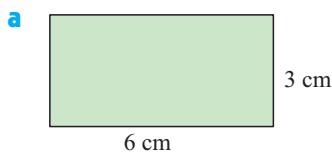
$$\begin{aligned} \text{Area} &= 5 \text{ cm} \times 2 \text{ cm} \\ &= 10 \text{ cm}^2 \end{aligned}$$

Sometimes the word *breadth* is used instead of *width*.



Area of a rectangle = length \times width

11 Find the area of each rectangle (not drawn to exact size).



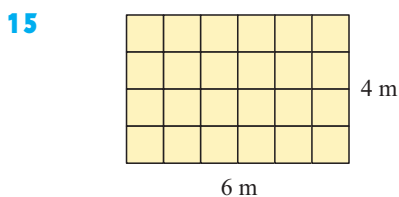
We say that the *dimensions* of a rectangle are length and width.



12 A rectangular garden bed has a length of 8 m and a width of 4 m. What is the area of the bed?

13 The floor of the classroom is a 9 m long by 7 m wide rectangle. What is its area?

14 A wall is 10 m long and has an area of 30 m^2 . How high is the wall?



This floor sketch shows an area of 24 m^2 .

Find all other floor shapes when the length and the width are whole numbers and the area is always 24 m^2 .

Hint: Find the factors of 24.

ACTIVITY

AREA ESTIMATION



You will need: a postage stamp, a book, a desk top, a classroom wall

What to do:

- 1 Estimate the area of each object. Copy the table below and write your estimates in the first column. Do not forget the units.

Object	Estimate of area	Actual length	Actual width	Area = length × width
postage stamp				
book				
desk top				
wall				

- 2 Measure the length and width of each object. Record them in the table.
- 3 Calculate the area using $\text{area} = \text{length} \times \text{width}$. Write the areas in the last column.
- 4 Compare the area calculated with your estimate. How accurate were your estimates?

E

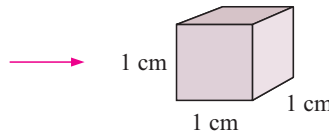
VOLUME

The **volume** of an object is the amount of space it occupies.

Volume is measured in **cubic units**.

This is a cubic centimetre.

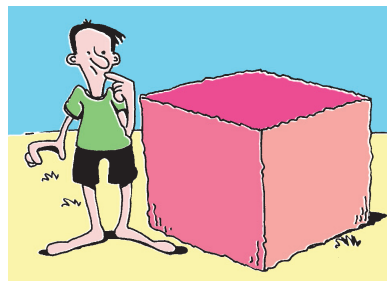
1 cubic cm is written as 1 cm^3 .



cm^3 or cc is short for cubic centimetre

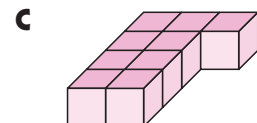
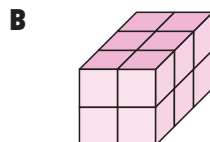
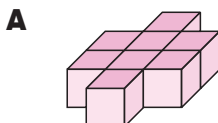
A cubic metre would be 1 m by 1 m by 1 m.

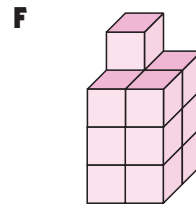
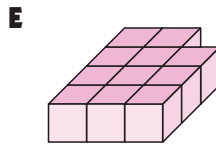
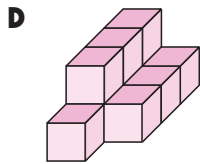
1 cubic metre is written as 1 m^3 .



EXERCISE 9E

- 1 Use MA blocks or centicubes to build these models. All blocks are centimetre cubes.





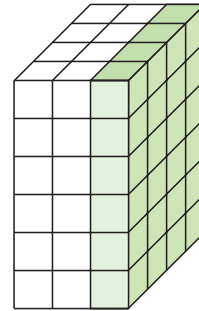
- a** Write down the volume of each model (in cm^3).
- b** List the models in order from smallest to largest volume.

2 Copy and complete

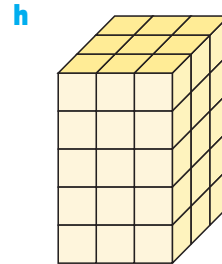
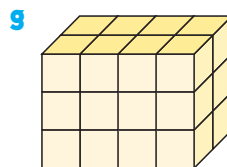
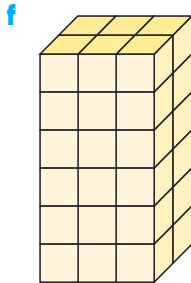
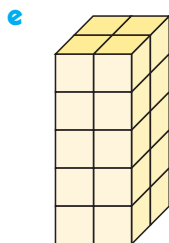
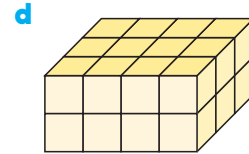
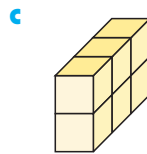
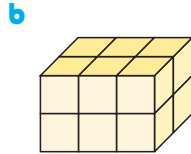
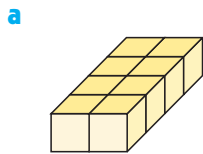
- a** cm^3 is short for
- b** cc is short for

3 Look at this model.

- a** How many cubes are in each flat layer?
- b** How many layers are there?
- c** How can the number of cubes making up the whole block be found using **a** and **b**?
- d** How many cubes are there in the shaded column?
- e** How many columns make up the model?
- f** Use your answers from **d** and **e** to find the number of cubes in this model.



4 If each little cube is 1 cm by 1 cm by 1 cm, find the volume of these models.



5 Which of the models in question 4 has the greatest volume?

6 When Daniel was asked to draw *all* the different box shaped solids with a volume of 12 cm^3 , made from cubes, he did not draw them straight away.

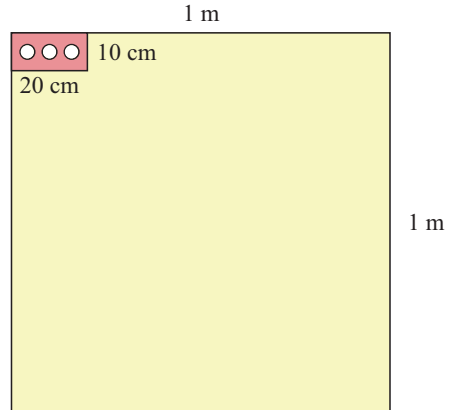
Instead he wrote:

$1 \times 1 \times 12$	}	and said, "There are 4 of them".
$1 \times 2 \times 6$		
$1 \times 3 \times 4$		
$2 \times 2 \times 3$		

- a** Draw Daniel's four boxes of volume 12 cm^3 .
- b** Use Daniel's method to find all the boxes made from 24 cubes with a volume of 24 cm^3 .

7 Suppose house bricks are 20 cm long and 10 cm wide by 5 cm deep.

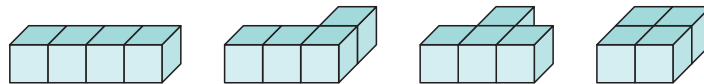
- a How many bricks could be laid out as shown on a square metre base?
- b How many layers of bricks would be used to build a cubic metre of bricks?
- c How many bricks would make up one cubic metre?



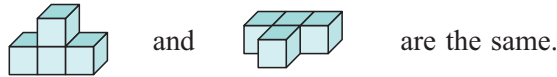
8 Click on the blockbuster icon to obtain a program that enables you to build with cubes, or use blocks.



- a Build these solids using 4 cubes.



- b Can you find any other solids that can be built with 4 blocks? You can only count each arrangement once. For example



- c Find how many different arrangements you can build with 5 cubes.

F

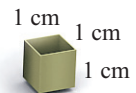
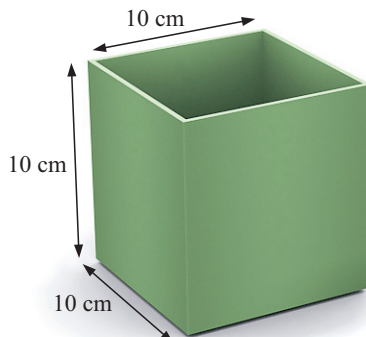
CAPACITY

The **capacity** of a container is the amount it can hold.

We measure capacity in **litres**, **millilitres**, **kilolitres**, etc.

One litre (L) of water can take many shapes in different containers.

A litre will fill a 10 cm by 10 cm by 10 cm box to the top.



A **millilitre (mL)** is $\frac{1}{1000}$ of a litre.

A 1 cm by 1 cm by 1 cm cube filled to the top will hold 1 millilitre.



THINGS TO REMEMBER

1 litre (L) = 1000 mL
 1 kilolitre (kL) = 1000 L
 1 cm³ = 1 mL

EXERCISE 9F

1 Copy and complete

- a 1000 mL = L b 5000 mL = L c 8000 mL = L

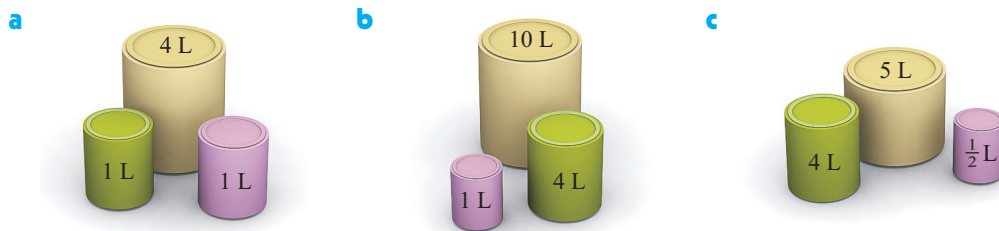
2 Copy and complete

- a 2 L = mL b 4 L = mL c 9 L = mL

3 Say whether these containers would usually have *more* than a litre or *less* than a litre.

- a a tea cup b a garden bucket c a bath
 d a medicine glass e a swimming pool f an icecream cone

4 What is the total capacity of these paint cans?



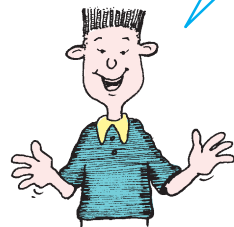
5 What is the total capacity of these containers?



6 One proper measuring cup contains $\frac{1}{4}$ of a litre ($\frac{1}{4}$ L).

- a How many cups make one litre?
 b Find the number of cups for
 i 3 litres ii 7 litres iii $\frac{1}{2}$ L

Water, paint, petrol, shampoo and cough medicine are all **liquids**.
 (at room temperature)



7 Would you measure these in millilitres, litres or kilolitres?

- a water in a bucket b paint in a can
 c water in a swimming pool d petrol in a car's tank
 e cough medicine f icecream in a container
 g water in a reservoir h shampoo in a bottle

8 $1250 \text{ mL} = 1000 \text{ mL} + 250 \text{ mL}$
 $= 1 \text{ L} + \frac{1}{4} \text{ L}$
 $= 1\frac{1}{4} \text{ L}$ Remember: $100 \text{ mL} = 1 \text{ L}$

Use the method given to convert these to litres.

- a** 1500 mL **b** 2250 mL **c** 3750 mL **d** 7250 mL

9 Write as litres using a decimal point.

- a** $1\frac{1}{2} \text{ L}$ **b** $2\frac{1}{4} \text{ L}$ **c** $\frac{1}{4} \text{ L}$ **d** $1\frac{3}{4} \text{ L}$

10 A



50 mL

B



C

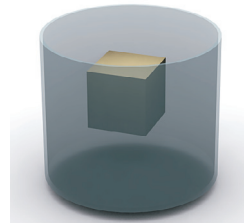


Which of the measuring devices shown above should be used to measure the capacity of

- | | |
|-----------------------------|---------------------------------|
| a a household bucket | b a can of drink |
| c a soup can | d a wine bottle |
| e a rubbish bin | f a petrol tank in a car |
| g a large paint can | h a wading pool |

If a solid cube with volume 1 cm^3 was dropped into a *full* container of water, the amount of water that overflowed would be 1 millilitre.

We say that 1 mL of water was *displaced*, or the *displacement* was 1 mL.

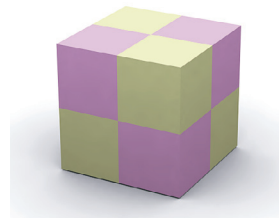


11 How much water would these objects displace? (Each small cube is 1 cm^3 .)

a



b



CONVERSION OF UNITS OF CAPACITY

$1 \text{ L} = 1000 \text{ mL}$
 $\times 1000$
 $\text{L} \xrightarrow{\times 1000} \text{mL}$
 $\div 1000$

To change **litres to millilitres** we *multiply* by 1000.

To change **millilitres to litres** we *divide* by 1000.

Examples:

• 2.5 L $= 2.500 \times 1000 \text{ mL}$ $= 2500 \text{ mL}$	• 800 mL $= 800. \div 1000 \text{ L}$ $= 0.8 \text{ L}$
--	---

12 Copy and complete

- a** 2 L = mL **b** 3.5 L = mL **c** 1.2 L = mL
d 0.5 L = L **e** 0.2 L = mL **f** 0.1 L = mL

13 Copy and complete

- a** 5000 mL = L **b** 8000 mL = L **c** 1200 mL = L
d 2500 mL = L **e** 500 mL = L **f** 375 mL = L

14 Write as litres by using a decimal point.

- a** 1500 mL **b** 2400 mL **c** 125 mL

15 Which capacity is the same as 5 L?

- A** 500 mL **B** 5000 mL **C** 50 mL

16 Which measurements have the same capacity as 50 mL?

- A** 0.5 L **B** 50 cm³ **C** 0.05 L

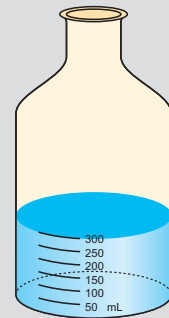
ACTIVITY MAKE YOUR OWN CONTAINER TO MEASURE CAPACITY



You will need: a clear plastic bottle, a marking pen with a fine line, a 50 mL medicine cup measure.

What to do:

- 1 Properly clean the plastic bottle and remove any paper labels.
- 2 Fill the medicine cup to 50 mL with water and pour it into the bottle. Mark the water level and write 50 mL by it. Repeat this process over and over again until you have markings right to the top.
- 3 Use your measuring device to check the capacity of several containers including cans, bottles, jugs, jars, lunch boxes and buckets.
- 4 Copy then complete this table.



<i>Container</i>	<i>Estimate of capacity</i>	<i>Measured capacity</i>

5



Peta's measuring jug looked like this. Her teacher was angry and said that Peta did not follow the instructions. How did Peta's teacher know this?

G

MASS

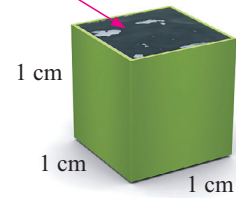
THE GRAM

One **gram** is how heavy a 1 cm by 1 cm by 1 cm cube of water would be.

We use **g** as the short way of writing grams.

We measure small masses using grams.

water inside container

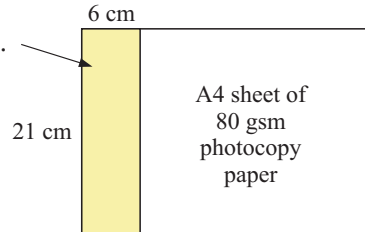


GOOD ESTIMATES OF ONE GRAM

- the mass of one paper clip



- cut this off and crumple it into your hand. This mass is extremely close to one gram.



THE KILOGRAM

One **kilogram** is the mass of one litre of water.



We use **kg** as the short way of writing kilograms.

We measure the mass of lots of everyday items using kilograms.

Some examples are: a bag of apples, a parcel at the Post Office and our own mass.

We have a better idea of how heavy a kilogram is compared with a gram because we handle bigger masses more often than smaller ones.

GOOD ESTIMATE OF A KILOGRAM

Hold a full one litre carton of milk in your hand.

This weighs slightly more than one kilogram.



THE TONNE

The unit used to measure very heavy masses is the **tonne**. We use **t** as the short way of writing tonnes.

'Kilo' means 'one thousand'.
1 kilogram = 1000 grams



TO REMEMBER

1 kilogram = 1000 grams

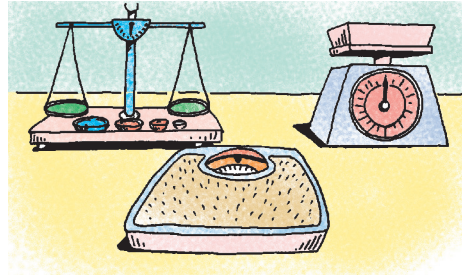
1 tonne = 1000 kilograms

MASS MEASURING DEVICES

Three mass measuring devices or instruments are shown alongside.

Modern chemical balances are electronic with digital displays.

They are very accurate to small parts of a gram.



DISCUSSION



- What measuring devices are used in the community?
- Who uses them?
- Why are they necessary?

ACTIVITY

MASS ESTIMATION



You will need: an exercise book, a pencil, a text book, a ruler, a block of wood, a house brick, kitchen scales, bathroom scales

What to do:

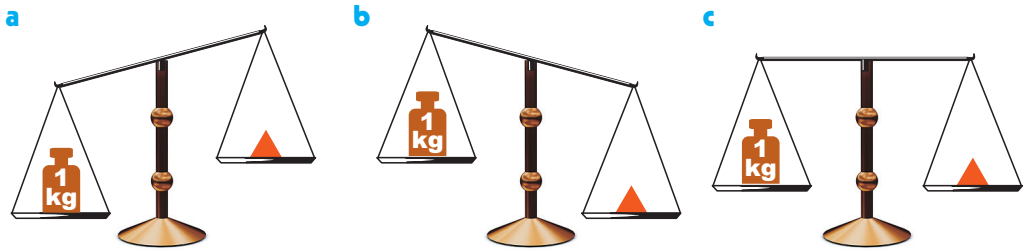
- 1 Copy the table below. Estimate the mass of each object and write it in the first column. Do not forget the units of measurement.

<i>Object</i>	<i>Estimate</i>	<i>Mass</i>
exercise book		
pencil		
text book		
⋮		
yourself		

- 2 Which set of scales is used for heavier masses? How can you tell this by looking at the markings on the scales? These markings are called calibrations.
- 3 Weigh each of the objects and record your result in the "Mass" column. Choose sensible units.
- 4 Compare your estimates with the actual masses. How accurate were your estimates?

EXERCISE 9G

1 Is the item being weighed heavier or lighter or equal to a kilogram?



2 Which of these would be *heavier* than one kilogram?

- a a motor car
- b an apple
- c a tea cup
- d a large cat
- e a green pea
- f this book

Remember
1 kg = 1000 g.



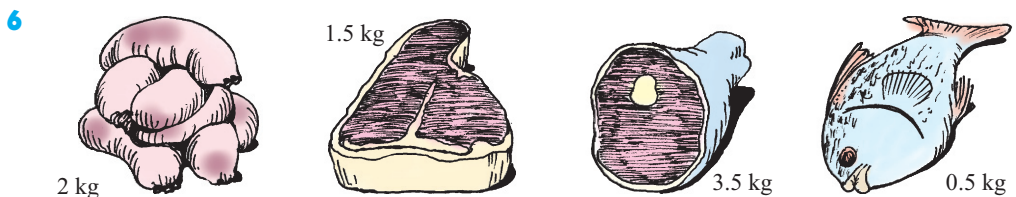
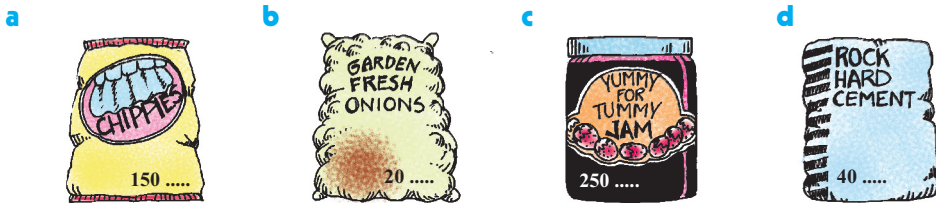
3 How many kilograms are there in

- a 1000 g
- b 2000 g
- c 4000 g
- d 8000 g
- e 500 g
- f 1500 g
- g 3500 g
- h 250 g

4 How many grams are there in

- a 3 kg
- b $\frac{1}{2}$ kg
- c $2\frac{1}{2}$ kg
- d $1\frac{1}{4}$ kg

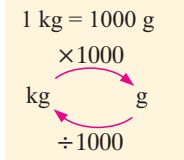
5 These items have the units left off. Write them down as grams (g) or kilograms (kg).



What mass is carried home if you buy

- a sausages and steak
- b steak and fish
- c lamb and sausages
- d steak and lamb
- e all of the items of meat drawn

CONVERSION OF UNITS OF MASS



To change **kilograms to grams** we *multiply* by 1000.
To change **grams to kilograms** we *divide* by 1000.

Examples:

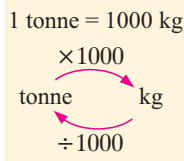
- $4.5 \text{ kg} = 4.5 \times 1000 \text{ g} = 4500 \text{ g}$
- $1600 \text{ g} = 1600 \div 1000 \text{ kg} = 1.6 \text{ kg}$

7 Copy and complete

- a** 2.4 kg = g **b** 5.5 kg = g **c** 0.6 kg = g
d 0.375 kg = g **e** 0.1 kg = g **f** 0.05 kg = g

8 Copy and complete

- a** 2000 g = kg **b** 5000 g = kg **c** 1500 g = kg
d 500 g = kg **e** 250 g = kg **f** 750 g = kg



To change **tonnes to kilograms** we *multiply* by 1000.
To change **kilograms to tonnes** we *divide* by 1000.

Examples:

- $4.6 \text{ t} = 4.6 \times 1000 \text{ kg} = 4600 \text{ kg}$
- $750 \text{ kg} = 750 \div 1000 \text{ t} = 0.75 \text{ t}$

9 Copy and complete

- a** 5 t = kg **b** 9.8 t = kg **c** 10.2 t = kg
d 0.5 t = kg **e** 0.8 t = kg **f** 0.36 t = kg

10 Copy and complete

- a** 5000 kg = t **b** 4300 kg = t **c** 7060 kg = t
d 800 kg = t **e** 200 kg = t **f** 120 kg = t

11 Which is lightest?

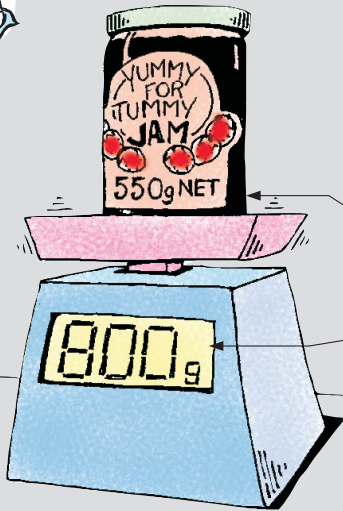
- A** 5000 g **B** 50 kg **C** 0.5 t

12 Which is heaviest?

- A** 0.12 t **B** 1200 kg **C** 120 000 g

ACTIVITY

NET MASS



Net mass is the mass of contents and not the container.
Gross mass is the mass of contents and container.



- The jam weighs 550 g.
- The **net** mass is 550 g.
- The jam and the jar together weigh 800 g.
- The **gross** mass is 800 g.
- The weight of the jar (and lid) is 250 g.

What to do:

- 1 Collect some food items which are packed in cardboard, plastic and glass. Find the net weight stated on the container. Weigh the full container and record the gross mass.
- 2 Record your observations in a table which has columns like this.

<i>Item</i>	<i>Net mass</i>	<i>Gross mass</i>	<i>Mass of container</i>

- 3 Discuss why food packages have net masses printed on them.

DISCUSSION

HOW DO YOU MEASURE?



Discuss what tools or devices would be best to measure

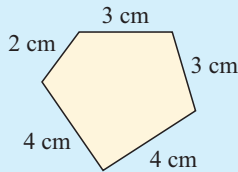
- distance
- angles
- depth
- medicine
- rainfall
- time
- mass
- age
- price
- capacity
- temperature
- heat
- sausages
- seconds
- air
- volume
- carpet
- area
- height
- circumference

MENTAL SET 9A

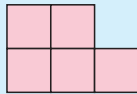
- 1 What units would you use to measure the height of a tall building?
- 2 What units would you use to measure the capacity of your bath?

3 $4\text{ m} = \dots\dots\text{ cm}$

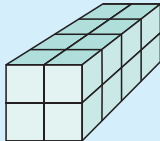
- 4 Find the perimeter of this shape.



- 5 Find the area of this shape if each block is 1 cm by 1 cm.



- 6 If each little cube is 1 cm by 1 cm by 1 cm, find the volume of this model.



7 $55\text{ cc} = \dots\dots\text{ mL}$

8 $500\text{ g} = \dots\dots\text{ kg}$

9 $2\frac{1}{2}\text{ litres} = \dots\dots\text{ mL}$

- 10 Which is longer, 8000 m or 0.8 km?

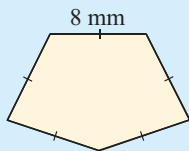
MENTAL SET 9B

- 1 What units would you use to measure the area of your hand print?
- 2 What units would you use to measure the mass of a pencil?

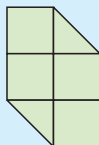
3 $3\text{ m} = \dots\dots\text{ mm}$

4 $5\text{ km} = \dots\dots\text{ m}$

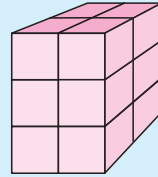
- 5 Find the perimeter of this shape.



- 6 If each square is 1 cm by 1 cm, find the area of this shape.



- 7 If each little cube is 1 cm by 1 cm by 1 cm, find the volume of this model.



8 $2\text{ L} = \dots\dots\text{ mL}$

9 $3\text{ kg} = \dots\dots\text{ g}$

- 10 Write 250 cm as metres.

MENTAL SET 9C

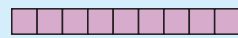
1 $8\text{ cm } 3\text{ mm} = \dots\dots\text{ mm}$

- 2 Which shape has the longer perimeter?

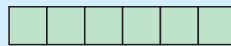
A



B



- 3 Draw another rectangle with the same area as this one.

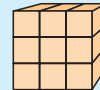


- 4 Which has the greater volume?

A

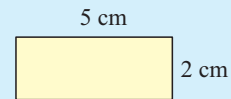


B



5 $2500\text{ mL} = \dots\dots\text{ L}$

- 6 Find the area of this rectangle.



7 Write 3.5 L as mL.

8 $4\text{ t} = \dots\dots\text{ kg}$

9 $7\text{ cm}^3 = \dots\dots\text{ mL}$

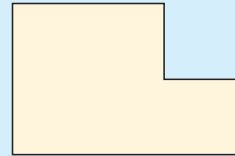
10 $3\frac{1}{2}\text{ kg} = \dots\dots\text{ g}$


REVIEW EXERCISE 9A

- 1 What units would you use to measure
- the distance across Australia
 - the mass of your suitcase when it is fully packed
 - the capacity of a teaspoon
 - the area of a postage stamp

- 2 a Write 57 mm as cm mm.
 b Write 200 cm as **i** mm **ii** m

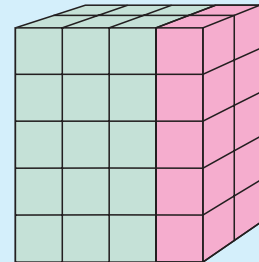
- 3 a Use your ruler to measure this shape in cm, and then find the perimeter.
 b Divide the shape into 1 cm squares to find its area.



- 4  100 m
 300 m

Find the number of hectares for this property.

- 5 For this model:
- How many cubes in each flat layer?
 - How many layers are there?
 - How many cubes are there in the whole model?
 - How many cubes are in the pink shaded column?
 - How many columns like the pink shaded column make up the model?



- 6 Copy and complete
- $3 \text{ L} = \dots \text{ mL}$
 - $1 \text{ cc} = \dots \text{ mL}$
 - $250 \text{ mL} = \dots \text{ L}$
- 7 A measuring cup holds a quarter of a litre. How many cups in 2 litres?
- 8 Would these items weigh *more* or *less* than 1 kilogram?
- a dozen eggs
 - a can of soft drink
 - 2 L of milk
- 9 Copy and complete
- $1.5 \text{ kg} = \dots \text{ g}$
 - $500 \text{ m} = \dots \text{ km}$
- 10 Chris is 1 m 45 cm tall and Boris is 1.39 metres tall. How much taller than Boris is Chris?

REVIEW EXERCISE 9B

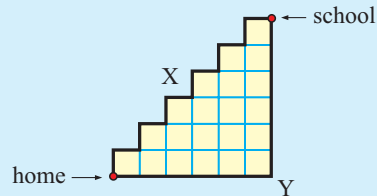
- 1 What units would you use to measure
- a the mass of a bag of flour
 - b the area of your bedroom walls
 - c the capacity of a goldfish bowl
 - d the capacity of an eyedropper

2 Copy and complete

a $1\frac{1}{2}$ km = m

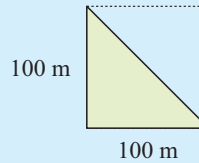
b 107 mm = cm mm

3 Wally can run from home to school by two paths. He can either go along the street to Y then from Y to school, or he can turn at every street corner (path X). Which way is shorter?

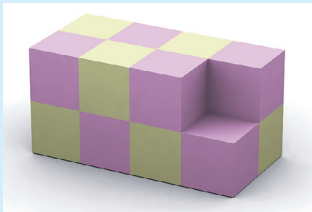


- 4 a Draw **i** a square **ii** a rectangle with an area of 4 cm².
 b Find the perimeter of each.

5 Find the area in hectares of the shaded region.



6



If each cube is 1 m by 1 m by 1 m, find the volume of the model shown.

7 Copy and complete

a 630 cm = m

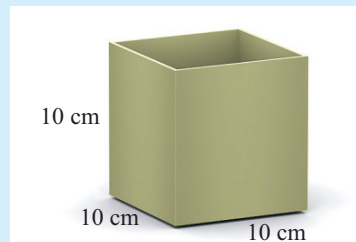
b 0.5 L = mL

8 Anna has 2 bags of apples. One weighs 2.25 kg and the other weighs 980 g. Find the difference in weight between the two bags.

9 Which two masses are the same?

- A** 0.8 t **B** 80 000 g **C** 800 kg

10 Find the capacity of this container in litres.

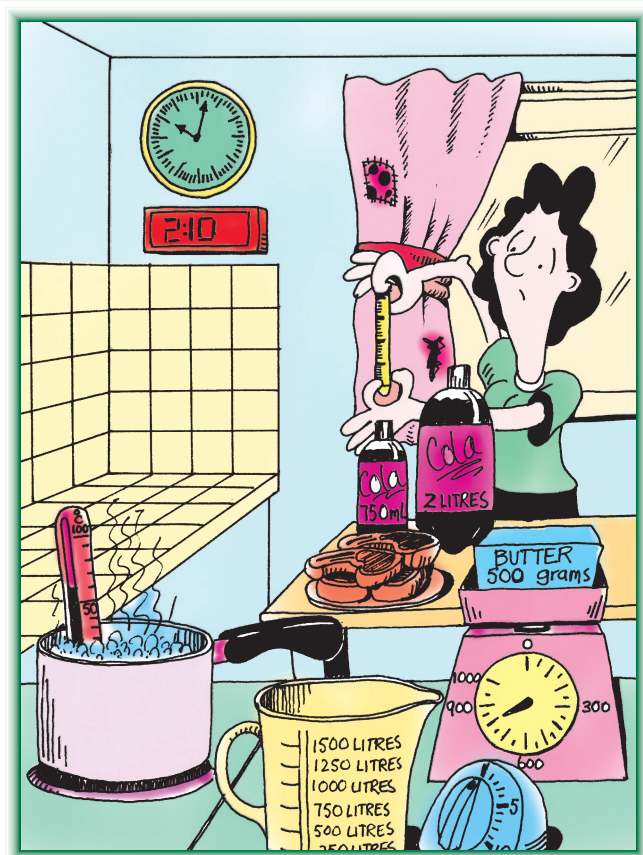


Chapter 10

Time and temperature

In this chapter you should learn to:

- ✓ tell the time with analogue and digital clocks and watches
- ✓ use a.m. and p.m.
- ✓ use time zones
- ✓ convert between units of time
- ✓ estimate time
- ✓ use a calendar
- ✓ use a time table
- ✓ use 24 hour time
- ✓ solve problems involving time
- ✓ read a thermometer



A

TELLING THE TIME

The most common units for measuring time are years, months, weeks, days, hours, minutes and seconds.

WEEKS AND YEARS

1 week = 7 days

1 year = 12 months
= 52 weeks
= 365 days (or 366 in a leap year)

1 **decade** = 10 years

1 **century** = 100 years

1 **millennium** = 1000 years

DAYS, HOURS, MINUTES AND SECONDS

A full **day** is divided into 24 equal parts called **hours**.

Each hour is split into equal smaller time intervals called **minutes**.

There are 60 minutes in each hour.

Each minute is then split into 60 equal time intervals called **seconds**.

So,

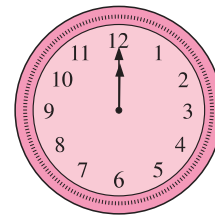
1 day = 24 hours
1 hour = 60 minutes
1 minute = 60 seconds

In darkness, if both hands point to the 12 it is midnight.

In daylight, if both hands point to the 12 it is noon.

Clocks and watches are used to measure the time of the day from **midnight** or **midday** (noon).

'h' means hours,
'min' means minutes



ANALOGUE TIME

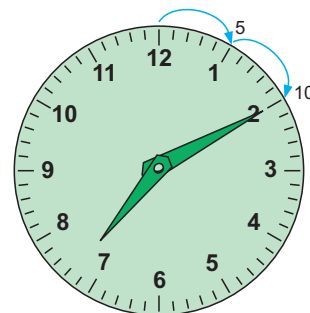
Analogue clocks and watches have faces like this.

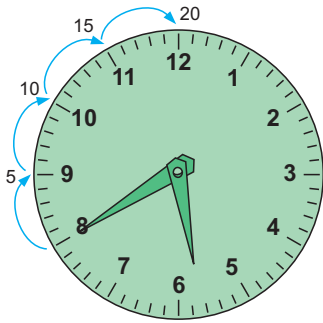
The hour hand is just after the 7 and is turning towards the 8.

The minute hand is showing 10 minutes.

So, the time is 10 minutes **past** 7 o'clock
or simply 10 past 7.

This is **analogue time**.



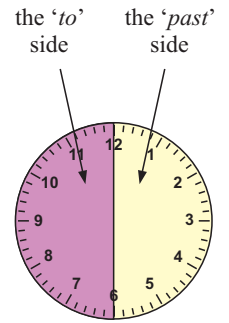


This clock shows that the minute hand must move 20 minutes to reach the 12.

The hour hand is approaching 6.

So, the time is

20 minutes **to** 6 o'clock or
20 to 6.



EXERCISE 10A

1 Write these times as analogue ('past' or 'to' times).

a



b



c



d



e



f



g



h



i



j



k



l



m



n



o



p



2 What is the time 2 minutes after

- a 10 past 7
- b 20 past 8
- c 25 past 2
- d 5 past 9

3 What is the time 3 minutes after

- a 15 to 11
- b 5 to 3
- c 25 to 12
- d 10 to 8

Looking at a clock face will help.



4 Find the time 5 minutes before

- a 20 past 11 b 10 to 9 c 15 past 12 d 25 to 7

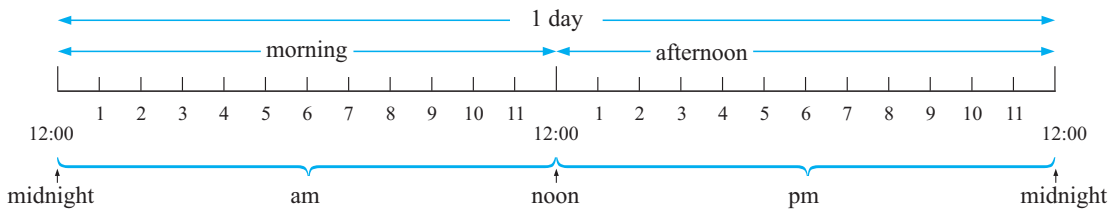
a.m. AND p.m.

a.m. stands for *ante meridiem* which means ‘before the middle of the day’.

p.m. stands for *post meridiem* which means ‘after the middle of the day’.

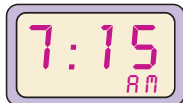
am or a.m. times are between midnight and midday. This is in the **morning**.
 pm or p.m. times are between midday and midnight. This is in the **afternoon** or **evening**.

We can see this easily on a **time line**.



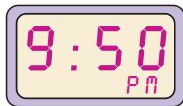
DIGITAL TIME

Digital time is often used, for example, on clocks without hands.



This clock reads 7:15 am.

7:15 am means 15 minutes past 7 in the morning.



This clock reads 9:50 pm.

9:50 pm means 50 minutes past 9 in the evening.

9:50 is the same as 10 minutes to 10.

5 Write the *morning* times shown in

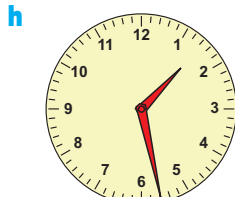
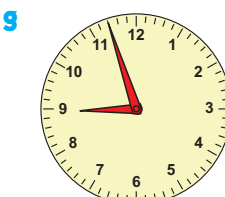
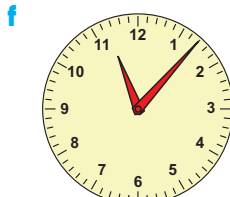
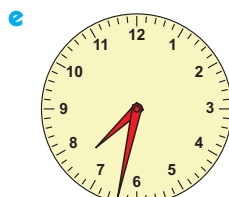
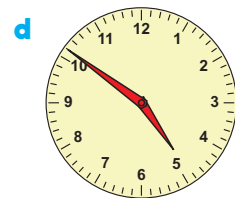
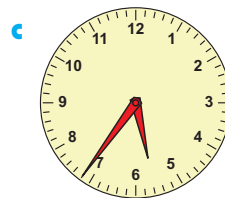
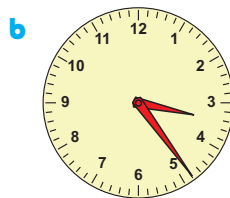
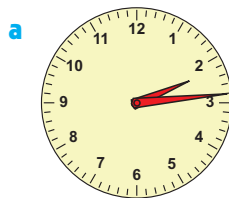
- i analogue form
- ii digital form

For example,

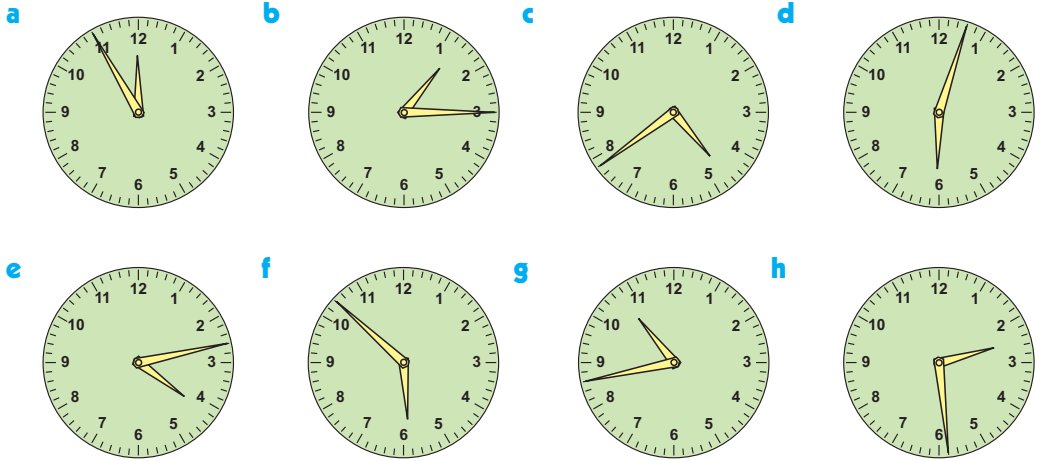


i 22 past 3
in the morning

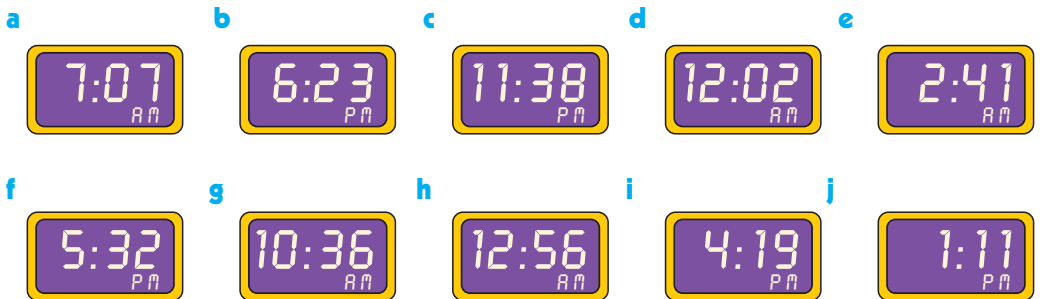
ii 3:22 am



6 Write these *afternoon* times in **i** analogue form **ii** digital form



7 Write these digital times as analogue times then record them on clockfaces. Click on the icon to print a page of clock faces.



8 Write these times as digital times using am or pm. For example, a quarter to 3 in the afternoon is 2:45 pm.

- | | |
|---|--------------------------------------|
| a 8 o'clock in the morning | b 9 o'clock at night |
| c 10 past 6 in the morning | d half past 7 in the evening |
| e 25 minutes to 1 in the morning | f quarter to 12 at lunch time |
| g quarter past 12 at lunch time | h 5 minutes past midnight |

9 What time is it

- a** one hour after 3:24 am
- b** two hours after 4:27 pm
- c** two hours after 11:02 am
- d** three hours after 6:38 pm
- e** four hours after 9:32 am
- f** 5 hours after 7:15 pm

You may need to use a day time line to help you with these.



- 10** To find the difference between 10:30 am and 1:24 pm on Saturday, we notice that
- from 10:30 am to 11 am is 30 minutes,
 - from 11 am to 1 pm is 2 hours and
 - from 1 pm to 1:24 pm is 24 minutes.

So the time difference is 2 hours 54 minutes.

Find the time difference between

- a** 8:00 am Wednesday and 11:00 am Wednesday
- b** 11:00 am Thursday and 2:30 pm Thursday
- c** 2:30 am Friday and 4:30 pm Friday
- d** 8:00 pm Saturday and 3:00 am Sunday
- e** 9:30 pm Sunday and 4:00 am Monday
- f** 8:40 am Monday and 3:20 pm Monday
- g** 4:35 am Wednesday and 12:21 pm Wednesday
- h** 3:20 pm Monday and 1:00 am Wednesday
- i** 11:17 am Friday and 12:49 pm Friday.

ACTIVITY

HOW FAST ARE YOU?



You will need: A watch with a second hand, or a stop watch, a netball, an athletics measuring tape.

What to do: Work with a classmate to complete these activities.

- Estimate the time which you think you might take in seconds.
- Get your classmate to time you using the second hand of a wristwatch.

- 1** How long does it take you to write down the numbers from 1 to 30?
- 2** How long does it take you to count from 1 to 100 aloud?
- 3** How long does it take you to bounce a netball 20 times?
- 4** How long does it take you to run 100 m?



Copy and complete a table like this.

	<i>Task</i>	<i>Estimate</i>	<i>Measured Time</i>
a	Write the numbers 1 to 30	.... seconds	.... seconds
b	Count the numbers 1 to 100		
c	Bounce a netball 20 times		
d	Run 100 metres		
	⋮		

INVESTIGATION

TIME ZONES

**Australia**

Australia is a big country. It has three different time zones. These zones are shown on the map.



When it is 12 noon in Melbourne it is 11.30 am in Adelaide and 10.00 am in Perth.

- 1 What is the time in Melbourne when it is 6 pm in Adelaide?
- 2 What is the time in Sydney when it is 11 pm in Perth?
- 3 What is the time in Kalgoorlie when it is 1 am in Brisbane?

The World

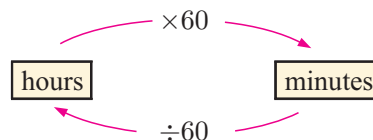
Use the internet to find out about World Time Zones. Try <http://www.worldtimezone.com/> or <http://timeanddate.com>

- 4 Choose five cities from around the world and record their times when it is midday Central Standard Time in Australia.

B**CONVERSION OF UNITS**

To convert **hours to minutes** we **multiply** by 60.

To convert **minutes to hours** we **divide** by 60.



EXERCISE 10B

- 1** Would you use hours, minutes or seconds when talking about
- | | |
|--|--|
| a the time to eat lunch | b the time to write your name |
| c the time to paint the walls of a room | d the time to play a game of tennis |
| e the time to walk 25 km | f the time to tie one shoelace |
| g the time to read the time | |
- 2** Convert to minutes. For example, 1 h 15 min = 60 min + 15 min = 75 min.
- | | | | |
|---------------------|---------------------|--------------------|---------------------|
| a 2 h | b 3 h | c 8 h | d 1 h 30 min |
| e 2 h 17 min | f 2 h 57 min | g 3 h 1 min | h 5 h 32 min |
- 3** Convert to hours.
- | | | | |
|-----------------|------------------|------------------|------------------|
| a 60 min | b 120 min | c 240 min | d 540 min |
|-----------------|------------------|------------------|------------------|
- 4** $143 \text{ min} = 60 \text{ min} + 60 \text{ min} + 23 \text{ min}$
 $= 2 \text{ h } 23 \text{ min}$
- Use this method to convert to hours and minutes.
- | | | | | |
|-----------------|------------------|------------------|------------------|------------------|
| a 72 min | b 124 min | c 217 min | d 286 min | e 607 min |
|-----------------|------------------|------------------|------------------|------------------|
- 5** Copy and complete:
- a** $\frac{1}{2}$ of an hour is $60 \text{ min} \div 2 = \dots \text{ min}$
- b** $\frac{1}{4}$ of an hour is $60 \text{ min} \div \dots = \dots \text{ min}$
- c** $\frac{3}{4}$ of an hour is $3 \times \frac{1}{4} \text{ hr} = \dots \text{ min}$.

ACTIVITY**ESTIMATING TIME**

You will need: A watch with a second hand, or a stop watch, a novel, and a piece of fruit such as an apple.

What to do: Work with a classmate to complete these activities.

- Estimate the time which you think you might take in minutes and seconds.
- Get your classmate to time you.

- 1 How long does it take you to eat an apple?
- 2 How long does it take you to read one complete page of a novel?
- 3 Choose an activity for yourself. Copy and complete a table like this.

	<i>Task</i>	<i>Estimate</i>	<i>Measured Time</i>
a	Eat an apple	... min ... sec	... min ... sec
b	Read a page		
c			
	⋮		

C USING A CALENDAR

Why do you need a calendar?

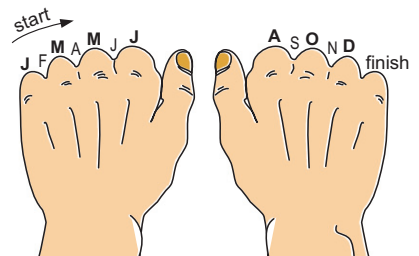
- A calendar has many uses.
- It tells you the date.
 - You can look at the calendar to find what day of the week your birthday will be, or what day Christmas day will fall on.
 - You can mark on it important dates like school holidays, parties, football competitions, ballet performances, music examinations and a reminder to worm your dog.

The calendar shows every day in the year. Usually there are 365 days in a year. Every fourth year is a **leap** year which has 366 days. The extra day is added on to February. So in a leap year February has 29 days.

2005																														
January							February							March							April									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
						1			1	2	3	4	5			1	2	3	4	5						1	2			
2	3	4	5	6	7	8	6	7	8	9	10	11	12	6	7	8	9	10	11	12	3	4	5	6	7	8	9			
9	10	11	12	13	14	15	13	14	15	16	17	18	19	13	14	15	16	17	18	19	10	11	12	13	14	15	16			
16	17	18	19	20	21	22	20	21	22	23	24	25	26	20	21	22	23	24	25	26	17	18	19	20	21	22	23			
23	24	25	26	27	28	29	27	28	27	28	29	30	31	27	28	29	30	31	24	25	26	27	28	29	30					
30	31																													
May							June							July							August									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
1	2	3	4	5	6	7				1	2	3	4					1	2			1	2	3	4	5	6			
8	9	10	11	12	13	14	5	6	7	8	9	10	11	3	4	5	6	7	8	9	7	8	9	10	11	12	13			
15	16	17	18	19	20	21	12	13	14	15	16	17	18	10	11	12	13	14	15	16	14	15	16	17	18	19	20			
22	23	24	25	26	27	28	19	20	21	22	23	24	25	17	18	19	20	21	22	23	21	22	23	24	25	26	27			
29	30	31	26	27	28	29	30	24	25	26	27	28	29	30	31	28	29	30	31											
September							October							November							December									
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S			
						1	2	3						1						1	2	3						1	2	3
4	5	6	7	8	9	10	2	3	4	5	6	7	8	6	7	8	9	10	11	12	4	5	6	7	8	9	10			
11	12	13	14	15	16	17	9	10	11	12	13	14	15	13	14	15	16	17	18	19	11	12	13	14	15	16	17			
18	19	20	21	22	23	24	16	17	18	19	20	21	22	20	21	22	23	24	25	26	18	19	20	21	22	23	24			
25	26	27	28	29	30	23	24	25	26	27	28	29	27	28	29	30	25	26	27	28	29	30	31							
							30	31																						

EXERCISE 10C

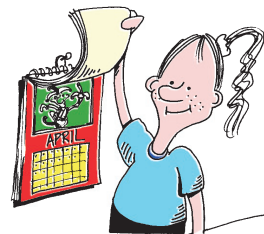
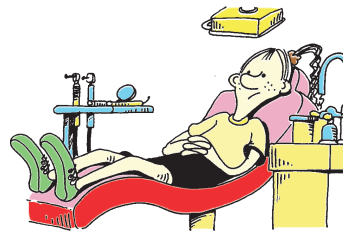
- 1 Look at the calendar above.
 - a How many months are in one year?
 - b Make a list of the months of the year and the number of days in each month.
 - c Is 2005 a leap year? How do you know?
 - d Use the calendar to find
 - i what day of the week is New Year's Day
 - ii what day of the week is Christmas Day
 - iii which months have five weekends
 - iv which months start on the same day of the week



2 Kylie is excited about Christmas and the school holidays.

November 2005							December 2005							January 2006						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
		1	2	3	4	5				1	2	3	1	2	3	4	5	6	7	
6	7	8	9	10	11	12	4	5	6	7	8	9	10	8	9	10	11	12	13	14
13	14	15	16	17	18	19	11	12	13	14	15	16	17	15	16	17	18	19	20	21
20	21	22	23	24	25	26	18	19	20	21	22	23	24	22	23	24	25	26	27	28
27	28	29	30				25	26	27	28	29	30	31	29	30	31				

- a She is looking at her calendar. It is only November 29th. How many days until Christmas day?
- b What day of the week is New Year's Day?
- c School finishes on December 14th. What day of the week is that?
- d The first Sunday in December is her Swimming Club Christmas party. What is the date of the party?
- e Kylie has marked her birthday with a circle. What day and date is her birthday?
- f Kylie is going on holidays to Bali on December 29th. She will be away for two weeks. What date will she return?
- g Kylie has a dental appointment on the third Tuesday in December. She does not want to think about it so she has not marked it on her calendar. What date is it?
- h School starts again on January 30th. How many complete weeks of holidays will Kylie have?
- i Kylie needs to know whether February 18th is on a weekend. Draw a calendar page for February. It will not be a leap year. What day is February 18th?



There are four **seasons** in a year.

They are **summer**, **autumn**, **winter** and **spring**. June, July and August are the winter months.

3 Use the 2005 calendar shown on the previous page to answer these questions.

- a How many days are there in winter?
- b On what day of the week was
 - i the start of winter
 - ii the finish of winter?
- c Write down the
 - i summer months
 - ii autumn months
 - iii spring months

ACTIVITY

MY CALENDAR



Click on the icon to obtain a calendar for a year of your choosing.

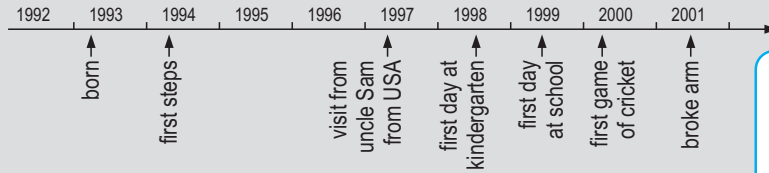


ACTIVITY

TIME LINES



This is Jon's time line for the important occasions in his life so far.



Notice that you could use the time line to give Jon's age at these occasions.

What to do:

- Make a time line for events in one school day of your life.
- or make a time line for important events in your life
- or make a time line for 10 important inventions made by Australians.



- 4 Use the time line shown in the Activity above to answer these questions.
- a In which year did Uncle Sam visit?
 - b How old was Jon when he started school?
 - c How old was Jon when he broke his arm?
 - d How long had Jon been at school when he played his first game of cricket?

D USING TIME TABLES

ACTIVITY



Make up our own timetable.
You could make up a personal daily time table with headings like these.

<i>my day</i>	<i>time</i>
wake up	
get dressed	
have breakfast	
leave home for school	
arrive at school	
⋮	

or

You could make up a timetable for a train, bus or car ride that you do regularly.

For example, your bus ride to school, or a car ride to your grandparent’s house.

You should include times that you pass particular landmarks on the way, as well as your start and finish times. It might look like this:

or

You could plan television programs for a day. Give the name and time of each program, and a short description of its content.

For example: Make up names that are not being used on television for your programs.

Make sure you have a mixture of programs that will be popular with all age groups and their interests.

<i>Home to School</i>	<i>time</i>
leave home	
get to bus stop	
catch bus	
pass Fire Station	
pass Shopping Mall	
pass High School	
⋮	

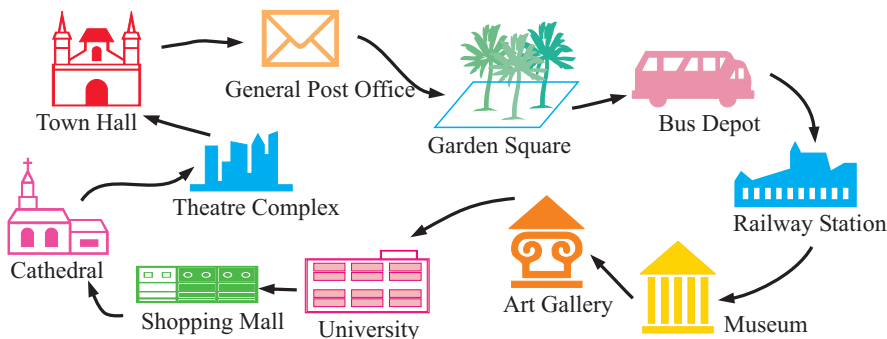
<i>Time</i>	<i>Program</i>	<i>Content</i>
7:30 am	Up to the moment	news
7:40 am	Under the microscope	science

EXERCISE 10D

1 A City Circuit bus departs from (leaves) the Town Hall every 10 minutes. It always follows the same route. Use the timetable given for the 10 am bus to answer the following questions.

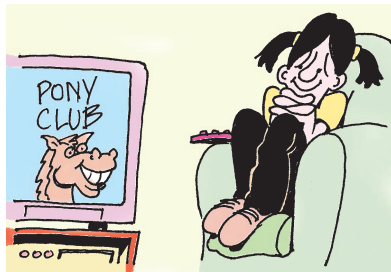
<i>Timetable</i>	
Town Hall	10:00 am
General Post Office	10:03 am
Garden Square	10:05 am
Bus Depot	10:08 am
Railway Station	10:10 am
Museum	10:12 am
Art Gallery	10:14 am
University	10:19 am
Shopping Mall	10:23 am
Cathedral	10:25 am
Theatre Complex	10:27 am
Town Hall	10:30 am

- a How long does it take the bus to complete one circuit (from the Town Hall back to the Town Hall)?
- b Find how long it takes to go from
 - i the Town Hall to the Railway Station
 - ii the Bus Depot to the Shopping Mall
 - iii Garden Square to the Cathedral
- c Write the times that the *next* bus will depart from the
 - i Town Hall
 - ii Museum
- d How many buses (after this one) leave the Town Hall before this bus returns?



- e If Cassie caught the 10:19 am bus from the University, at what time would she arrive at the Bus Depot?
- f Write the timetable for the bus that leaves the Town Hall at 2:20 pm.
- g It was planned to run another City Circuit bus on the same route in the *opposite* direction. Write a timetable for the 10 am bus in the opposite direction.

2 Marie looks at the television program guide shown alongside.



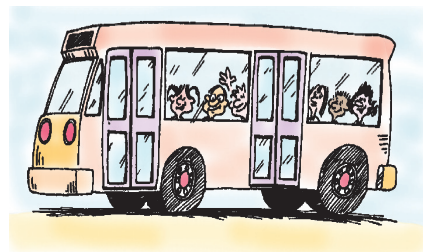
Program	Start time
News	7 am
Days Events	7:15 am
Cartoons for Kids	8 am
The Garden Show	9 am
Sports Roundup	9:30 am
Quiz Kids	10 am
Comedy Hour	11 am
Pets Corner	12 noon

- a How long is the program ‘Days Events’?
- b If Maria wants to watch Sports Roundup, Quiz Kids and Comedy Hour, how many hours of television is that?
- c Maria has to play netball at 8:30 am. She will be back home by 10:20 am.
 - i What program will be playing when she leaves home?
 - ii What program will be playing when she returns?
How much of the program remains?

3

Melbourne	depart	7:30 am
Albury	arrive	11:10 am
	depart	11:50 am
Canberra	arrive	4:05 pm
	depart	4:45 pm
Goulburn	arrive	5:55 pm
	depart	6:25 pm
Sydney	arrive	9:30 pm

The Happy Travellers Bus Service has a regular daily run between the capital cities in Australia.



Use the bus timetable to answer these questions.

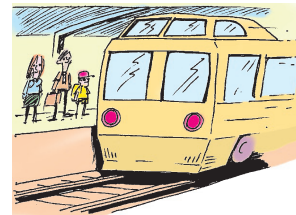
- a Find the time taken to go from
 - i Melbourne to Canberra
 - ii Canberra to Sydney
 - iii Melbourne to Sydney
- b How long did the bus stop in
 - i Albury
 - ii Canberra
 - iii Goulburn
- c
 - i If the bus was 15 minutes early arriving in Canberra, what time did it arrive?
 - ii If the bus was 15 minutes late leaving Goulburn, what time did it depart?

4

TRAIN TIMETABLE								
Days of Operation		Monday to Friday			Saturday		Sunday	
		am	pm	pm	am	pm	am	pm
Wattleton (Main Street)	dep	7:20	1:15	5:50	7:20	5:45		4:40
Blue Hills		7:25		5:55	7:25	5:50		4:45
Timbertop Station	arr	7:37	1:30	6:10	7:35	6:02		4:55
	dep	7:46	1:34	6:15	7:40	6:10		4:59
Gum Flat		7:52		6:22	7:48	6:15		5:05
Kangaroo Bend		8:00		6:30	7:56	6:21		5:12
Acacia Ridge		8:14		6:45	8:10	6:35		5:25
Wombat Gully		8:19		6:50	8:16	6:40		5:30
Ferny Glen		8:30	2:00	7:00	8:25	6:48		5:40

Use the timetable to answer the following questions.

- a How long would it take to travel from Wattleton to Ferny Glen if you caught the following trains?
 - i 7:20 am train on Monday
 - ii 1:15 pm train on Friday
 - iii 4:40 pm train on Sunday
- b Explain why the times in a are different.
- c How long do these trains stop at Timbertop Station?
 - i 5:50 pm train from Wattleton on Thursday
 - ii 5:45 pm train from Wattleton on Saturday
- d On what day(s) and time(s) is the
 - i fastest trip between Timbertop and Wombat Gully
 - ii slowest trip between Blue Hills and Gum Flat
- e Explain why there are entries missing in some columns.



24-HOUR TIME

Travellers often use 24 hour time.

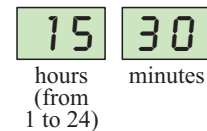
This is written as hours after midnight.

5 am is written as 0500 hours. We say this as ‘Oh 5 hundred’ hours.

Noon is written as 1200 hours. (‘12 hundred hours’)

3 pm is $3 + 12 = 15$ hours after midnight.

So 3 pm is 1500 hours (‘15 hundred hours’) and 3:30 pm is 1530 hours (‘15 30 hours’).



- 5 Write these arrival times as digital times.

Flight times	
From	Arrives at
a Sydney	1210 h
b Newcastle	1315 h
c Perth	1430 h
d Canberra	1535 h

6 Write these times as 24-hour times.

a 4:15 am

b 12:05 pm

c 4:25 pm

d 10:15 pm

e 8:25 am

f 1 am

g 11:40 pm

h 8:30 pm

E

PROBLEM SOLVING

EXERCISE 10E

- Katy goes to the movies. The movie starts at 2 pm and finishes at 4:14 pm. What is the *duration* of the movie?
- The 1:23 pm bus is 9 minutes late. At what time does it arrive?
- Justin catches the train at 11:48 am and travels for 1 hour 13 minutes before he gets off. What is the time when he leaves the train?
- Morning lessons start at 8:50 am and lunch break is at 12:35 pm. How much time *elapses* (passes) between the start and finish of morning lessons?
- The *annual* school fair was held on the first Saturday in March, and the school picnic was held 10 days later. On what day was the picnic held?
- Craig and Tony played tennis for $2\frac{1}{2}$ hours. How many minutes did they play for?
- Leah left school in 2005. She attended a class reunion a *decade* later. In what year was the class reunion?
- Irena was born on February 1st in a leap year. How many days old was she on March 1st that year?

The **duration** is how long it lasts.



Annual means once a year.



A **decade** is 10 years.



F

TEMPERATURE

We measure temperature with a **thermometer**.

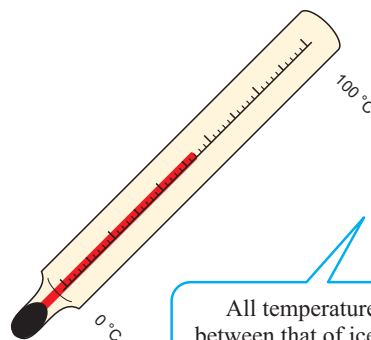
We measure in degrees Celsius, written °C.

0°C reads 'zero degrees Celsius'.

It is the temperature at which pure water freezes.

100°C reads 'one hundred degrees Celsius'.

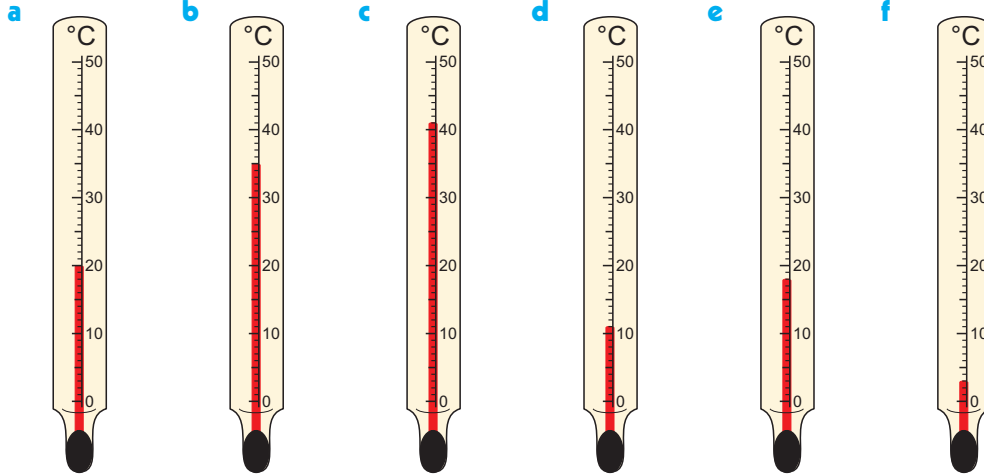
It is the temperature at which pure water boils.



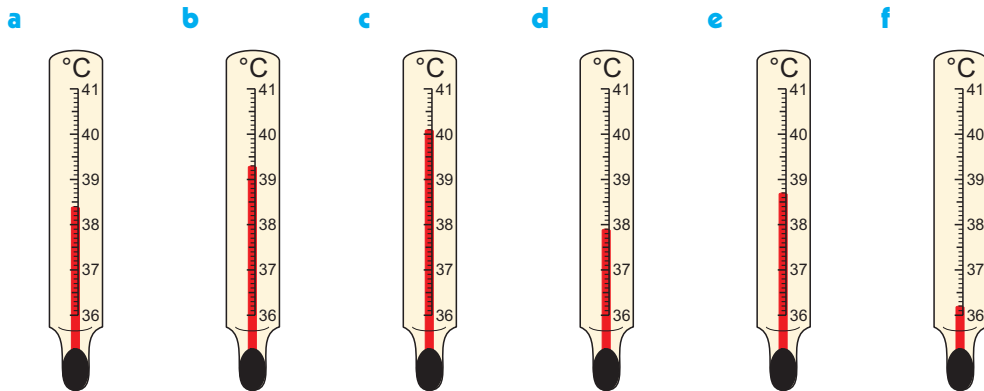
All temperatures between that of ice and boiling water must be between 0°C and 100°C.

EXERCISE 10F

1 What temperature is shown on these thermometers?



2 What temperature is shown on these medical thermometers? You may need to use decimals in your answers.



3 Match these temperatures with the statements.

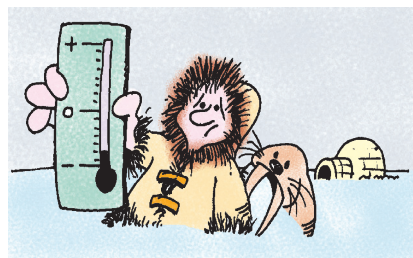
- A** 10 000°C **B** 0°C **C** 8°C **D** 100°C **E** 180°C **F** 45°C **G** 400°C

- | | |
|--|---|
| a the temperature of ice | b the temperature of bath water |
| c the temperature of a cold day | d the temperature of molten metal |
| e the temperature of the sun | f the temperature of boiling water |
| g the temperature of a household oven | |

If a temperature is colder than 0°C it is shown using a **minus sign**.

5°C below zero is written as -5°C

The temperature is below freezing point.



INVESTIGATION

WORLD WIDE TEMPERATURES



Use the Weather Channel, the Internet or your daily newspaper to find the temperatures of Australian cities and cities in other parts of the world.

What to do:

- 1 Compare the temperatures of Darwin and Hobart. What do you notice?
- 2 Compare the temperatures of Adelaide and Melbourne. What do you notice?
- 3 Compare the temperatures in the Southern hemisphere with those in the Northern hemisphere. Can you explain why some temperatures are very different?
- 4 Can you find any cities with temperatures below 0°C?

ACTIVITY

FINDING THE TEMPERATURE



You will need: A thermometer marked from 0°C to 100°C.

What to do: Estimate these temperatures then measure them accurately using a thermometer.

Copy and complete the table.

	<i>Place</i>	<i>Estimate of temperature °C</i>	<i>Measurement of temperature °C</i>
a	Inside a refrigerator		
b	Inside the classroom		
c	In hot water from a hot water tap		
d	In cold water		

In some countries such as the USA, the **Fahrenheit scale** is used to measure temperature.

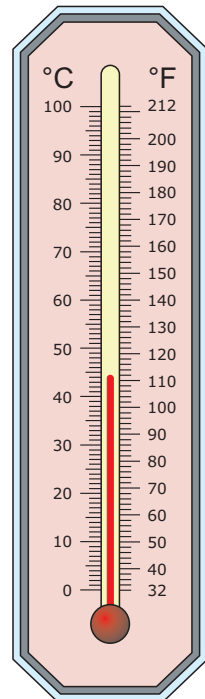
Degrees Fahrenheit is written °F.

Australia used the Fahrenheit scale many years ago.

212°F is the temperature at which pure water boils.

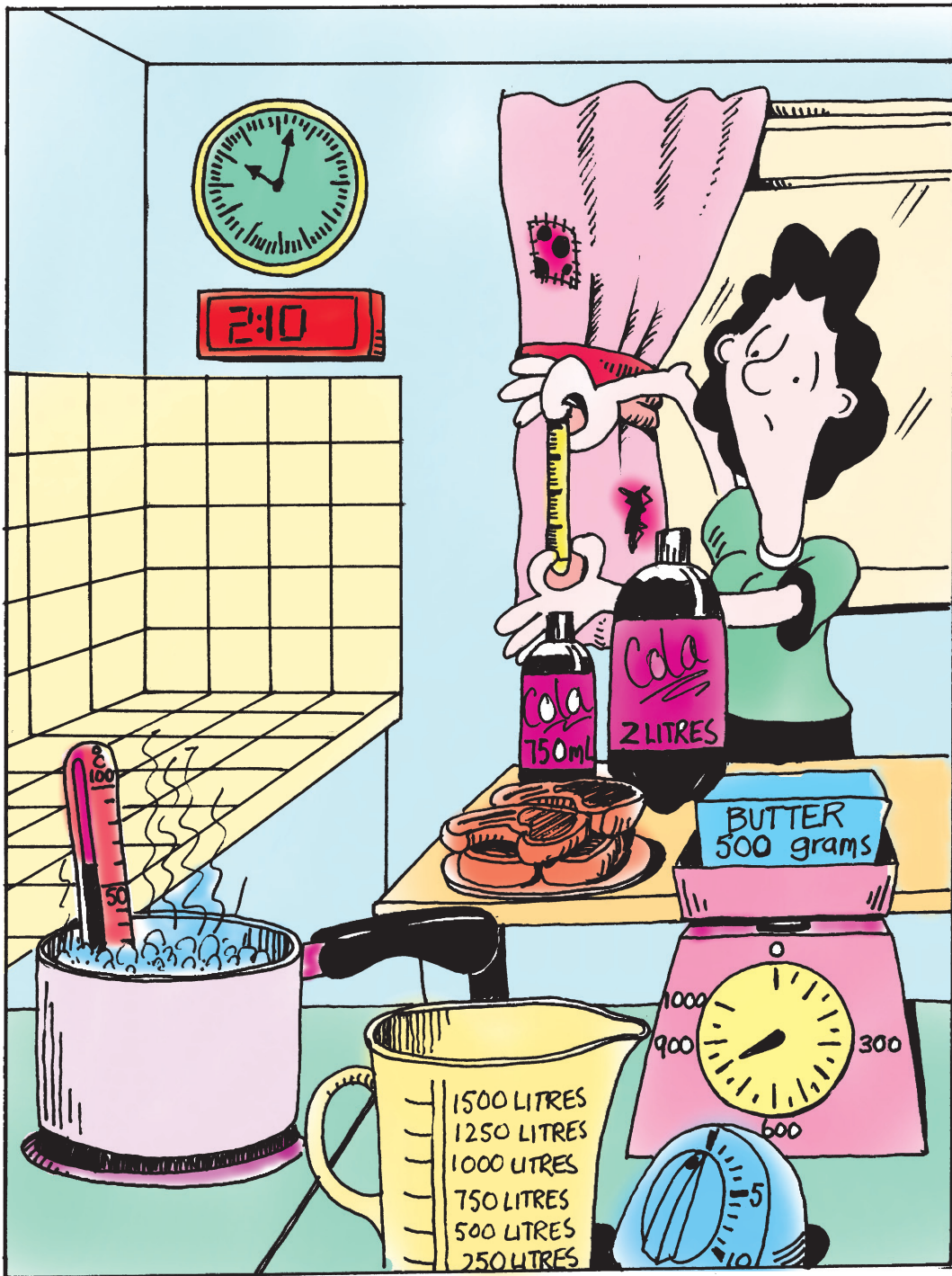
32°F is the temperature at which pure water freezes.

The thermometer shown gives the temperatures in degrees Celsius and degrees Fahrenheit.



4 Copy and complete

- | | |
|-------------------------|---------------------------|
| a 0°C = °F | b °C = 212°F |
| c 50°C ÷°F | d .....°C ÷ 100°F |



SKILL TESTER

MEASUREMENT

MAGDA'S MESSY MEASUREMENTS

Study Magda's kitchen carefully.

- 1 What is wrong with Magda's measuring equipment? List each faulty instrument. Say why you know it is faulty. How could each instrument be adjusted or fixed?
- 2 If each chop is 250 grams, what is the total mass of the chops?
- 3 Magda's clocks are not always accurate. Her timer is very accurate. She needs to bake the chops for 27 minutes. How could she do this?
- 4 The food is to be served at 6 pm according to the *digital clock*.
 - a How long does Magda have to prepare the food?
 - b
 - i When was noon?
 - ii How long till midnight?
- 5 Magda's tape measures only 400 mm. She needs to measure 2 metres of curtain material. How could she do this with her tape measure.
- 6 You cannot see all the tiles, but the kitchen bench is 10 tiles long. The wall alongside the bench is also tiled the length of the bench. Each tile is a 20 cm by 20 cm square.
 - a What is the
 - i length
 - ii width
 - iii perimeter
 of the bench.
 - b What is the height of the tiles *above* the bench?
 - c How many tiles have been used
 - i on the wall beneath the clock
 - ii on the bench
 - iii on both walls and the bench together
 - d There are 25 tiles for each square metre. Approximately how many square metres of tiles are in this kitchen?

A $2\frac{1}{2} \text{ m}^2$ **B** $3\frac{1}{2} \text{ m}^2$ **C** $4\frac{1}{2} \text{ m}^2$ **D** $5\frac{1}{2} \text{ m}^2$ **E** $6\frac{1}{2} \text{ m}^2$

MENTAL SET 10A

1 1 leap year = days

2 Write as analogue time.



3 What time is it 1 hour after 11:32 am?

4 90 minutes = hours

5 Write 10 past 7 in digital form.

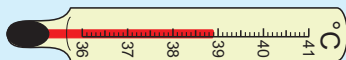
6 Find the time between 9 am Wednesday and 3:30 pm on the same day.

7 How many days in June?

8 How many days in February?

9 Name the next month following December that has 31 days.

10 What temperature is shown?



MENTAL SET 10B

Use the calendar page shown for December to answer questions 1 to 7.

DECEMBER						
S	M	T	W	T	F	S
31					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

1 What day is December 5?

2 What day is December 20?

3 What is the date of the first Saturday in December?

4 What is the day and date of the last day in December?

5 How many Mondays in December?

6 How many weekends in December?

7 What date was the last Monday in November?

8 Find the time 2 hours before 12:15 pm.

9 Find the time between 2:55 pm and 3:05 pm on the same day.

10 True or false? The boiling point of pure water is 100°C.

REVIEW EXERCISE 10A

1 Write these times using am or pm.

a 3 o'clock in the morning

c half past midnight

b 10 past 4 in the afternoon

d an hour later than 5.25 pm

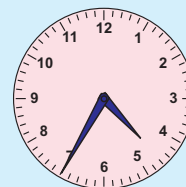
2 i Write as analogue times.

ii Write as digital times.

a



b



3 a Convert 2 hours 25 minutes to minutes.

b Convert 360 minutes to hours.

c Convert 398 minutes to hours and minutes. Use your answer to b to help you.

4 Use the calendar pages shown to answer these questions.

a How many Sundays are there in September?

b What is the date of the 3rd Friday in October?

c Find the date 2 weeks after September 19th.

September						
M	T	W	T	F	S	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

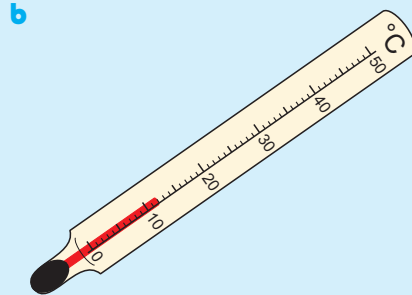
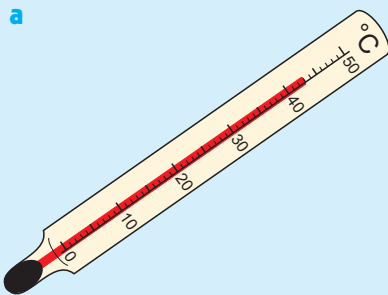
October						
M	T	W	T	F	S	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

5 The Arrivals screen at the airport shows these flight details.

ARRIVALS	
From	Arrival time
Sydney	11:30 am
Darwin	11:49 am
Melbourne	12:05 pm
Singapore	12:21 pm

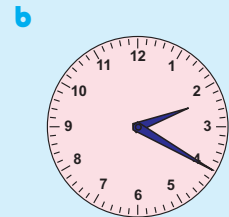
- a How long after the Sydney flight arrives, will the Melbourne flight arrive?
- b Abu arrives at the airport at 12:09 pm. How long does he have to wait for the Singapore flight to arrive?
- c Cassie arrives on the Darwin flight. She has to wait 1 hour and 36 minutes before her connecting flight departs. At what time does it depart?

6 What temperature is shown on the thermometer?



REVIEW EXERCISE 10B

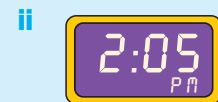
- 1 i Write as analogue times.
ii Write as digital times.



- 2 a Write these times using am or pm.
i half past 11 in the morning

ii 25 to 9 at night

- b Write these as analogue times.



- c Find the time between
i 11:30 am Saturday and 4:50 pm Saturday
ii 5:20 pm Saturday and 9:30 am Sunday.

- 3 a Convert three and a quarter hours to minutes.
b Convert 240 minutes to hours and minutes.
c Convert 257 minutes to hours and minutes. Use your answer to b to help you.

4 Use the television program guide given to answer the following questions.

- a Using the 12-hour clock, at what times did 'The Monsters' start and finish?
- b I turned on the television set at 12:05 pm and watched for 48 minutes.
 - i What program was showing when I turned the television set on?
 - ii What program was showing when I turned the television set off?

Wednesday	
11:00	Festival of Films
11:30	Cartoon Mania
12:00	Car racing
12:30	Top Dog
13:00	Teen Hour
13:30	Sport Stunts
14:00	The Monsters
14:30	My Cat called Felix

5 Match these temperatures with the statements.

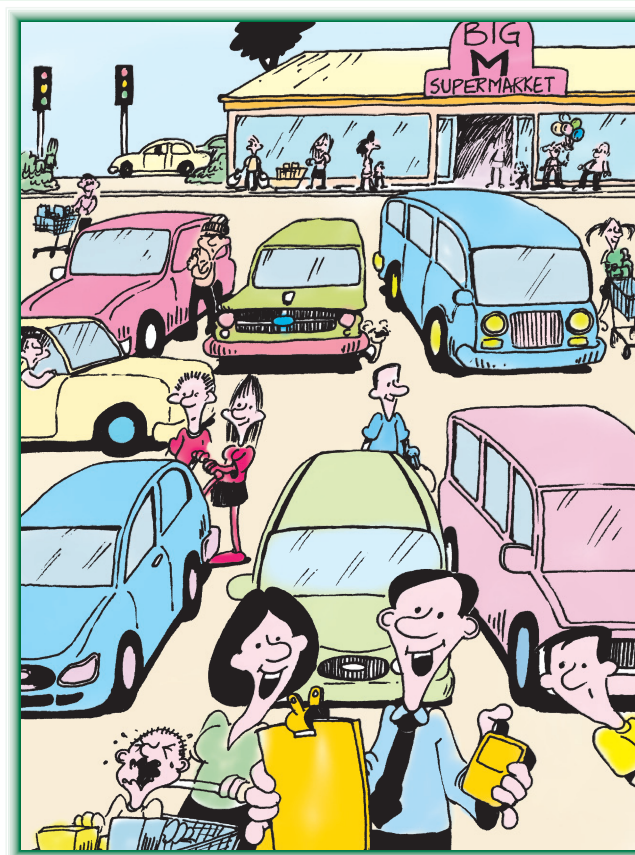
A 100°C **B** 250° **C** 25°C **D** -18°C

- a the temperature of a spring day in Adelaide
- b the oven temperature for cooking a cake
- c the temperature on a winter's day in Moscow
- d the temperature of pure boiling water

Chapter 11

Data collection and graphing

In this chapter you should learn to:



- ✓ properly collect and record data
- ✓ use coding to record data
- ✓ use dot plots to record data
- ✓ graph data using column graphs and bar graphs
- ✓ interpret data using column, bar and composite graphs
- ✓ use technology to graph data
- ✓ interpret information from pie charts
- ✓ draw and interpret pictograms
- ✓ draw and interpret line graphs
- ✓ interpret story graphs
- ✓ conduct a survey of your own choosing

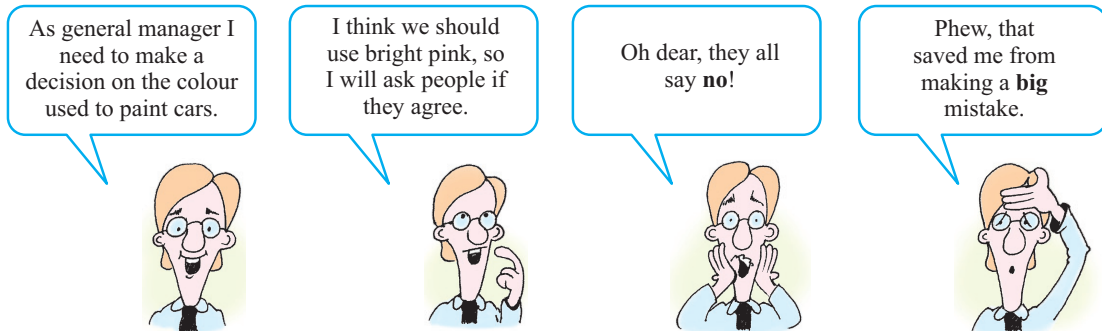
STATISTICS

- Working with statistics deals with
- **collecting** data
 - **organising** the collected data
 - **displaying** the organised data
 - **noticing** what the data is telling us.

In this chapter we will look at these *four* parts of statistics.

THE NEED FOR COLLECTING DATA OR INFORMATION

We need to collect data or information so that we can make sensible decisions.



A COLLECTING AND RECORDING DATA

COLLECTING DATA

There are several ways to collect information (data).

- **Using our eyes** to see what is happening or has happened.
For example, seeing who is wearing black shoes, seeing what colour the bikes in the bike stand are painted.
- **Asking people** a question and writing down the answer they give.
- **Measuring** of lengths, areas, volumes, times, etc.
- Giving people a **questionnaire** to fill in.
- **Gathering information** from books, magazines or from the internet.
- **Experimenting.** For example, measuring plant growth. The height of the plant is measured over time at set times.



EXERCISE 11A

- 1 Say how you might collect data (information) in these cases.
 - a You want to know the most popular colour for bicycles owned by students at a school of over 500 students.
 - b You want to find family sizes (including parents) for students in your class.
 - c You want to find the growth (height) of climbing beans over a 14 day period.
 - d You want to find the average height of Australia’s five highest mountains.
 - e You want to find the fastest runner in your school.
 - f You want to find the favourite TV programme of students in your class.
 - g You want to find who is wearing a watch to school.

RECORDING DATA

Now that you have decided how to collect your data, you need to find a way to **record** it.

How are you going to write down the data as you observe it?

Suppose you wish to find out the favourite takeaway food for members of your class. You ask each member in turn which takeaway they prefer.



CODING

To record the results you could use a **code**. The code might be to use the first letter of a name if the letters are different.

If chicken and Chinese food were on the list you might use C for chicken and Cs for Chinese.

The code could be:

F	Fish and chips
H	Hamburger
P	Pizza
C	Chicken

Using P for pizza could lead to problems if pies, pasties and pasta also need to be coded.

The 30 class members were surveyed and their responses were:

F C H H F F P F P H C P F C F
C H H P C C F C F P P P C F F

Coding saves us time as we do not have to write words.

But, we still have to organise the data for counting.



- 2 Write down codes you would use for these sets of data.
 - a Bike colours: red, blue, black, green, pink, orange
 - b TV programmes: Shortland Street, Judge Judy, SportsOne, Blues Clues, Dexters Laboratory.
 - c School subjects: maths, reading, spelling, science, physical education
 - d Makes of car: Ford, Holden, Nissan, Toyota, Honda
 - e Pets: Dogs, Cats, Rabbits, Roosters, Lambs, Guinea pigs

TALLY CHARTS

Using the takeaway food data: F C H H F F P F P H C P F C F
C H H P C C F C F P P P C F F

This data can be put on a **tally chart**. On a tally chart | represents 1 object or person, |||| is 4 objects or people and ||||| is 5 objects or people.



Tally chart		
Fast food	Tally	Total
Fish and chips	|||| ||||	10
Hamburger	||||	5
Pizza	|||| ||	7
Chicken	|||| |||	8

5 people ↗ ↘ 3 people

This means that there were 10 class members who liked fish and chips the best.

5 people + 3 people makes 8 people who liked chicken best.

3 At recess time the canteen supervisor kept a record of items bought. Her record sheet is shown. How many students bought

Pasta bake	|||| |||| ||||
Chicken nuggets	|||| |||| |||| |||| |
Sandwich	|||| |||| |||| |||| |||| |||| ||
Roll	|||| |||| |||| |||| |||| |||| |||| |
Fruit	|||| |||| |||| |||| |||| |||| ||

- a pasta bake
- b chicken nuggets
- c fruit
- d sandwiches or rolls?

4 Tina rolled a die 35 times and she got these results.



Use a tally chart to find the totals for each result.

Hint:

Number on die	Tally	Total
1		
2		
⋮		

5 Kirsty decided to do a survey on the bird life in her area. She used the code M for magpie, S for sparrow, K for kookaburra, W for wren, G for galah. During a 30 minute period she recorded these birds.

M M S K S G G G G W M G G S S S K
S S S S K M S S S M W S S S W S S
S S S M M S S S K M S S W G G G

- a Make a tally table and total each row.
- b How many birds did she see in this period?

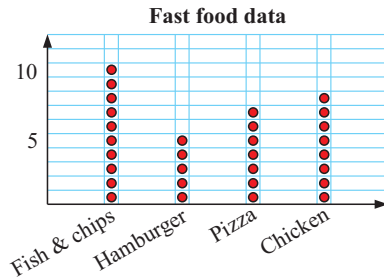
DOT PLOTS

A **dot plot** is a way of recording data as you gather it. It is a graph where each dot shows one of its type.

For example, for the takeaway food data,

F C H H F F P F P H C P F C F
C H H P C C F C F P P P C F F

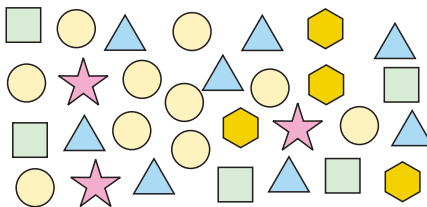
the **dot plot** is:



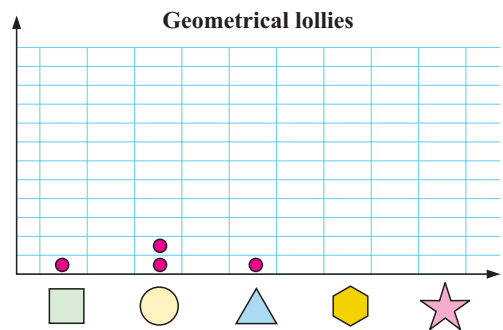
Here, each dot stands for one person's answer.

We get an immediate *picture* of the data.

6 Ian tipped out a packet of lollies of different shapes. This is what he saw.



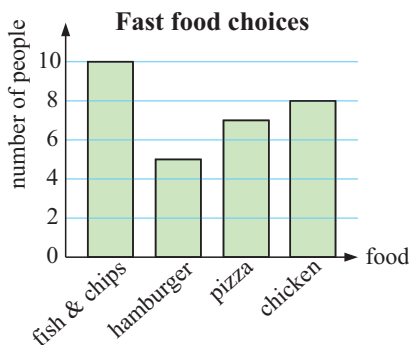
- Copy and complete this dot plot for the lollies.
- How many of each shape were there?
- What fraction of lollies are
 - circles
 - hexagons
 - not circles?



B COLUMN AND BAR GRAPHS

COLUMN GRAPHS

Here is a column graph for the fast food information (data).



This graph gives a better visual display than the collection sheet, tally table and dot plot.

Different column heights show different numbers of people liking these foods best.

Important notes

- The line across the bottom of the graph is called the **horizontal axis**.
- The line along the left edge of the graph is called the **vertical axis**.
- Labels must be shown on both the horizontal and vertical axes.
- A clear **scale** should be seen on the vertical axis so that numbers of each type can be easily read off.
- The columns are about twice as wide as the gaps

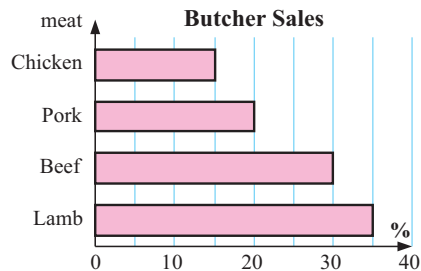
Axes is the plural of axis.



BAR GRAPHS

Bar graphs are similar to column graphs, but the bars are horizontal.

For example, this bar graph shows the percentage of sales of different types of meat.



EXERCISE 11B

- 1 Yuka surveyed the orders of the first 20 customers at her fish and chip shop on Friday. Her results are shown. Draw a column graph of this data using graph paper.

<i>Food</i>	<i>Number of orders</i>
Fish	7
Donut	1
Crabstick	4
Burger	5
Hot dog	3

- 2 Draw a column graph to display the information in this tally chart.

Don't forget to properly label your graph with

- a title
- axes labels
- scales.



Eye colour of dragon flies	
<i>Colour</i>	<i>Tally</i>
Red	|||| |
Blue	|||| ||| ||
Green	|||| ||| ||||
Brown	|||| |||
Grey	|||

- 3 The children in class 5T were asked their favourite rainy day pastime. The results are given in the table. Draw a bar graph of this data.

<i>Rainy day pastime</i>	<i>Number of children</i>
watching TV	5
reading	6
computer games	9
playing music	2
other	4

- 4 The Scouts had a ‘trash and treasure’ sale to raise money for their new Scout Hall. The amounts raised by the different tables are shown. Draw a bar graph of this data.

Table	Amount raised (\$)
Books	120
Clothing	150
Household	90
Furniture	110
White elephant	100
Garden	90

ACTIVITY

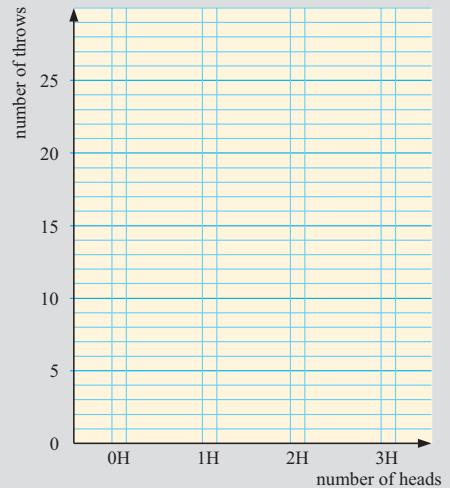
THREE COIN TOSS



You will need: 3 coins

When three coins are tossed you could get these outcomes.

	no heads
	one head
	two heads
	three heads



What to do:

- 1 Toss three coins 50 times and record your results using a dot plot.
- 2 Draw a column graph for the data you obtained.

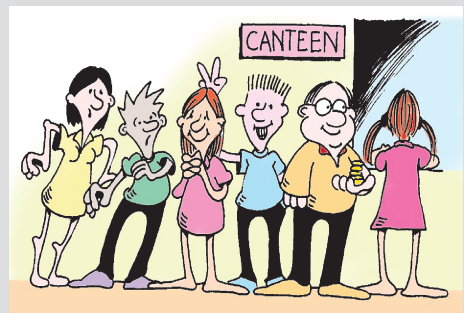
ACTIVITY

CANTEEN SALES



Prepare a table to record student purchases from the canteen. Your table could include headings for hot food, rolls or sandwiches, healthy snacks, fruit and drinks.

Stand near the head of the canteen queue. Use a tally to record the items as they are bought. Draw a fully labelled column graph of your results.



WHAT DOES THE GRAPH TELL US?

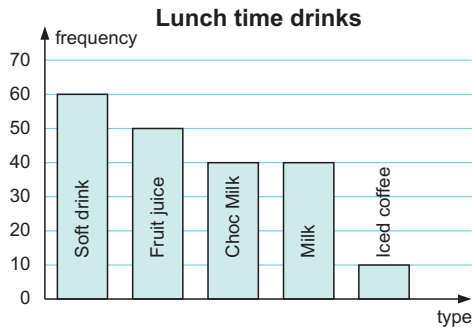
This graph shows the type of drink that students bought at lunch time.

We can see that soft drinks were most popular. 60 students bought soft drinks.

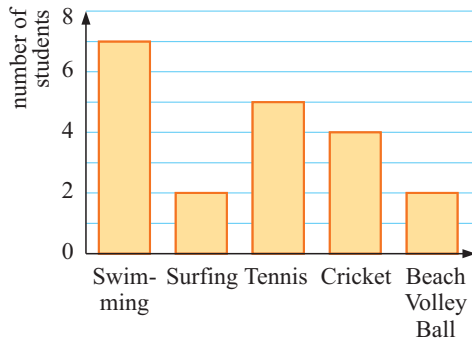
Iced coffee was least popular. 10 students bought iced coffee.

The same number of students (40) bought Choc Milk and Milk.

If students bought 1 drink each, then $60 + 50 + 40 + 40 + 10 = 200$ students bought drinks.



5 Summer activities

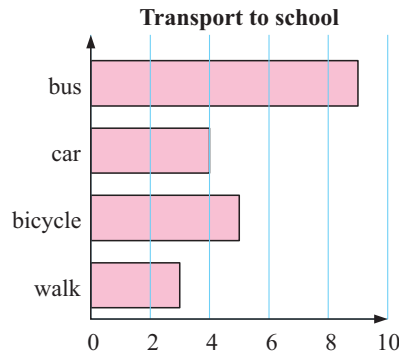


This column graph shows the summer outdoor activities chosen by 5J class. Each student chose one activity.

- a
 - i What was the most popular activity?
 - ii How many students chose it?
- b How many students chose tennis?
- c How many students were in class 5J?

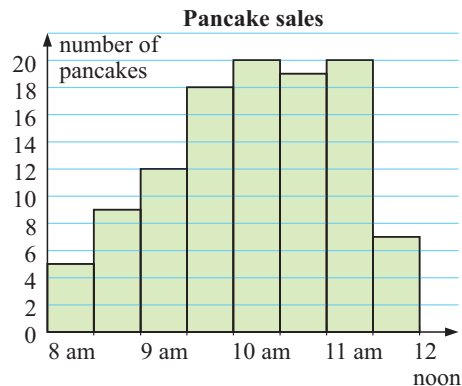
6 This bar graph shows the type of transport that 5C students use to come to school.

- a How many students travel by car?
- b Which type of transport is used by most students?
- c How many students are in class 5C?
- d Choose *greater* or *less*. The total number of students who ride bicycles or walk to school is than those who come by bus.



7 The graph shows the number of pancakes sold at the school fair. The number was recorded every half hour.

- a How many pancakes were sold before 8.30 am?
- b How many pancakes were sold between 11 am and midday?
- c How many pancakes were sold altogether?
- d Give two possible reasons why no more pancakes were sold after midday.





C COMPOSITE GRAPHS

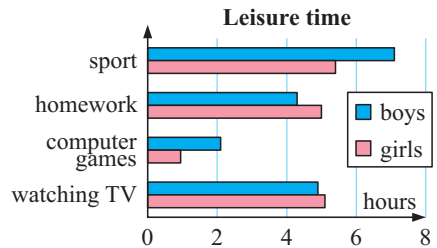
Composite graphs are side-by-side column graphs or bar graphs that **compare** data.

This composite bar graph compares the amount of time that boys and girls spend on leisure activities after school.

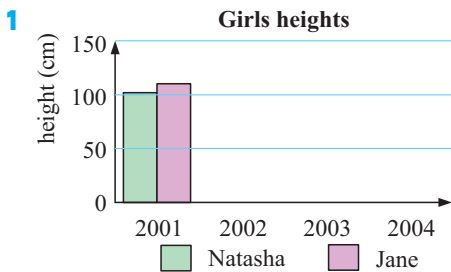
The bars for boys and girls are drawn together for each activity.

Notice that:

-  represents boys and  represents girls.
- Boys spend more time playing sport than girls.
- Girls spend more time doing homework than boys.
- Boys spend more time playing computer games but less time watching television than girls.





EXERCISE 11C

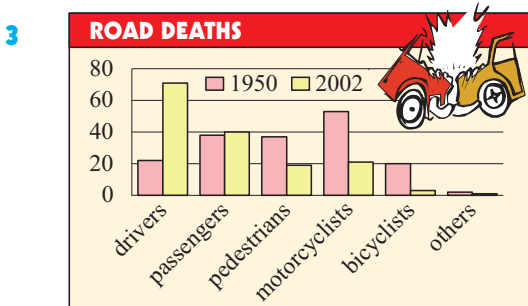
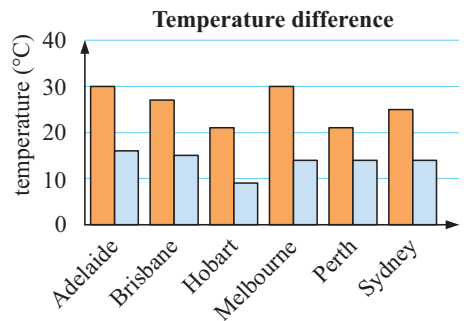


Natasha and Jane have recorded their heights (in cm) on January 1st each year for the last 4 years.

	2001	2002	2003	2004
Natasha	102	107	113	120
Jane	110	113	115	118

Copy and complete the composite graph. Write a sentence comparing their heights.

- 2** The maximum temperature  and minimum temperature  of some Australian cities was recorded one day in October. Use the graph to answer these questions.
- Which city recorded the lowest minimum temperature?
 - Which cities had the highest maximum temperature?
 - Which city had least temperature change?
 - Which city had the greatest difference between maximum and minimum temperatures?



This graph shows the road deaths in South Australia in 1950 and 2002.

- Which category shows the greatest increase in road deaths? Can you think of a reason for this?
- Which category shows the greatest decrease in road deaths. Can you think of a reason for this?

- c The number of passenger deaths has increased very little from 1950 to 2002. In 1950 cars were not fitted with seatbelts. Discuss how seatbelts have affected the number of passenger deaths.
- d Predict what will happen to the number of driver deaths in the next 10 years. Give a reason for your answer.

D USING TECHNOLOGY TO GRAPH DATA

Many special computer programs are used to help us organise and graph data.

HAESE & HARRIS STATISTICAL GRAPHING PACKAGE



Click on the icon to enter the statistical graphing computer package.

Change the data in the table and see the effect on the graph.

- Notice that labels on the axes can be changed and so can the graph's heading.
- The type of graph can be changed by clicking on the icon to give the type that you want.

Experiment with the package and use it whenever possible.

USING MICROSOFT EXCEL

INVESTIGATION USING A SPREADSHEET FOR GRAPHING DATA



Suppose you want to draw a frequency column graph of the car colour data.

<i>Colour</i>	white	red	blue	green	other
<i>Frequency</i>	38	27	19	18	11

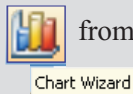
The following steps using **Excel** enable you to do this quickly and easily.

Step 1: Start a new spreadsheet, type in the table as shown and then highlight the area shown.

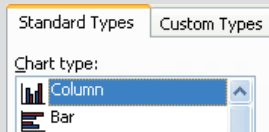


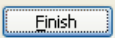
	A	B
1	Colour	Frequency
2	white	38
3	red	27
4	blue	19
5	green	18
6	other	11

Step 2: Click on  from the toolbar.

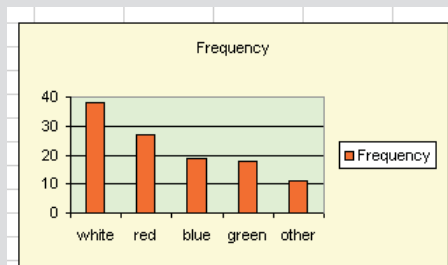


Step 3: Choose



This is probably already highlighted. Click .

You should get:



This demonstration takes you through all the steps.

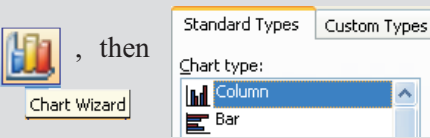
Suppose you now wish to compare two distributions:


<i>Colour</i>	white	red	blue	green	other
<i>Frequency 1</i>	23	17	15	11	8
<i>Frequency 2</i>	15	18	21	9	3

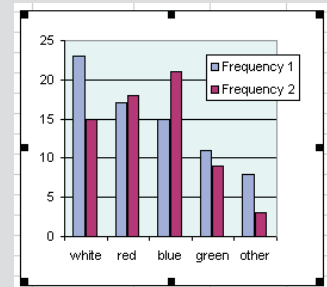
Step 4: Into the C column type the *Frequency 2* data and highlight the three columns as shown.

	A	B	C
1	Colour	Frequency 1	Frequency 2
2	white	23	15
3	red	17	18
4	blue	15	21
5	green	11	9
6	other	8	3

Step 5: Click on  , then



Step 6: Choose  then 



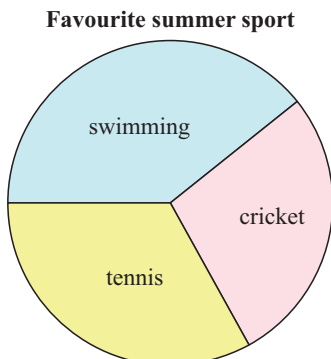
Step 7: Experiment with other types of graphs and data.

What to do:

- 1 Gather statistics of your own or use data from questions in the previous exercise. Use the spreadsheet to draw an appropriate statistical graph of the data.
- 2 Find out how to adjust labels, scales, etc.

E PIE GRAPHS

A pie chart is made up of a circle divided into sectors.



This pie graph shows the favourite choice for summer sport by Year 5 students in Mr Sims’s class.

The largest sector is ‘swimming’. More children chose swimming than either of the other sports.

The smallest sector is ‘cricket’. Cricket was the least popular sport.

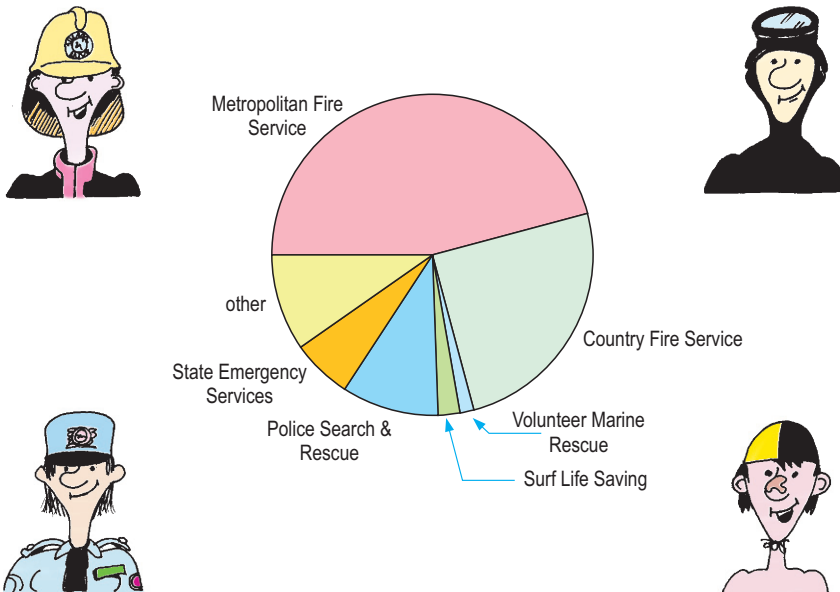
EXERCISE 11E

1 Class 5T were asked to name their favourite type of television program. The pie graph shows their choices.



- a Which type of program did most children prefer?
- b What fraction of the children preferred cartoons?
- c Which two types of programs were chosen by more than half of the children?
- d Which two program types were chosen by equal numbers of children?

2 Most people who own property pay an Emergency Services levy. A levy is a form of tax. The pie chart shows how the money is used.




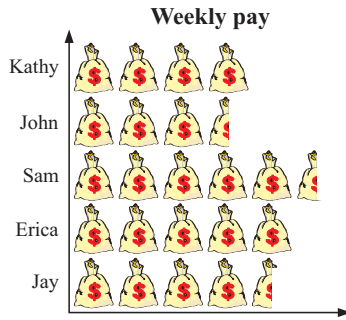
- a Why is it called an Emergency Services levy?
- b Approximately what fraction of the money is used by the Country Fire Service?
- c Which organisation shown gets the smallest share of the money?
- d Which organisation gets close to half of the money?

F PICTOGRAMS (PICTOGRAPHS)

Five school leavers told us what their weekly pay was when they started work. Their amounts were:

Kathy	\$400
John	\$350
Sam	\$550
Erica	\$500
Jay	\$450

If we let  represent \$100, a pictogram of the data would be:



If a money bag is \$100, then a half bag would be \$50.



EXERCISE 11F

1

Activity	No. of people
walking	24
jogging	7
cycling	15
rollerblading	5

Many people use the path by the river for leisure activities.

Jessica did a survey for one hour on Sunday morning and recorded these results.

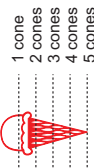
Draw a pictograph to represent these results.

Let  represent 2 people.

2 Pete's icecream van sells 10 flavours of icecream, but the most popular flavours are chocolate, strawberry, boysenberry, vanilla and rum and raisin.

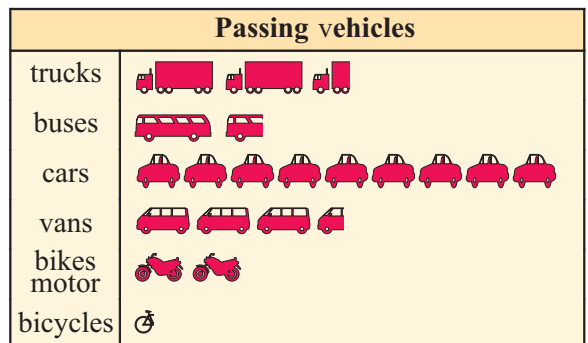
flavour	Number of cones sold
chocolate	21
strawberry	16
boysenberry	14
vanilla	10
rum & raisin	15
others	19

His sales for last Saturday are shown in the table. Draw a pictograph to represent his sales.




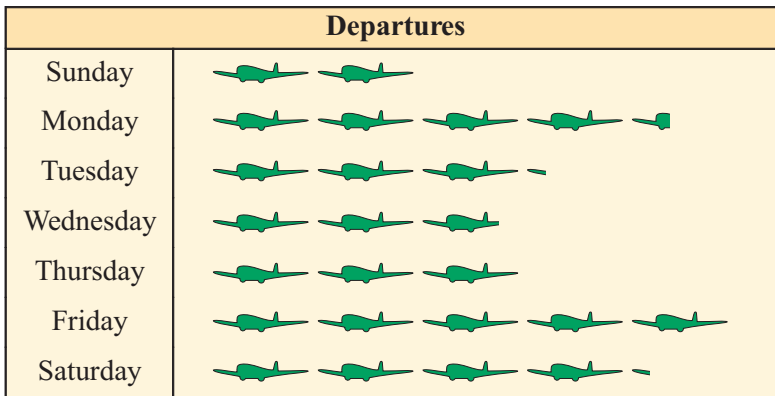
Let  represent 5 cones sold.

3 Ian counted the vehicles that passed as he waited for his bus. Each icon on the pictograph represents two vehicles.



- a How many bicycles went past?
- b How many delivery vehicles went past?
- c Was the number of cars greater than the sum of all the other vehicles?

- 4 This pictograph shows the number of flights leaving an airport each day for a week.
- a How many flights left on Thursday?
 - b What day shows the greatest number of departures?  = 5 flights
 - c How many flights left over the weekend?



G

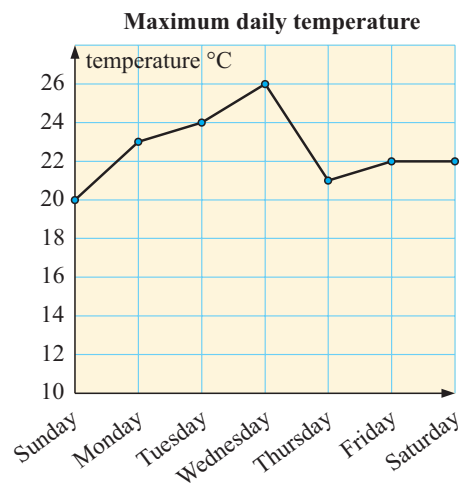
LINE GRAPHS

Line graphs can be used to show change over time. For example,

- the change in temperature of a hot drink as it cools
- the change in the length of a shadow during the day
- the change in the mass of an animal as it grows.

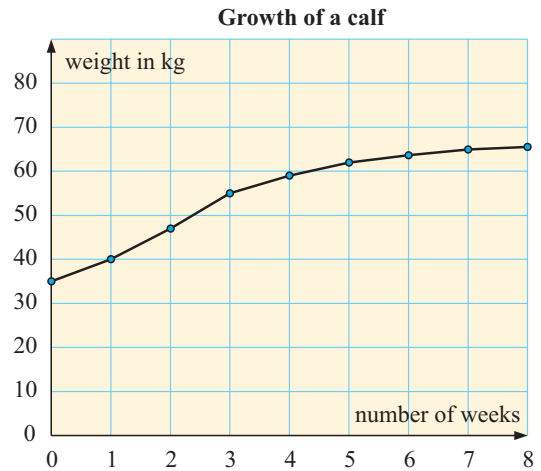
EXERCISE 11G

- 1 This line graph shows the maximum temperature each day for a week.
- a
 - i Which day was hottest?
 - ii What was the maximum temperature?
 - b What was the maximum temperature on Monday?
 - c
 - i What was the lowest maximum temperature for the week?
 - ii What day did it occur?
 - d A cool change came in during one night. What night was it?
 - e What was the difference between the highest and lowest maximum temperatures for the week?



Maximum means highest or greatest.

2 Shane lives on a farm. He helps to look after the calves. Shane weighs a calf when it is born and weighs it every week for the next eight weeks. The graph shows the growth of one of Shane’s calves.



- a How much did the calf weigh when it was born?
- b How much did the calf weigh when it was 8 weeks old?
- c How old was the calf when it weighed **i** 40 kg **ii** 59 kg?
- d The graph is steeper during the first 3 weeks than it is in later weeks. What does this mean?
- e If we continued to record the calf’s weight, would it increase throughout the calf’s life? Why/why not?

INVESTIGATION

REPRESENTING DATA

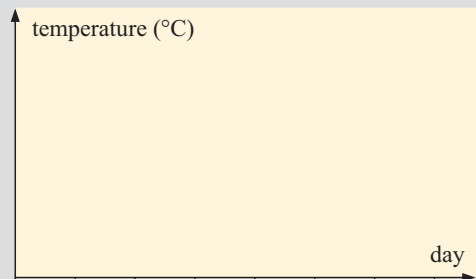


What to do:

- 1 Use your daily newspaper or the internet to find data that shows change over time. Find the maximum or minimum daily temperatures for your town each day for a week.
- 2 Record your data in a table like this.

<i>Time</i>							
<i>Temperature (°C)</i>							

- 3 Graph your data. Do not forget to name the graph and label the axes.

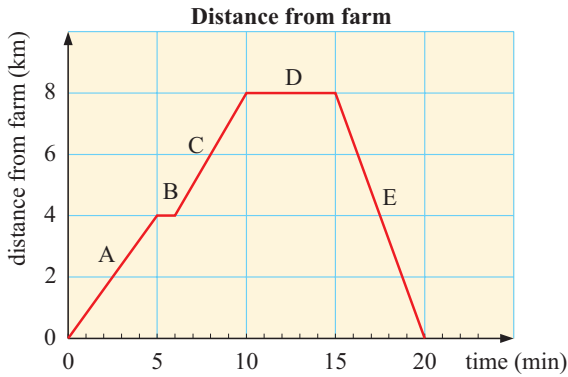


or Collect your own data by measuring

- the length of a shadow at half hour intervals during the day or
- the temperature of very cold water in a cup as the cup is left to stand at room temperature. Record the temperature at 2 minute intervals.

Then graph your data.

GRAPHS THAT TELL STORIES



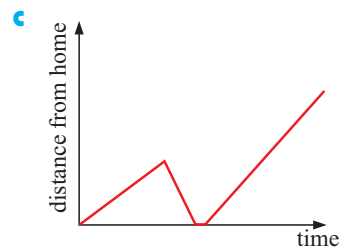
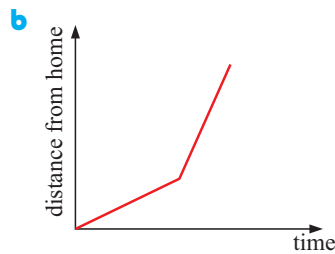
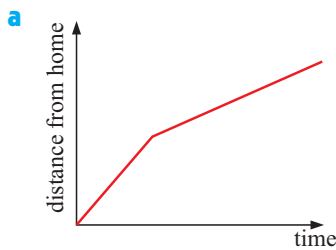
The graph shows Diana’s distance from her farm when she drove to the nearest town to collect a spare part for her tractor.

- A shows that she started out slowly.
- B shows where she had to stop because there were sheep on the road. Her distance remains the same.
- C shows that she continued towards the town faster than she was travelling earlier.

- D shows the time when she was stopped in town while she collected the spare part. Her distance remains the same.
- E shows that she returned home at quite a fast speed.

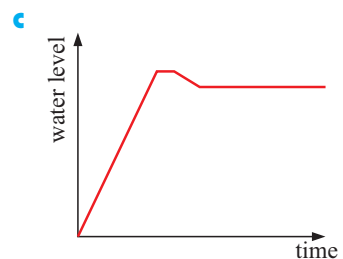
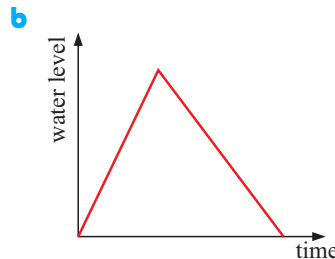
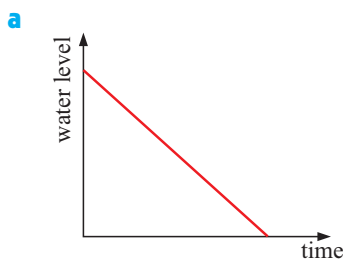
Notice that when the graph is steeper it means that Diana is travelling more distance in a particular time. So she is travelling faster.

3 Match the graph to the story.



- A** I am walking steadily to school. After a while I meet a friend and we walk together. We walk slower than when I was by myself.
- B** I am part-way to school when I remember that I have left my homework at home. I run back home to get it then run to school.
- C** I start to walk to school then I accept a ride with a friend.

4 Match the graph to the story.



- A** I fill a bucket with water. After a few minutes my dog drinks some of the water. I decide to leave the water in the bucket in case he wants a drink later.
- B** I quickly fill a bucket with water but the bucket is split and the water runs out.
- C** I start with a full bucket of water and pour the water slowly over my seedlings until the bucket is empty.

DISCUSSION

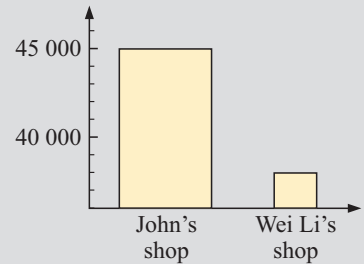


Some people may try to trick or mislead others by the way they draw their graphs.

Here is an example.

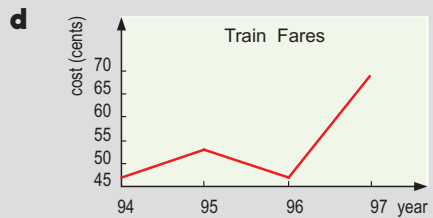
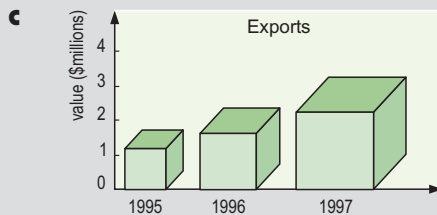
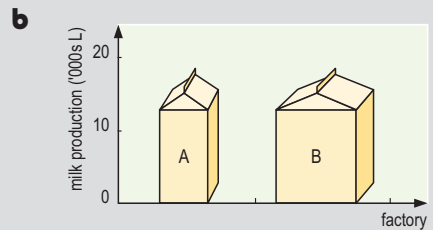
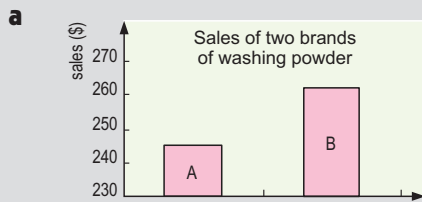
Kelly owns two shops. One of them is managed by John, and the other by Wei Li. John's shop earns a profit of \$45 000 a year, whereas Wei Li's profit is \$38 000 a year.

John draws this graph to show the profits earned by the two shops and gives it to Kelly.



What to do:

- 1 Discuss the misleading features of this graph.
- 2 Why do you think John has drawn the graph like this?
- 3 Discuss misleading features of these graphs.



H

SURVEYS

DISCUSSION



Suppose you want to find out what people think about TV coverage of football. Discuss these suggestions:

- Rima believes that all people in Australia should be sent a letter to find out what they think.
- Jason believes that people at a football match should all be asked to fill out a questionnaire.
- Georgie thinks that 1000 names should be picked out from the telephone directories. They should be asked to complete a questionnaire over the phone.

In your discussion did you discover that:

- It takes too much time and is very expensive to survey all Australians and so you could not do this.
- Asking a group at a football match would probably give a biased opinion which we would not want. People at a football match would all be interested in football and not everyone in the population is interested in football.
- Selecting a smaller group, called a sample, is the thing to do. The group must be large enough to represent accurately the views of the whole population.

PLANNING A SURVEY

These questions must be considered before conducting a survey.

- What questions do I need to ask?
- What data do I need to collect? How will I collect it?
- How will I organise the data?
- Where will I collect the data from?
- At what time of the day do I collect the data?
- How will I display the data?

If you ask poor questions, you will get all sorts of answers. So, the whole exercise could be a waste of time.

DISCUSSION



Which would be a better question to include in a survey?

How do you feel about keeping wild animals in a zoo? *or*

Should we keep wild animals in a zoo (Yes/No)?

EXERCISE 11H

- 1** Jenny is trying to find out whether people like eating muesli bars. She is trying to find out *which brands* they like best. She made up three questions to ask. One of the people surveyed gave these answers.

Question 1: What do you like about muesli bars? *They are yummy!*

Question 2: What muesli bars do you like best? *Ones with nuts in them.*

Question 3: Do you know the actual names of some muesli bars?
Yes, several of them.

Help Jenny by rewriting the questions so that the answers will be useful.

- 2** Rewrite these questions so that you will get a yes or no answer.
- How do you feel about cutting down our native forests?
 - What is your opinion of the Prime Minister?
 - What do you think about transporting nuclear waste through your suburb?
 - What do you think about TV advertising?

ACTIVITY

FOOD FOR THOUGHT



You wish to find out information about some food and drink items bought from your school canteen (or tuckshop).

What to do:

- 1 Work out *four* questions that you want answers to. Get your teacher to check them.
- 2 Design a table or form for collecting answers to your questions.
- 3 Discuss how you are going to organise the data (tally, dot plot).
- 4 Discuss when and where you will collect the data.
- 5 Discuss what method of display you will use to show the data (column graph, pictograph, bar graph etc).

I

STATISTICAL ACTIVITY

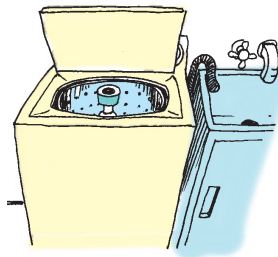
These are some of the ways that water is used in the home.

shower



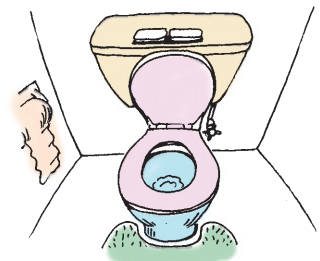
50 L

washing machine



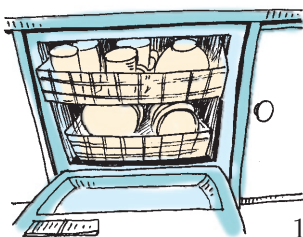
100 L for each load

toilet



10 L each flush

dishwashing



15 L each wash

washing hands



3 L each time

Gather some data on water use in your household. You need to find out how much water each member of your family uses during a week.

What to do:

- 1 Discuss possible ways of getting the information that you need. Should each family member have his or her own card, or is there a better way? Discuss the advantages and disadvantages of your ideas. Check with your teacher.
- 2 Design a card or sheet for collecting information. Check with your teacher.

- 3 You may need to research some extra information. For example, if your household has a dishwasher you will need to find out how much water it uses.
- 4 Select a time to conduct your survey and gather the information that you need.
- 5 When you have the data from each family member, record water amounts used in a table. Record equal amounts of washing machine and dishwashing usage to each member of the family.
- 6 Draw a graph showing water used by each family member.
- 7 Find the mean usage per person.
- 8 How much water do you use each year? A calculator could be used for 7 and 8.

J

READING CHARTS AND TABLES

We can learn lots of interesting information by reading charts and tables.

EXERCISE 11J

- 1 If you asked your grandparents about the types of foods they ate when they were your age, you might be surprised. Read the table to see how people's eating habits have changed between 1938 and 2004 in Australia.

People are now taller and heavier than they used to be.

Does the table tell the whole story about changes to eating habits?



1938



2004

Food	Average amount eaten by one person during the year 1938	Average amount eaten by one person during the year 1998
Meat	64 kg	36 kg
Fish	2 kg	3 kg
Eggs	243	137
Fresh fruit	15 kg	56 kg
Tomatoes	7 kg	19 kg

- a Which foods did people eat less of in 1998 than in 1938?
- b Which foods did people eat more of in 1998 than in 1938?
- c How much meat was eaten by a person in 1938?
- d How much fresh fruit was eaten by a person in 1998?

DISCUSSION



People are taller and heavier than they used to be. Use the table above to compare what people ate in 1938 and what they eat now. Does the table tell the whole story about changes to eating habits?

2 This table compares how much people paid for petrol in 2000. Victor Harbor is a town about 100 km from Adelaide. Coober Pedy is in the far north of South Australia and is about 850 km from Adelaide.

	Jan	Mar	May	July	Sept
Adelaide	75.9	86.4	84.9	89.4	96.1
Victor Harbor	77.7	87.9	85.2	89.8	98.6
Coober Pedy	90.9	97.9	98.8	101.4	113.1

- a Give the price for a litre of petrol
 - i in Adelaide in January 2000
 - ii in Victor Harbor in July 2000
 - iii in Coober Pedy in September 2000
- b Which town always had the most expensive petrol? Give a reason for this?
- c What do you notice about the petrol prices the later it was in the year?
- d When did the price of petrol fall? Give the town(s) and the month(s).

3 Sally is going to New Zealand for a holiday. She has a road map which shows this chart.

Sally notices that the chart is made up of two triangles.

The top right triangle shows the times taken to drive safely between towns. Can you see that it takes 11 hours 30 minutes to drive between Auckland and Wellington?

The bottom left triangle shows the distances between towns.

The distance between Auckland and Wellington is 666 km.

	Auckland	Hamilton	Palmerston North	Rotorua	Taupo	Wellington
Auckland		2:20	9:20	4:10	4:40	11:30
Hamilton	131		7:00	1:50	2:20	9:10
Palmerston North	453	412		6:05	4:40	2:35
Rotorua	239	108	341		1:25	8:15
Taupo	280	149	263	78		6:50
Wellington	666	535	145	464	386	

- a i How far is it between Auckland and Hamilton?
- ii How long would it take to drive this distance?
- b i How long would it take to drive between Hamilton and Rotorua?
- ii How far apart are these two towns?
- c i What is the shortest distance between towns given on the chart?
- ii What are the names of the towns?
- d i Name the two towns with the same travelling times from Taupo and give their distances from Taupo.
- ii Name the two towns with the same travelling times from Hamilton and give their distances from Hamilton.
- iii Discuss why you do not always take the same time to travel the same distance on different roads.



SKILL TESTER**SAM'S SUPER SURVEY**

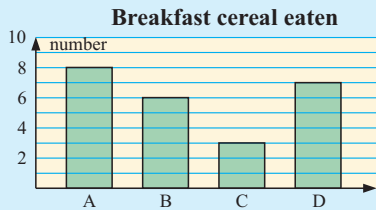
Sam is in the carpark of a supermarket. He is employed by the supermarket.

- 1 Choose the best answer.
 - a Sam is collecting
 - i money
 - ii tallies
 - iii information
 - iv data
 - b The equipment in Sam's left hand is likely to be a
 - i counter
 - ii mobile phone
 - iii calculator
 - iv tape recorder
 - c Sam should be
 - i accurate
 - ii a statistician
 - iii quick
 - iv well dressed
 - d Choose the best answer. Sam should
 - i ask questions only of the people who have time to answer them
 - ii be able to speak several languages
 - iii only ask mothers with children
 - iv stop every shopper to ask the questions
- 2 What would be the best way for the supermarket to find out:
 - a why shoppers come to this supermarket
 - b how shoppers travelled to this supermarket
 - c how far from their home was this supermarket
 - d how much money shoppers spent
 - e what the average (mean) amount each shopper spent
 - f which soft drink was bought the most
 - g how many shoppers returned their trolleys to the trolley bay
 - h how many shoppers brought their small children with them
 - i if they paid by cash or plastic (credit card)?
- 3 Prepare questions for Sam so that he can get a quick answer to **2 a**, **2 b** and **2 c**.
- 4 How could the answers to **2 a**, **2 c**, **2 g** and **2 h** help the supermarket? Give reasons for each.
- 5 Prepare two other questions that Sam could ask. Give your reasons why this information would be helpful for the supermarket.
- 6 Who else may want to know the results of Sam's Super Survey?
- 7 What code could you use to collect answers for the questions: "Do you shop daily, weekly, fortnightly or irregularly?"
- 8 At 9 am there were 100 cars in the carpark. At 11 am there were 110, 1 pm 160, 3 pm 130 and 170 at 5 pm. Carefully draw a pictogram to show this information.
- 9
 - a Prepare a tally chart to show how people travelled to the supermarket between 10 am and 11 am. Sedan car 68, 4WD 22, Taxi 18, Bus 25, other vehicles 5.
 - b Could this information be shown as a
 - i dot plot
 - ii pictograph
 - iii column graph?
 Give reasons for your answer.
 - c Choose the best method to represent the information in **a**.

MENTAL SET 11A

<i>Favourite sport of class 5H</i>	
Football	7
Netball	13
Tennis	5
Soccer	3
Cricket	2

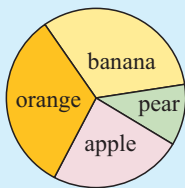
- How many students had netball as favourite?
- How many are in 5H?
- What sport is favoured least?
- What fraction of 5H favoured football?
- What fraction of 5H favoured soccer or cricket?



- The above graph is called a
- How many people eat D?
- How many people in the sample?
- What fraction eat B?
- What fraction eat C or D?

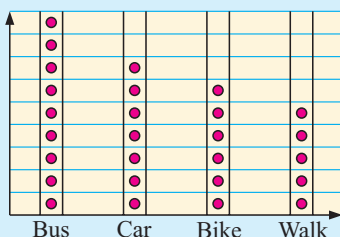
MENTAL SET 11B

Survey of favourite fruit



- What is the name of this type of graph?
- Which fruit was most favoured?
- Which fruit was least favoured?

How students in 5B travel to school



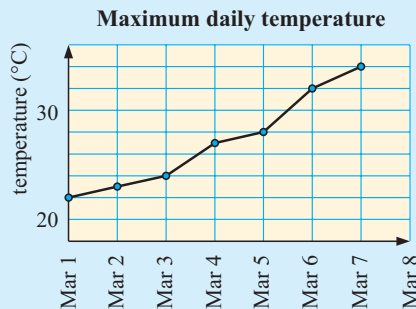
- How many students travel by bus?

Use this pictograph to answer questions 5 to 10.

<i>Salesperson</i>	<i>Number of cars sold by KGT cars during May</i>
Bob	6 cars
Sandra	4 cars
Joanna	6 cars
David	8 cars
Susan	4 cars
represents 2 cars sold	

- How many people sell cars for KGT cars?
- During what month are the above figures for?
- What does the car symbol represent?
- How many cars did Sandra sell?
- How many cars did Susan sell?
- How many cars were sold in total?

MENTAL SET 11C



Use the graph to answer these questions.

- What is shown on the horizontal axis?
- What is shown on the vertical axis?
- Which day was hottest?
- Which day was coolest?
- During the week, what happened to the temperatures?
- What was the maximum daily temperature on March 2?
- What was the maximum daily temperature on March 6?
- What was the difference in maximum daily temperature between March 1 and March 7?
- Between which two days was the greatest increase in temperature?
- What was the increase in 9?

REVIEW EXERCISE 11A

1 Below are the results of a survey where the students in 5K were asked:

“How many students are there in your family?”

1 3 2 2 1 4 2 3 3
2 1 3 2 1 4 5 2 2

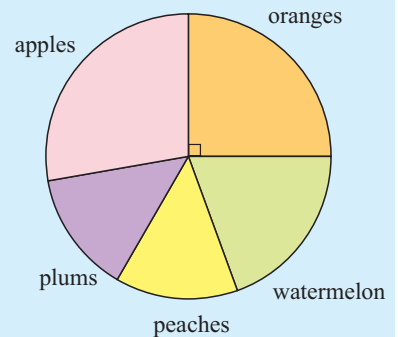
- a Make a tally table and total each row.
- b Draw a column graph to display these results.

2 “Smiths Newsagency” sells magazines, newspapers, stationery, books and gifts. The table shows the profits from each of the categories for one week. Draw a bar graph to represent this information.

Item	Weekly profit
magazines	\$270
newspapers	\$240
stationery	\$60
books	\$40
gifts	\$100

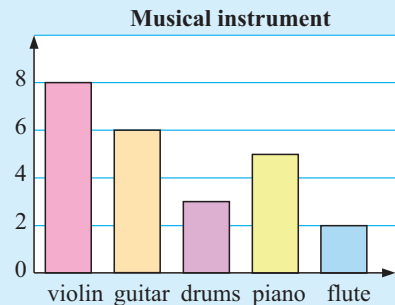
3 Class 5H were asked to name their favourite fruit. The pie graph shows their choices.

- a Which fruit did most children prefer?
- b What fraction of the children preferred oranges?
- c Which two fruits were chosen by more than half of the children?
- d Which two fruits were chosen by equal numbers of children?
- e If there were 20 children in 5H, how many chose oranges?



4 The column graph shows the musical instrument played by each student in class 5W.

- a Which was the most popular instrument, and how many students played it?
- b How many students had a piano as their instrument?
- c How many students were in class 5W?



REVIEW EXERCISE 11B

1 Sun-Lee decided to count the number of cars, trucks, vans and buses which passed the bus stop. The results are listed below:

C = car, T = truck, C C C V T C B C C V C C
V = van, B = bus T T C C C C T V B C T C
C V V C V C

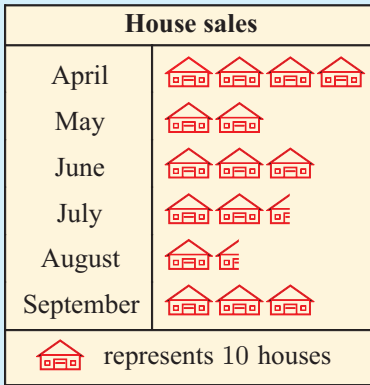
- a Make a tally table and total each row.
- b How many vehicles passed Sun-Lee at the bus stop in this five minute period?

2 Tony tossed three coins thirty times and obtained the following results.

Draw a column graph to display the information in this table.

'3 heads'	2
'2 heads'	13
'1 head'	12
'0 heads'	3

3

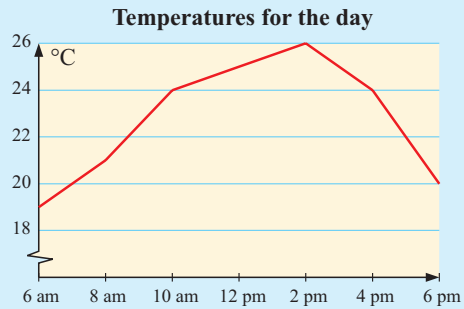


The pictograph shows the number of houses sold by Bill Black Real Estate in a six month period.

- a How many houses were sold in
 - i June
 - ii August
- b In which month were
 - i the most houses sold,
 - ii the least number of houses sold?
- c What was the total number of sales over the winter months (June, July, August)

4 This line graph shows the temperature taken every two hours during the day.

- a What was the highest temperature? At what time did this occur?
- b What was the lowest temperature? At what time did it occur?
- c The temperature at 5 pm was the same as the temperature at

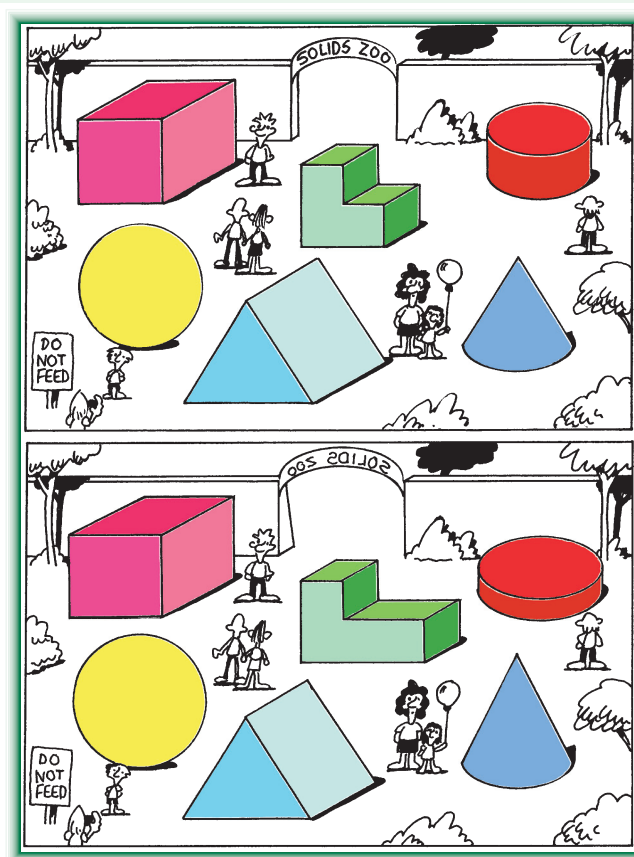


Chapter 12

3 dimensional shapes

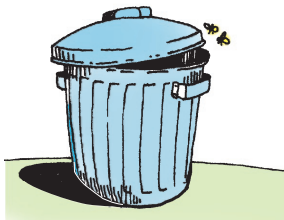
In this chapter you should learn to:

- ✓ recognise features of 3D objects
- ✓ name special 3D objects
- ✓ make solids from nets
- ✓ draw pictures of 3D objects
- ✓ make containers and models



A NAMES OF SPECIAL SOLIDS

Solids are objects which occupy space.



However, unlike the name suggests, a solid in geometrical language may be hollow.

A piece of timber is a solid and so is a rubbish bin.

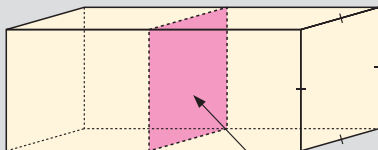


ACTIVITY

CROSS-SECTIONS OF SOLIDS

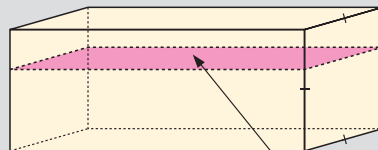


A **cross-section** of a solid is the shape of a slice through it.



a square

If we slice this box vertically the cross-section is a square.



a rectangle

If we slice this box horizontally the cross-section is a rectangle.

What to do:

Just for fun, draw vertical cross-sections of

- a loaf of bread
- a licorice allsort
- a swiss roll
- an empty match box

PRISMS AND CYLINDERS

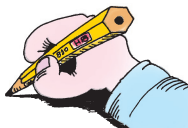
A refrigerator



is a rectangular prism. Its cross-section would be a rectangle.



A pencil



is a hexagonal prism. Its cross-section would be a hexagon.



A battery



is a cylinder. It has a uniform cross-section which is a circle.



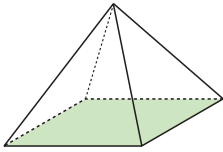
Prisms are solids with a uniform cross-section. A prism is usually named by its end or cross-sectional shape. A prism has rectangles for its other faces.

Cylinders are solids with uniform circular cross-section.

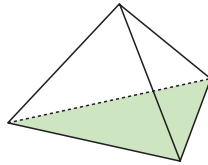


Uniform suggests 'the same'.

PYRAMIDS



square-based pyramid



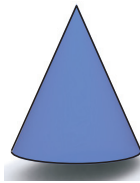
triangular-based pyramid

A **pyramid** is a solid with a polygon base. It has triangular faces which come from its base to meet at a point called the **vertex**.



CONES AND SPHERES

A **cone** is a solid with a circular base and a curved surface from the base to a point called the **vertex**.



cone



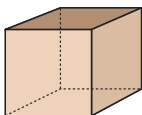
A **sphere** is a ball shaped solid.



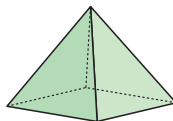
sphere



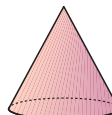
NAMES OF SPECIAL SOLIDS



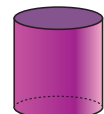
cube



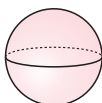
square-based pyramid



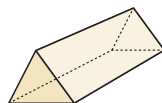
cone



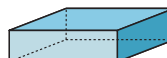
cylinder



sphere



triangular prism



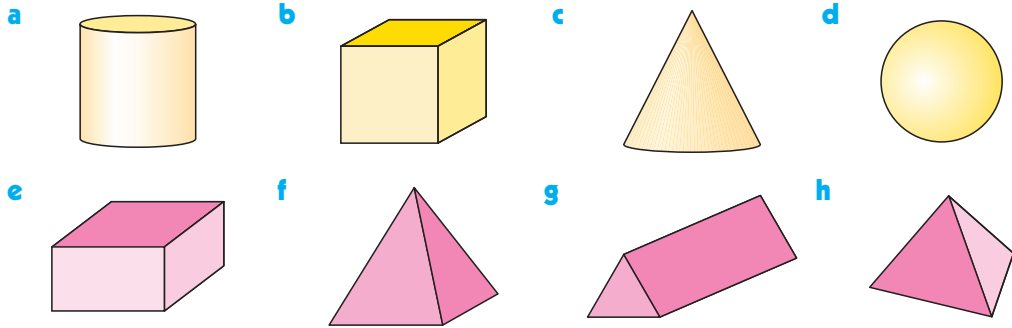
rectangular prism



tetrahedron

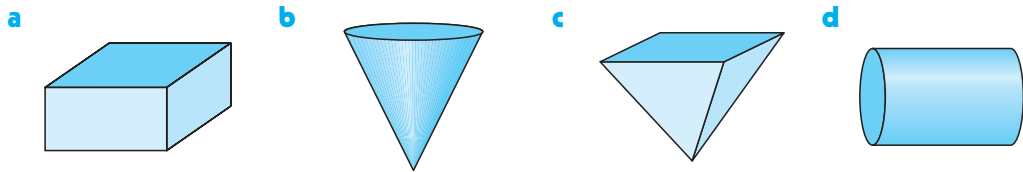
EXERCISE 12A

1 Name these solids.



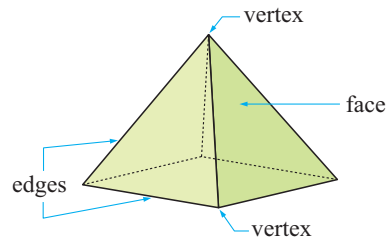
- 2 a Most of the solids in question 1 have one thing in common.
 i What is it? ii Which solid does not have that common thing?
 b What do solids a, c and d have in common?
 c Name an everyday use for each solid.

3 Draw free-hand sketches and name each object.



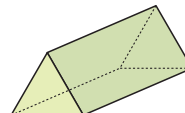
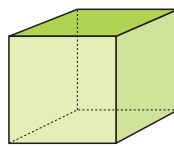
POLYHEDRA

Solids with flat surfaces are called **polyhedra**.
 One of them is called a **polyhedron**.
 Each flat surface is called a **face**.
 An **edge** is where two faces of a polyhedron meet.
 A **vertex** (plural **vertices**) is where three or more faces meet. It is a **corner** of the polyhedron.



Notice that a square-based pyramid has two types of faces. These are a square (base) and an isosceles triangle (4 of them).

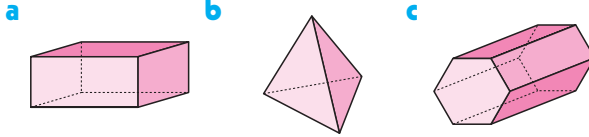
- 4 a How many faces has a cube?
 b How many edges has a cube?
 c How many vertices has a cube?
 d Name the shape of each face of a cube.
- 5 a How many faces has a triangular prism?
 b How many edges has a triangular prism?
 c How many vertices has a triangular prism?
 d Name the shapes of the faces of a triangular prism.



Solids with all flat surfaces belong to the polyhedra family.



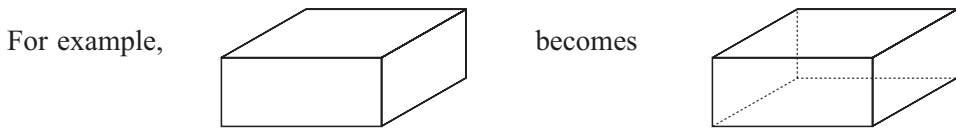
6 Copy and complete the table for these solids.



Solid	a	b	c
Number of vertices			
Number of edges			
Number of faces			

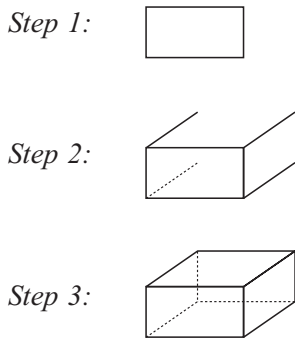
B SKETCHING SOLIDS

Sides which cannot be seen from the direction facing the solid are called **hidden edges**. Adding 'dashed lines' or 'dotted lines' helps us see the object with greater realism.

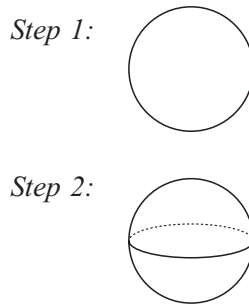


To draw your own solids, follow these steps.

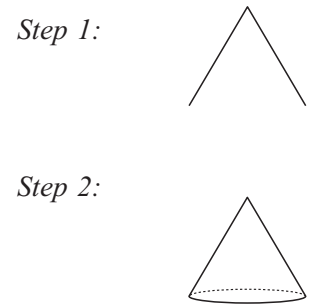
CUBE OR BOX



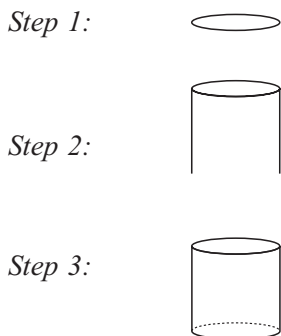
SPHERE



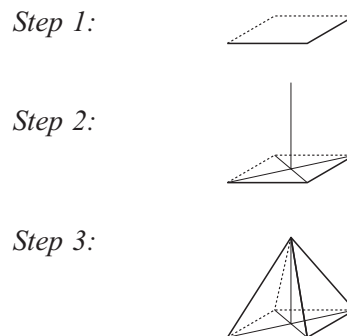
CONE



CYLINDER



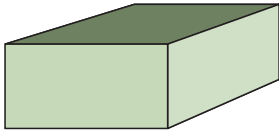
PYRAMID (square-based)



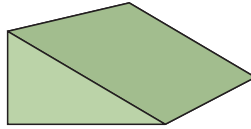
EXERCISE 12B

1 Copy and draw in the hidden edges of these solids.

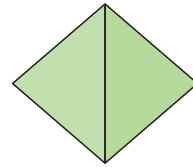
a



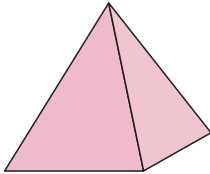
b



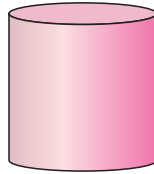
c



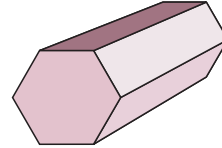
d



e



f



2 Name the solids in question 1.

3 Draw a a cube b pyramid c rectangular prism.

C

MAKING SOLIDS

ACTIVITY

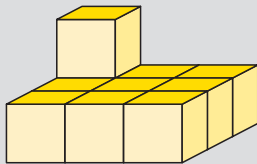
USING BLOCKS



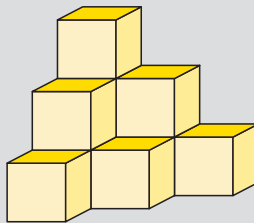
What to do:

Use blocks to make up these solids.

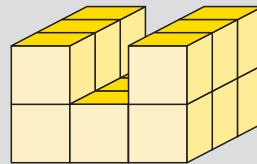
a



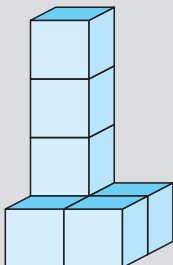
b



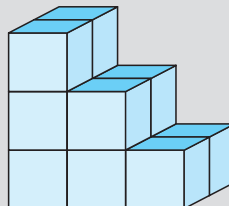
c



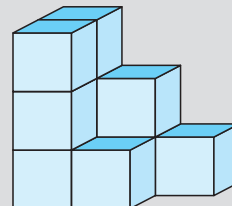
d



e



f

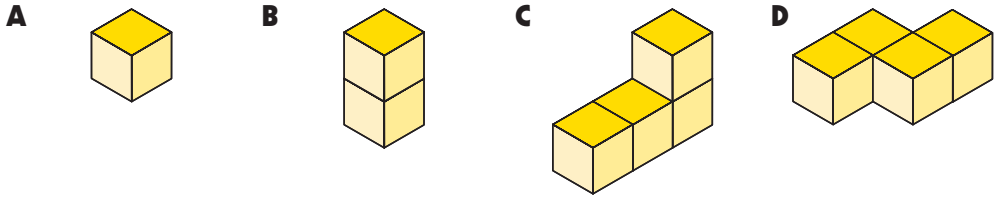


Click on the icon to find a program that will enable you to construct solids.

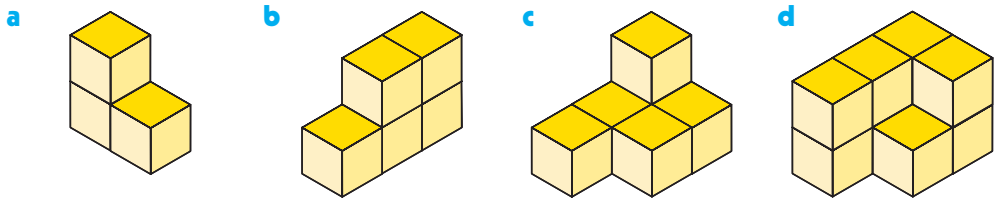


EXERCISE 12C

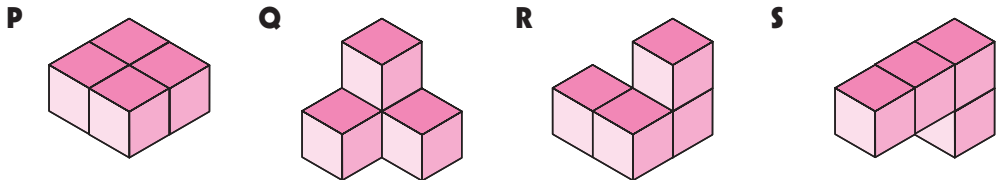
1 Cubes like the **A** have been glued together to make the blocks shown as **B**, **C** and **D**.



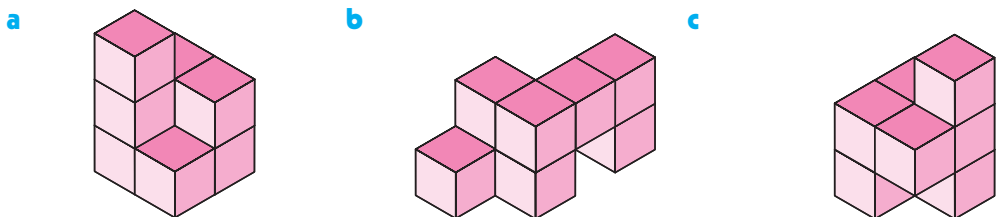
Which of these blocks would you use to make these solids?



2 You are given these joined block models.



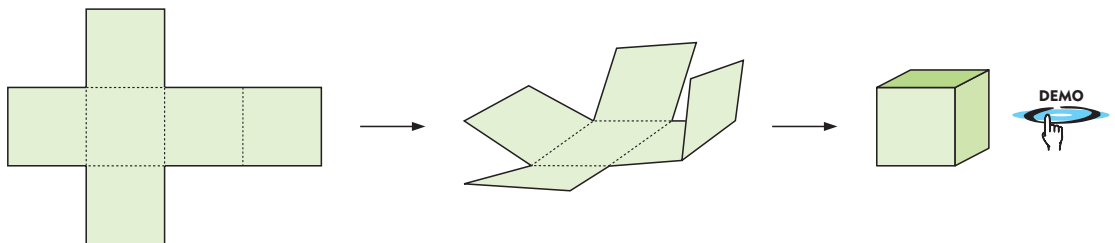
Which of them would you use to make these solids?



NETS

Nets are patterns which can be folded along certain lines so that we can make models of solids.

For example, a **cube** is formed when this net is cut out and folded along the dashed lines.

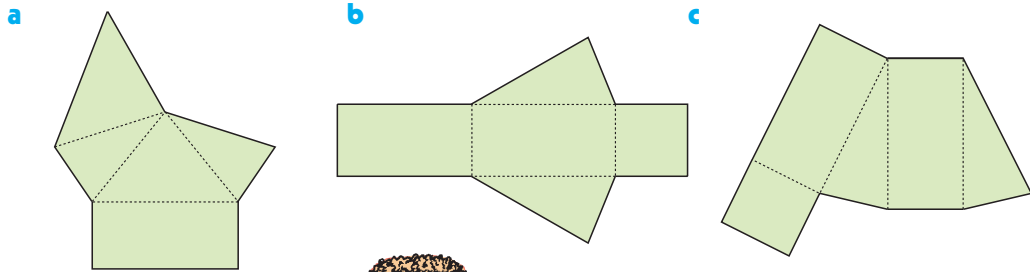


3 Click on the icon to obtain printable nets. Make these solids using light card.

- a a triangular-based pyramid
- b a cube
- c a square-based pyramid
- d a box



- 4 How would you change the net for the box so that you would be able to make an open box?
- 5 Draw and name the solids which would be formed from these nets.



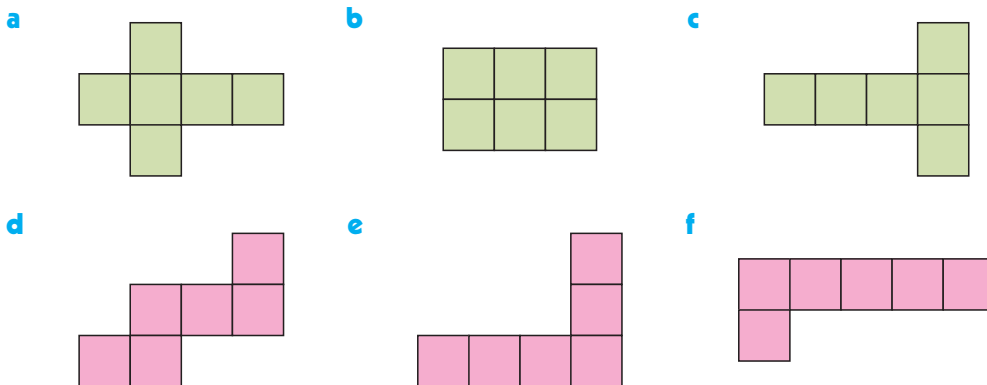
These nets are also available by clicking on the icon.



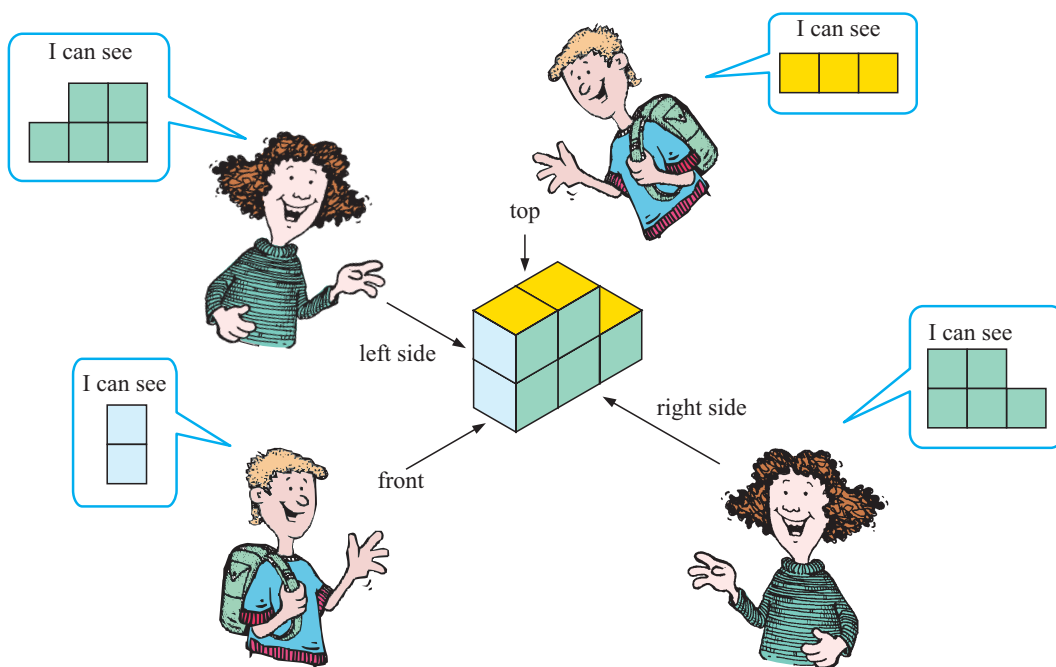
- 6 Match the net given in the first column with the correct solid and the correct name.

	<i>Net</i>		<i>Solid</i>		<i>Name</i>
a		A		(1)	pentagonal pyramid
b		B		(2)	tetrahedron
c		C		(3)	triangular prism
d		D		(4)	square-based pyramid

7 Which of these nets can be used to make a cube?



D VIEWS FROM DIFFERENT DIRECTIONS



The four views of objects (from the left, right, top and front) are the views from those directions. Blockbuster will enable you to view solids from different directions.

The view from the top is called the **plan view**.



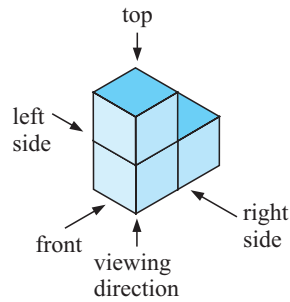
EXERCISE 12D

- 1 Use blocks to make the object shown above and view it from the four directions (front, top, left and right).

2 Use blocks to make this solid.

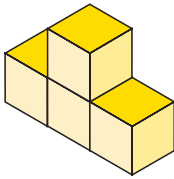
Draw views of the solid from

- a the front
- b on top
- c the right side
- d the left side

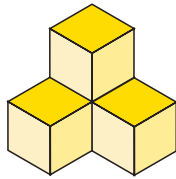


3 For these solids

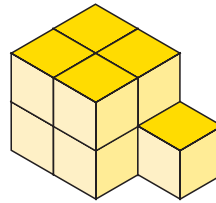
a



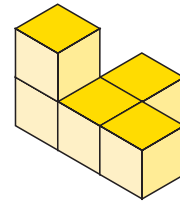
b



c



d



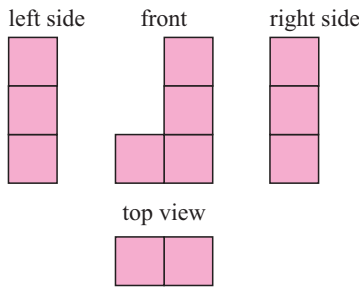
- i draw the front view
- iii draw the right side view

- ii draw the top (or plan) view
- iv draw the left side view

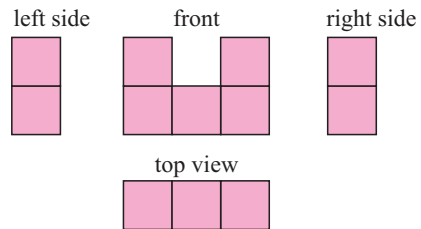
4 Challenge

Draw the block that has these views.

a



b



E

MAKING CYLINDERS AND CONES

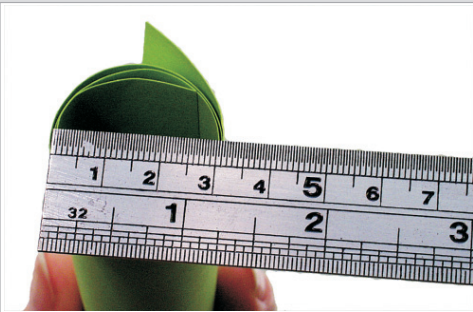
ACTIVITY

MAKING HOLLOW CYLINDERS



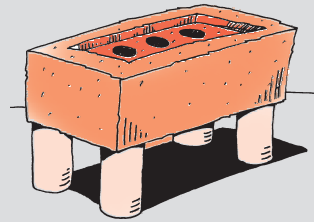
Using this method, make a hollow cylinder 10 cm in length and 3 cm in diameter.

- Obtain a sheet of A4 photocopying paper. Cut it lengthwise to get a 10 cm wide strip.
- Roll up the strip, not too tightly, and without bending the paper so that the cylinder's diameter is about 2 cm. Hold it carefully in one hand.
- Release the paper gradually until it unwinds to 3 cm diameter. Check frequently with your ruler.
- Stick it fast with tape in two or more places.



What to do:

- 1 Make your own cylinder of length 15 cm and diameter 3 cm.
- 2 Are four of these cylinders strong enough to support a house brick?



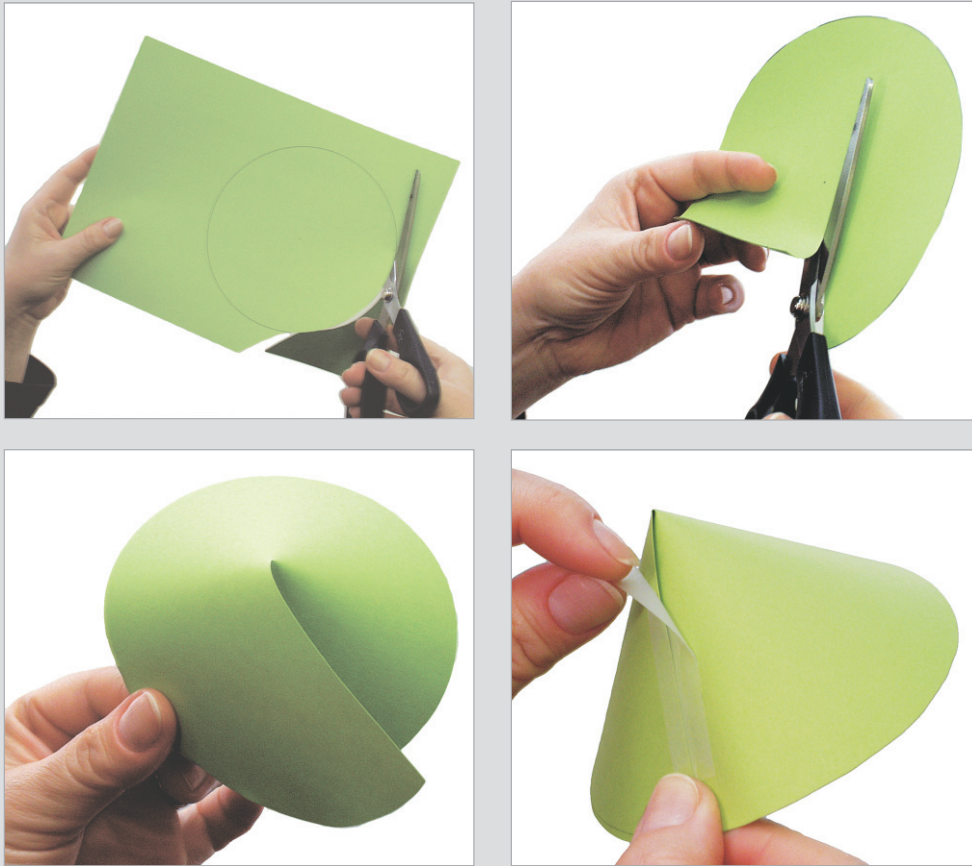
ACTIVITY

MAKING CONES



Follow these instructions to make a hollow cone.

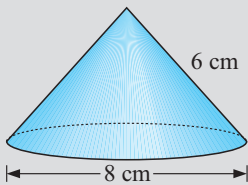
- Obtain a sheet of A4 photocopying paper. Draw a circle (using a compass) of radius 6 cm on it.
- Use scissors to cut a straight line from any point on the circle to its centre.
- Slide one cut line across the other cut line to get a cone.
- Use tape to hold the cone in position.



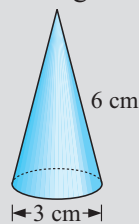
What to do:

1 Carefully make cones of this shape using the method given.

a



b



F

THE PLATONIC SOLIDS

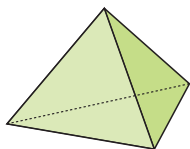
Recall that a polyhedron is a solid with faces in the shape of polygons.

A **regular polyhedron** is a solid where

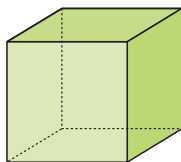
- all the faces are identical (same shape and size)
- all the edges are identical (same length)
- all the vertices have the same number of edges meeting at them
- all the faces must be regular polygons.

There are *only five* solids which fit these conditions for a regular polyhedron. These solids have been known for at least three thousand years.

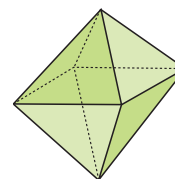
They are called the **Platonic Solids**, after the Greek philosopher **Plato**.



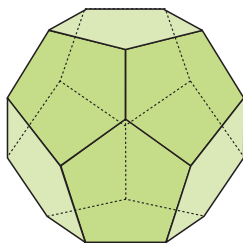
Tetrahedron



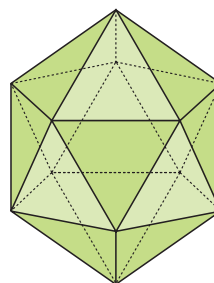
Cube



Octahedron



Dodecahedron



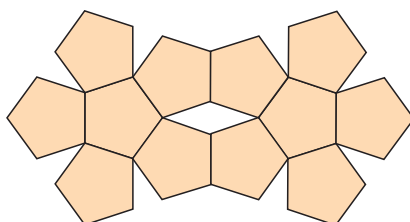
Icosahedron



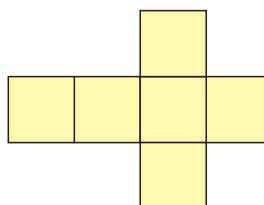
EXERCISE 12F

- 1 Below are the nets which can be used to make each of the Platonic Solids.

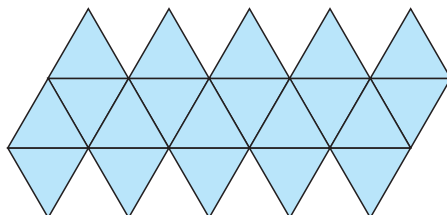
A



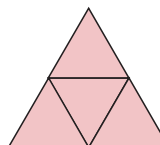
B



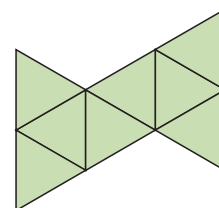
C



D



E



Match the nets with the names.

- a** tetrahedron **b** cube **c** octahedron
d dodecahedron **e** icosahedron

- 2 **a** How many square faces are there on a cube?
b How many pentagonal faces are there on a dodecahedron?
c How many triangular faces are there on an icosahedron?
- 3 If octa means eight, what does icoso mean?

- 4 Click on the icon to obtain nets of the Platonic Solids. Photocopy onto light card and make up each of them.



SKILL TESTER

SOLID GEOMETRY

“SPOT THE DIFFERENCE”

There are two parts to this tester.

Part 1 You only need to use your eyes.

Ignore the solids and look for the differences in the rest of the picture.

The author found 20 differences. How many differences can you find?

List ten of them.

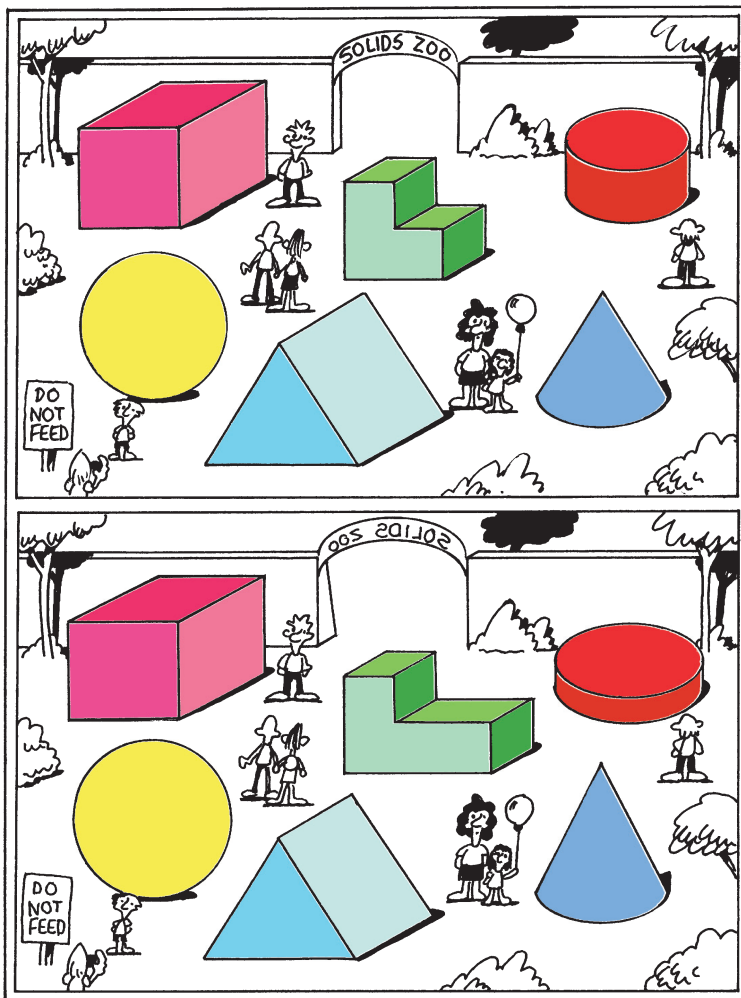
Part 2 Describe the differences in the solids.

You need to use your eyes, a protractor, geoliner or rotagram, a length of cotton and a ruler.

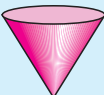
You must also use words like:

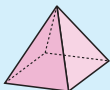
vertex, height, face, edge, perimeter, area, rectangular prism, cone, millimetres, base, circle, angle, sphere, length, degrees, width, diameter, cylinder, circumference, perspective, triangular prism.

There are at least ten differences you can describe.

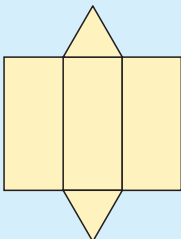


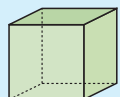
MENTAL SET 12A

1 Name this solid 

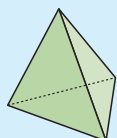
2 Name this solid 

3 Draw a sketch of a rectangular prism showing all hidden edges.

4 This is a net for making a 

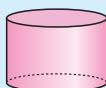
 for questions 5, 6, 7.

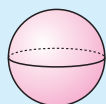
- 5 The cube has faces.
- 6 The cube has edges.
- 7 The cube has vertices

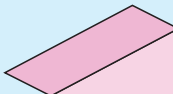
 for questions 8, 9, 10.

- 8 This solid has faces.
- 9 This solid has vertices.
- 10 This solid has edges.

MENTAL SET 12B

1  is a

2  is a

3 Copy and draw the hidden lines of 

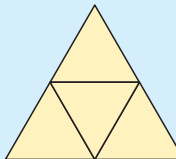
4 What is the name of the solid in 3?

5 The solid in 3 has faces

6 The solid in 3 has edges

7 The solid in 3 has vertices

8 Name the shapes of the faces of the solid in 3.

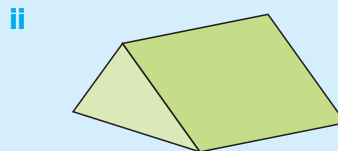
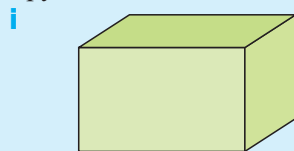
9 What is this the net of? 

10 How many faces would the solid made from the net in 9 have?

REVIEW EXERCISE 12

1 Draw freehand sketches of these solids.
 a a sphere b a cylinder c a cube

2 a Copy and draw the hidden edges of these solids.

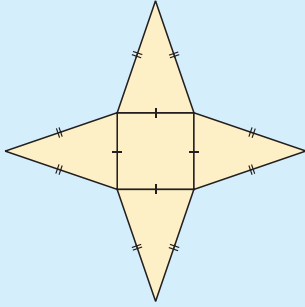


b Copy and complete for the solids in part a.

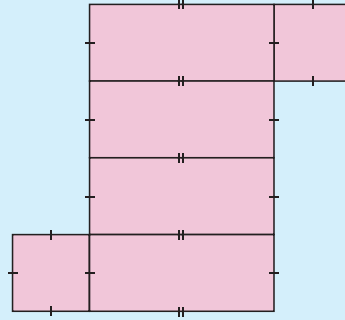
Name	i	ii
Number of vertices		
Number of edges		
Number of faces		

3 Draw and name the solids which would be formed from the following nets:

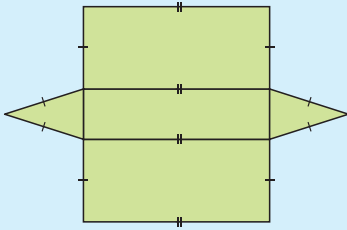
a



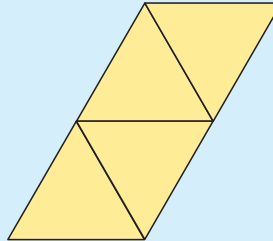
b



c

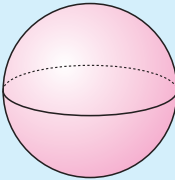


d

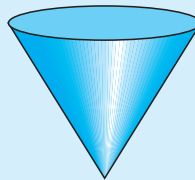


4 Name these solids.

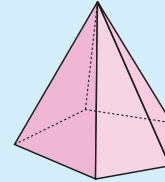
a



b



c



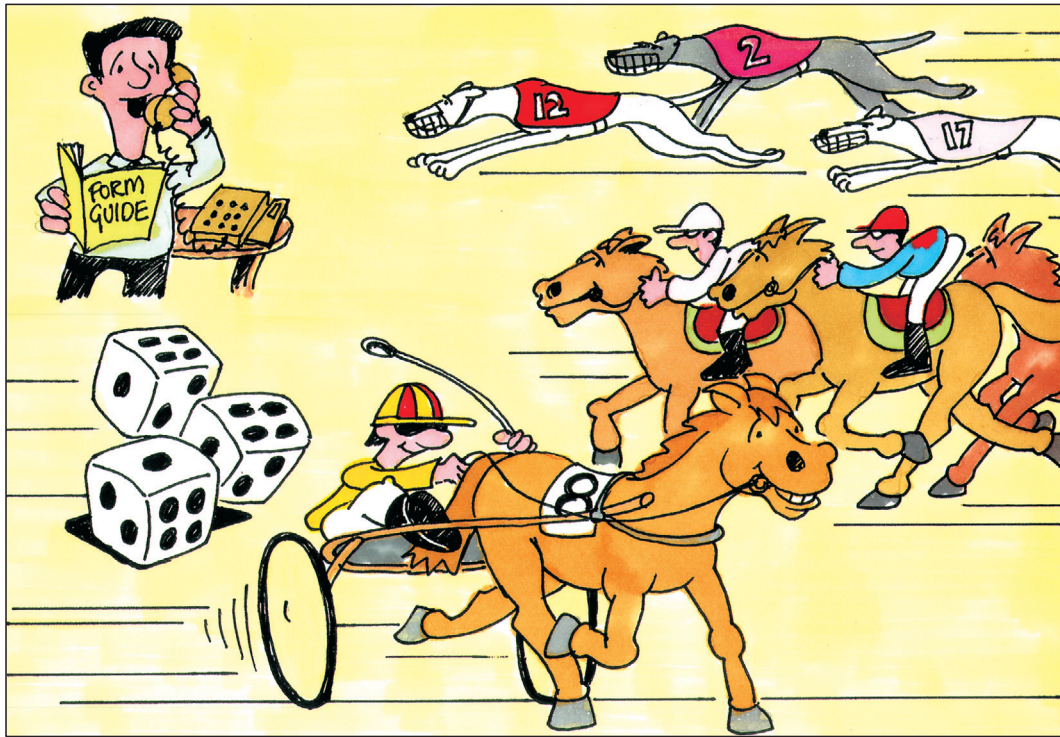
Chapter 13

Chance

In this chapter you should learn to:



- ✓ use words to describe the chance of something happening
- ✓ predict the likelihood of some event happening
- ✓ list all possible outcomes of an experiment
- ✓ find probabilities by experiment
- ✓ describe the chance of something happening using numbers



Many people like to predict what will happen in the future. During the last century there were many predictions that the World would come to an end.

This did not happen so the predictions were wrong.

However, such a terrible event could have happened.

For example, a giant asteroid could have crashed into the Earth and destroyed animal and plant life.

Things in the future have different chances of occurring and we have many words which help us describe them.

For example,

- It is *unlikely* that I could swim one kilometre without stopping.
- I *probably* won't be at school tomorrow because I am sick.
- There is a *50-50 chance* that the captain will win the toss.
- It is *very likely* to be over 30°C tomorrow.
- It is *impossible* for me to come to your birthday party next week because I will be on an overseas holiday with my parents.
- Of all the children competing at Sports Day, Jon is *least likely* to get tired because he is very fit.

A 50-50 chance means that it is equally likely that he will win or lose.



A

WORDS DESCRIBING CHANCE

DISCUSSION

DESCRIBING CHANCE



Choose from this list all words which describe the chance of something happening (or not happening) in the future.

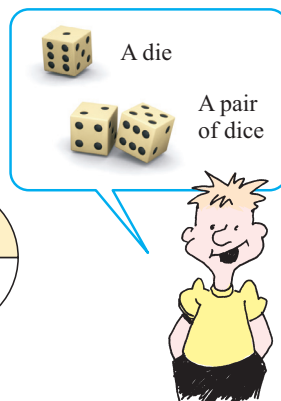
Words	Yes/no	Words	Yes/no	Words	Yes/no
possible	yes	difficult		quickly	
likely		certain		little chance	
tomorrow		five		rarely	
impossible		uncertain		lightly	
black		no chance		good chance	
unlikely		probably		never	
maybe		square		doubtful	
monthly		often		suddenly	

EXERCISE 13A

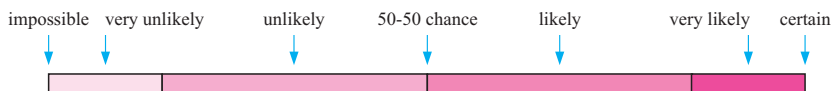
1 *certain, very unlikely, unlikely, never, very likely, likely, a 50-50 chance*

Choose from the given words or phrases, the chances that

- a the next triangle drawn will have four sides
- b you will roll a '3' the next time you roll a die
- c you will die from a bad case of influenza
- d the next time you toss a coin it will fall 'heads'
- e you will drink more than one litre today
- f a pentagon will have five sides
- g the next baby born will be a girl
- h the spinner alongside will finish on white
- i Peter will throw a 1, 2, 3 or 4 next time he rolls a die.

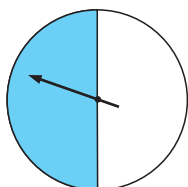


2 Ted uses this 'chance line' to help him decide on chances of events happening.

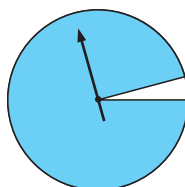


Draw a number line like Ted's showing the chances of these spinners finishing on blue.

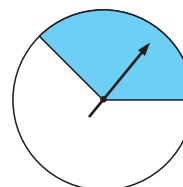
A



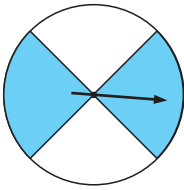
B



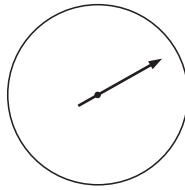
C



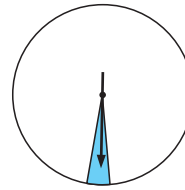
D



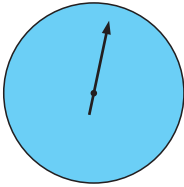
E



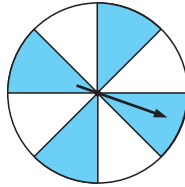
F



G

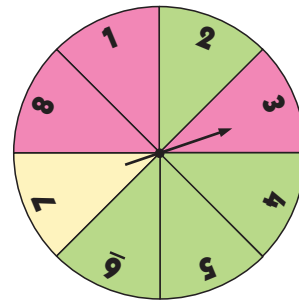


H



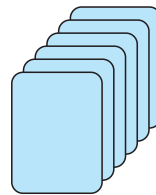
3 This spinner has eight equal sectors. At the moment it has stopped on 'grey 3'. Copy and complete these sentences.

- a** It is that the spinner finishes on a numbered sector.
- b** It is that the spinner finishes on 'yellow'.
- c** It is for the spinner to finish on '12'.
- d** It is for the spinner to finish on 'green'.
- e** It is for the spinner to finish on 'pink 7'.

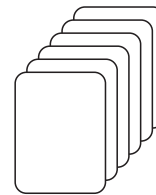


4 You have six blue and six white cards and must place *four* cards in a hat. What cards would you place in the hat if you want it to be

- a** certain of drawing out a blue card
- b** impossible to draw out a blue card
- c** a 50-50 chance of getting a blue card
- d** more likely to get a blue card than a white card



6 blue



6 white



Drawing a card out means taking one out without first identifying its colour.



5 You have five blue cards, five white cards and five grey cards and must place any three of them in a hat. What cards would you place in the hat if you want it to be

- a** impossible to get white or grey
- b** impossible to get white
- c** certain to get grey
- d** an equal chance of getting blue or white or grey

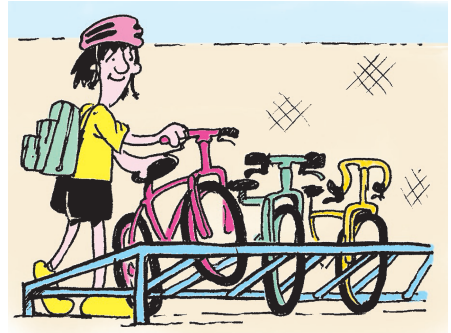
B WHAT DO YOU EXPECT?

Anna’s class went outside and wrote down the colours of the bikes in the bike stand. These are the results.

Bike colour	red	blue	green	pink	yellow	black
Number of bikes	7	3	4	1	5	10

From these results, Anna’s class was able to make these statements.

- There were $7 + 3 + 4 + 1 + 5 + 10 = 30$ bikes in the stand.
- 3 out of 30 bikes were blue.
- The most popular colour of bikes was black.
- The least popular colour of bikes was pink.
- The chance of seeing a green bike is 4 in 30.



EXERCISE 13B

1 Each student in Olga’s class recorded the sport they enjoyed playing most.

Sport	netball	soccer	rugby	tennis	golf	skateboarding	hockey
Number of students	7	6	3	4	2	5	1

Copy and complete these sentences.

- There were students in Olga’s class.
- The most popular sport was
- out of the students enjoyed netball most.
- The chance of a student enjoying netball the most is in
- The chance of a student enjoying skateboarding the most is in
- was the least enjoyed sport as only in said they enjoyed it.

2 Yuri surveyed his class members to see what their favourite food was. The results were:

Favourite food	chips	icecream	red meat	vegetables	chicken	fish
Number of students	10	7	2	1	6	4

- There were students in Yuri’s class.
- was the favourite food of most students.
- out of students put chicken as their favourite food.
- The chance that a student’s favourite food was icecream was in
- The chance that a student’s favourite food was fish was
- was the least favoured food as only in selected it.

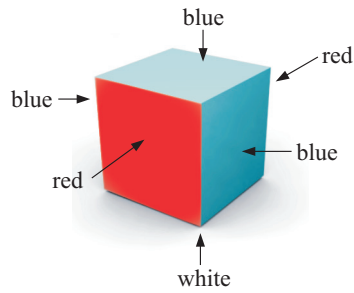
Often we try to **guess** what an outcome may be. This guess is called a **prediction**.

We try to **predict** what presents we will receive. We try to predict the winner of a football game.

Some people try to **predict** the numbers in Lotto.

3 On a die, three faces are painted blue, two faces are painted red and one face remains white.

- a** If the die was rolled many times, predict which colour would you expect on top most.
- b** If the die was rolled 30 times, predict how many times you would get
 - i** blue **ii** red **iii** white



c Experiment

Make a die like the one above by sticking blue coloured paper onto three faces and red on two others. Roll the die 30 times and record your results in a table like this one.

Result	Tally	Total	Prediction
blue			
red			
white			

Get results from other groups and compare them with yours. Keep this die to use later.

- d** Do your results and those of other groups agree with your predictions in **b**?



We seldom get exactly what we expect, but with many repeats the results are usually fairly close to it.

4



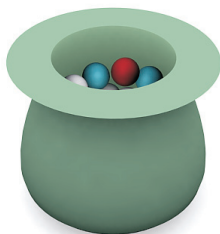
This spinner has eight equal sectors and is spun 80 times.

- a** Which result would you expect to occur
 - i** most often **ii** least often
- b** Do you predict any results to occur equally?
- c** How many times do you predict you will get
 - i** yellow **ii** blue **iii** green
 - iv** red?

5 Draw a diagram of a spinner which uses the colours red, white and blue where

- a** red, white and blue have equal chance of occurring
- b** red has the greatest chance and blue has the least chance of occurring
- c** red has no chance and blue has a greater chance than white of occurring

6



Draw three quick sketches of a bag of 15 marbles. A marble is to be drawn from the bag without looking.

Colour the marbles red, white or blue if

- a** all colours have an equal chance of occurring
- b** red is most likely and white is least likely
- c** blue is very likely and red cannot occur

DISCUSSION

SKILL OR 'FLUKE'



At basketball Tony throws a goal on the first attempt from a 4 m distance.

- Does this mean that Tony will throw goals all of the time or even most of the time?
- Which is more likely to be the truth? Tony is excellent at throwing goals and will throw them most of the time *or* Tony's throw was a bit of a 'fluke'.
- How could you test your feelings about how good (or bad) Tony is at throwing goals?



C

POSSIBLE OUTCOMES

Most coins have a 'head' side which usually shows the head of a King, Queen, Prime Minister or President. The other side is called the 'tail' side.

When tossing a coin there are *two* possible outcomes.

This is the 'head' side (H)



This is the 'tail' side (T)

When rolling a die there are *six* possible outcomes.



These are: 1, 2, 3, 4, 5 or 6.

When rolling a pair of dice these are the ways you can get a total of 5.

We could list them as (1, 4) (3, 2) (2, 3) (4, 1) to save us drawing them.



EXERCISE 13C

- 1 If a die and a coin are tossed, list the possible outcomes.

Hint: One possible outcome is 4H meaning a 4 with the die and a head with the coin.

- 2 Which of the outcomes in question 1 could be described as getting
 - a an even number and a head
 - b a prime number and a tail

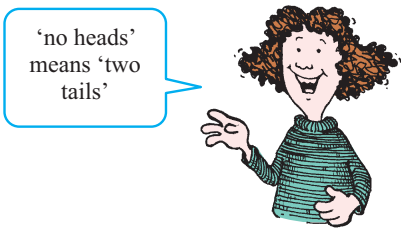
- 3 Here are the possible outcomes when tossing two coins.



List the possible outcomes using H for 'heads' and T for 'tails'.

4 When tossing two coins many times, can you explain why you should expect to get

- a equal numbers of 'two heads' and 'no heads'
- b twice as many 'one head' as 'two heads'?



5 a Copy and complete this array for possible outcomes when rolling a pair of dice (A and B) or 2 different coloured dice.

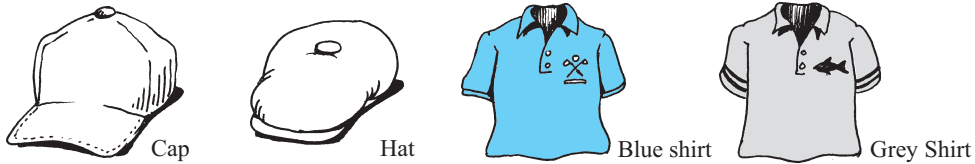
				
				
				
				
				

Name the dice A and B.
 means die A shows 3 and die B shows 4.



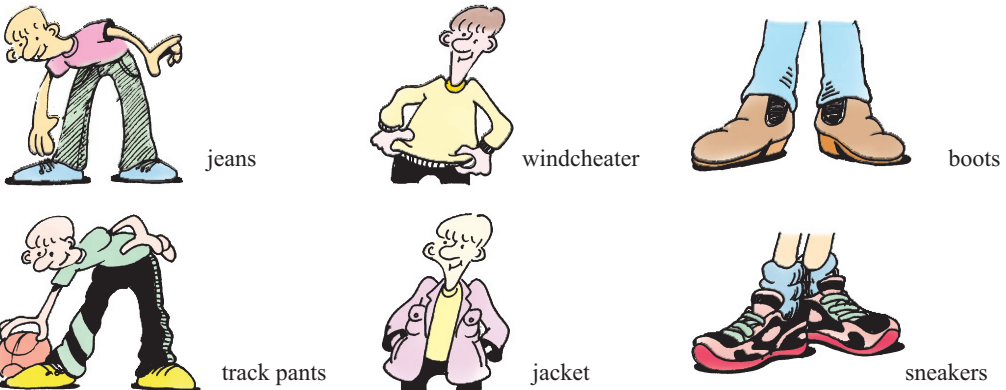
- b How many different outcomes are possible?
- c How many different outcomes have a sum of
 - i two
 - ii three
 - iii seven
 - iv twelve

6 Tiger has two caps and two shirts.



Using C to represent cap, etc list all possible ways that Tiger could choose a cap and a shirt.

7 Matt can choose from jeans or track pants, jacket or windcheater and boots or sneakers.



Give all possible ways Matt could dress by choosing one bottom, one top and one footwear.

D

PROBABILITY BY EXPERIMENT

In an experiment we need to use correct words to describe what we are doing.

For example,

Sarah does an experiment. She tosses a coin 10 times to find how many times it will land 'heads'.

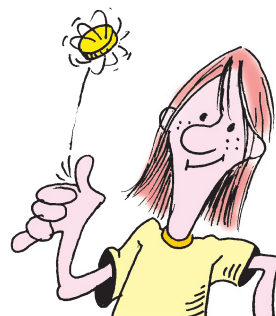
This means that there are 10 trials.

The possible **outcomes** for one trial are heads or tails.

The **event** is 'getting a head'.

The **likelihood** of 'getting a head' in 1 trial is 1 chance in 2 or 50%.

The **probability** of a head is $\frac{1}{2}$ or 50%.



EXERCISE 13D

1 Angelo tosses a coin 10 times. He wants to see how many tails he will obtain.

- a How many trials are there?
- b What are the possible outcomes for one trial?
- c True or false? The event is 'getting a tail'.
- d Copy and complete these sentences.

..... out of the possible outcomes are tails.

The likelihood of 'a tail' is in

The probability of 'a tail' is $\frac{\text{.....}}{\text{.....}}$.



2 Tony rolls a die 30 times. He wants to see how many even numbers he will obtain.

- a How many trials are there?
- b What are the possible outcomes for 1 trial?
- c True or false? The event is 'getting an odd number'.
- d Copy and complete these sentences.

..... out of the possible outcomes are even numbers.

The likelihood of an even number is in

The probability of an even number is $\frac{\text{.....}}{\text{.....}}$ or%.

If a card is chosen at **random** it means that every card has the same chance of being chosen.

3 Rachael has five cards marked on one side.



She shuffles them, then asks Eli to take one card at **random**.

- a How many trials are there?
- b What are the possible outcomes?
- c The likelihood of a letter of the alphabet is in
- d The probability of an 'A' is $\frac{\text{.....}}{\text{.....}}$ or%



- 4 Yong has a bag containing four marbles. Three are blue and one is red. Meredith takes a marble at random from the bag, looks at its colour, then puts it back. She then takes another marble at random, looks at its colour, then puts it back. This continues until she has 12 results.
- How many trials are there?
 - What are the possible outcomes for one trial?
 - Copy and complete these sentences.
 - out of the possible outcomes is red.
 - The likelihood of getting 'a red marble' is ... in ...
 - The probability of 'a blue marble' is $\frac{\dots}{\dots}$ or%.
 - How many red marbles could Meredith expect in her results? Would she get exactly this number? Discuss why/why not.

MENTAL SET 13A

- In an experiment a die is rolled 25 times and each outcome is recorded. How many trials were there?
- It is likely for the spinner to finish on pink than on white.
- What outcomes could occur when you toss a coin?
- There were 40 cars in a carpark. 10 of them were white. The chance of seeing a white car in the carpark was%.



There are marbles numbered 1 to 9 in a bag. One marble is taken at random from the bag.



Now answer questions 5 and 6.

- The likelihood that the marble is odd is in
- The probability that the marble is less than 10 is%.

Choose from these words to answer 7 - 10:

- impossible very unlikely unlikely likely 50-50 chance very likely certain*
- A cube has 8 vertices.
 - Paul will toss 6 'heads' in a row when he tosses a coin.
 - The temperature will be above 5°C on Christmas day in Adelaide.
 - It will rain on 10 or more days during January in Adelaide.

MENTAL SET 13B

- What outcomes could occur when you roll a die?
- If you rolled 2 dice, which outcomes would give you a sum of 11?
- If you toss 2 coins, which result ('2 heads', '1 head', 'no head') would you expect most often?
- For this spinner, the likelihood of getting A is ... in
- The possible outcomes when you toss 2 coins are HH, HT, TH, TT. The likelihood that the outcome is 2 tails is ... in



- There are 3 oranges, 3 apples and 4 bananas in a bowl of fruit. One piece of fruit is chosen at random. It is equally likely that it is or

Choose from these words to answer questions 7 - 10:

- impossible very unlikely unlikely likely 50-50 chance very likely certain*
- You will throw an even number next time you roll a die.
 - A triangle has 3 sides.
 - It will snow in Darwin.
 - Your new car will be dented in the first two years that you own it.

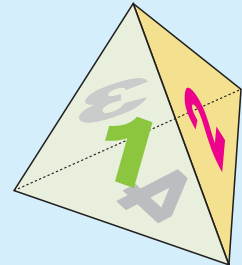
REVIEW EXERCISE 13A

1 From this list of words or phrases, *certain, very unlikely, unlikely, never, very likely, likely, a 50-50 chance* choose the chances that

- a the next square drawn will have four equal sides
- b it will rain on Christmas Day in Perth
- c Jenny will roll a prime number the next time she rolls a die.

2 a Copy and complete this array for possible outcomes when rolling a pair of tetrahedral dice with faces marked 1, 2, 3, 4.

1, 1	1, 2	1, 3	1, 4
2, 1	2, 2	.....	.....
3, 1	.....	.....	.....
4, 1	.....	.....	.....

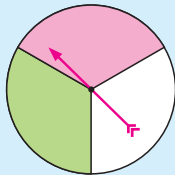


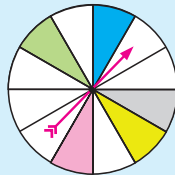
- b How many different outcomes are possible?
- c How many different outcomes have a sum of
 - i two
 - ii three
 - iii four
 - iv eight

3 If, in one year, 1000 babies were born in a city hospital, how many would you expect to be girls?

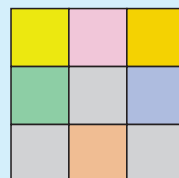
- 4 Draw a diagram of a spinner which uses the colours red, white and blue where
- a red, white and blue have equal chance of occurring
 - b red has no chance of occurring and white has a greater chance than blue of occurring
 - c blue and white have equal chance of occurring and red has the greatest chance of occurring

5 The arrow spins on the coloured circle. What is the likelihood that the arrow will finish on white?

a  chance in

b  chance in

6 A coin is tossed and it lands on one square of the board shown. What is the probability that it lands on grey?





















SKILL TESTER

'DEALING WITH CHANCE'



READ ABOUT ZAC'S CARDS

A pack of playing cards is divided into four suits called diamonds , clubs , hearts , and spades . The cards that Zac is using in each suit are the 10, Jack (J), Queen (Q), King (K) and Ace (1).

Study the picture carefully.

- 1 Choose the best word from the list: *certain, unlikely, impossible, probably, very likely, 50:50 chance, very unlikely, likely* to describe the chance of the following happening.
 - a
 - i The sun will not rise tomorrow.
 - ii The sun will shine tomorrow.
 - iii The sun will be eclipsed tomorrow.
 - b
 - i In twelve hour's time it will be raining outside.
 - ii In twelve hour's time it will be sunny outside.
 - iii In twelve hour's time it will be night outside.
 - c
 - i Both flies will run up the wall.
 - ii Both flies will land on Zac's nose.
 - iii Both flies will play cards with Zac.
 - d The *next* card Zac draws from the pack will be
 - i blue
 - ii an ace
 - iii a red king
 - iv black
- 2 Answer *True* or *False* to the following. If Zac spun the spinner 20 times:
 - a the 2 was likely to come up more times than any other number
 - b an odd number was likely to come up more times than an even number
 - c the total scores of 20 spins could be 100
 - d six consecutive threes could come up
- 3 Write *True* or *False* to the following. The next 3 cards Zac draws from his pack **could** be
 - a , , 
 - b , , 
 - c , , 
 - d , , 
- 4 When the pair of dice are rolled, how many possible outcomes are there for a total of
 - a twelve
 - b three
 - c six
 - d one

Extension

- 5 Use numbers, not words, to answer the following: Before Zac started to draw the first card, what chance did it have of being
 - a black
 - b blue
 - c an Ace
 - d 
 - e 
- 6 Which cards could Zac predict most accurately? The first four or the last four? Give your reasons.
- 7 Why is Zac playing chance games? List 3 reasons.

INVESTIGATION

TOSSING A COIN



When tossing a coin there are two possible results for the face which is seen from above. These are: 'heads' or 'tails'.

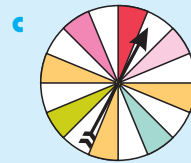
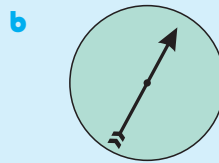
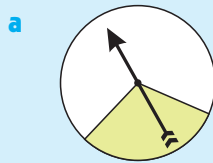
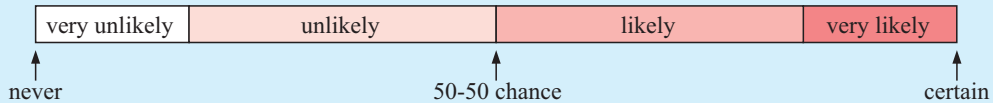
What to do:

- 1 Toss a coin 20 times and tally the number of 'heads' and 'tails'.
- 2 Repeat step 1 four more times and record your results in a table like this one.
- 3 Discuss the results you found for
 - a the 20 toss rounds
 - b the final totals

	Heads	Tails
First 20 tosses		
Next 20 tosses		
Next 20 tosses		
Next 20 tosses		
Final 20 tosses		
Totals		

REVIEW EXERCISE 13B

- 1 Copy the 'chance line' and show on it the chances of the spinner finishing on white.



- 2 Draw three quick sketches of 6 marbles in a jar. A marble is to be drawn from the jar without looking. Colour the marbles red, white or blue if
 - a all colours have an equal chance of being chosen
 - b red is most likely and blue cannot occur
 - c red and blue are equally likely but white is most likely
- 3 Here are the possible outcomes when tossing a 5 cent, a \$1 and \$2 coin.



- a List the possible outcomes using H for 'heads' and T for 'tails'.
- b How many different outcomes are possible?
- c Of these outcomes, how many have
 - i 3 heads
 - ii 2 heads
 - iii 1 head
 - iv 0 heads



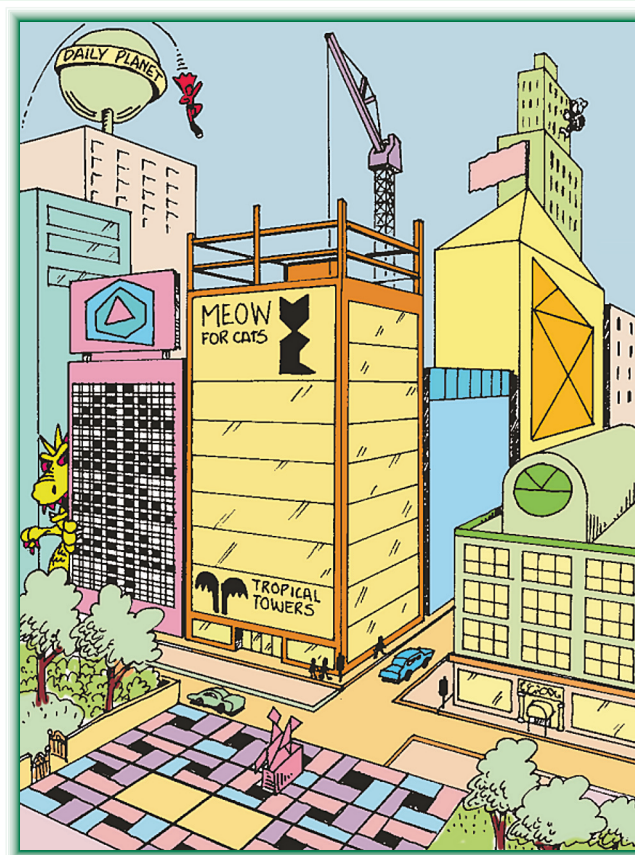
- 4 What is the probability of the arrow pointing to D for this spinner?

Chapter 14

Transformations

In this chapter you should learn to:

- ✓ tessellate shapes to make designs
- ✓ recognise translations, reflections, rotations and enlargements
- ✓ translate, reflect, rotate and enlarge figures



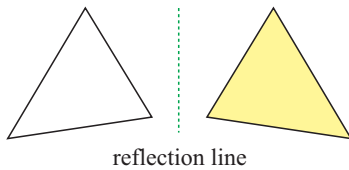
A TRANSFORMING SHAPES

We will look at four ways of transforming figures.

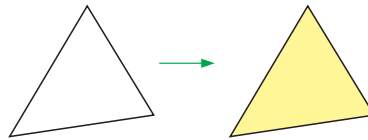
They are **reflection**, **translation**, **rotation** and **enlargement** (or reduction).

Here are some examples.

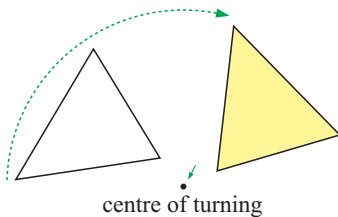
- a reflection (or flip)



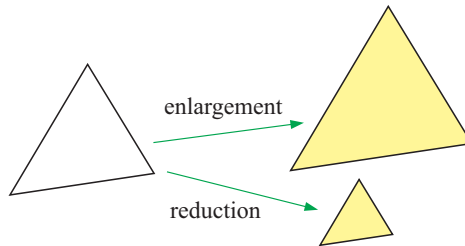
- a translation (or slide)



- a rotation (or turn)



- an enlargement or reduction



EXERCISE 14A

1 What transformation is shown in these photographs?

a

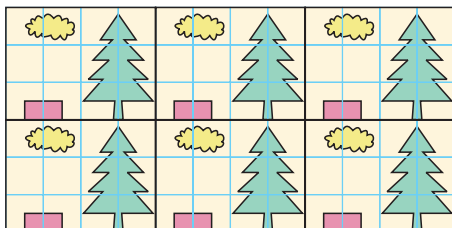


b

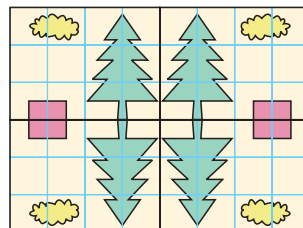


2 What transformation is shown in these patterns?

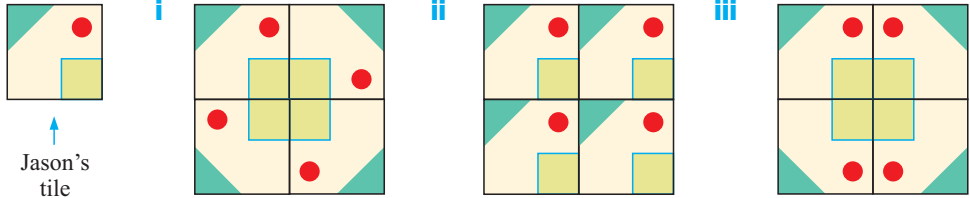
a



b



- 3 a Jason made a tile and drew a pattern on it. He then made designs by either translating, reflecting or rotating the pattern. Which transformation did he use in these patterns?



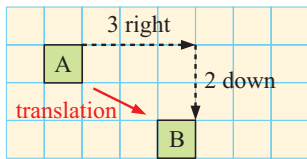
- b Like Jason, draw a simple design on a tile and carry out these three transformations on it.

B TRANSLATIONS

A **translation** or slide can be thought of as a *horizontal* movement (left or right) followed by a *vertical* movement (up or down).

Here are two examples of translation.

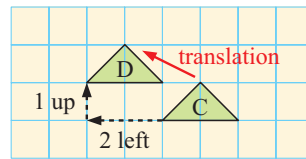
The square at A has slid to B.



To get from A to B we move 3 units right and 2 units down.

We say the translation is 3 units right and 2 units down.

The triangle at C has slid to D.



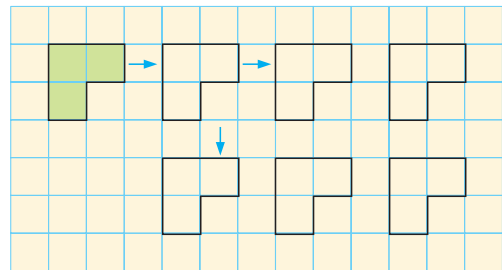
To get from C to D we move 2 units left and 1 unit up.

We say the translation is 2 units left and 1 unit up.

We can use translations to make patterns.

Start with the shape given. Slide it 3 units right, then slide it 3 units down.

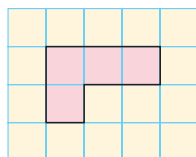
Repeat this process to form a pattern.



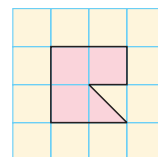
EXERCISE 14B

- 1 On grid paper, translate (slide) these shapes to form a pattern.

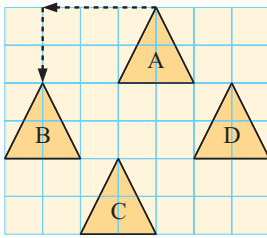
- a Slide this shape 3 units right, then slide it 2 units down.



- b Slide this shape 2 units right, then slide it 2 units down.



2

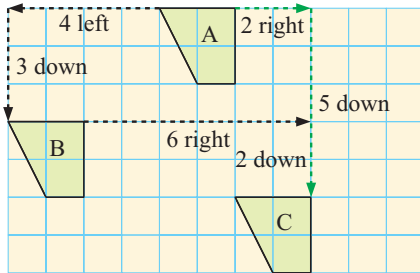
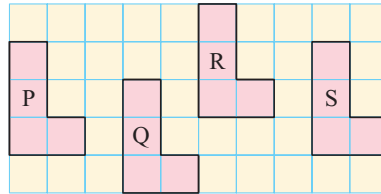


Give the translation from

- a** A to B
- b** A to C
- c** D to B
- d** B to C
- e** C to D
- f** A to D

3 Give the translation from

- a** P to Q
- b** Q to R
- c** P to R
- d** R to S
- e** R to Q
- f** S to P

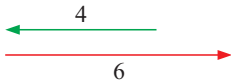


The shape at A has been translated 4 units left and 3 units down to B. The shape at B has been translated 6 units right and 2 units down to C.

What translation will move the shape from A to C?

From the diagram we can see that the translation is 2 units right and 5 units down.

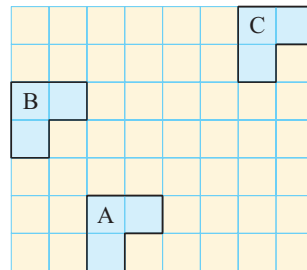
So 4 left then 6 right is the same as 2 right



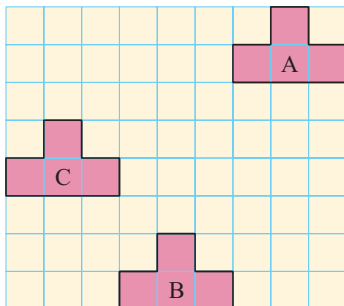
and 3 down then 2 down is the same as 5 down.



- 4
- a** Give the translation from A to B.
 - b** Give the translation from B to C.
 - c** Can you predict the translation from A to C? Use your answers from **a** and **b** to help you.
 - d** Check your answer to **c** from the diagram.



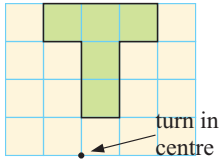
5



- a** Give the translation from A to B.
- b** Give the translation from B to C.
- c** Using your answers to **a** and **b**, predict the translation from A to C.
- d** Check your answer to **c** from the diagram.

C ROTATIONS

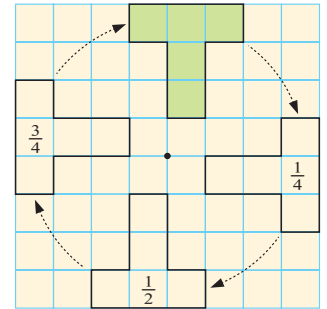
A **rotation** is a turn about a point through a given angle.



This shape rotated clockwise through

- a quarter turn
- a half turn
- a three-quarter turn

is shown in the diagram alongside.



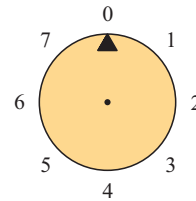
Clockwise is the same direction as the hands of a clock move.



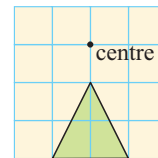
EXERCISE 14C

1 Find the position of the arrow on this dial if it is turned through

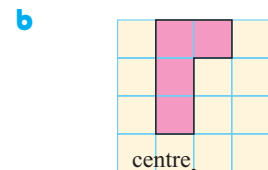
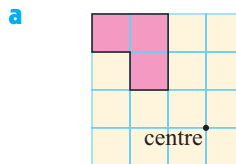
- a** a quarter turn clockwise
- b** a three quarter turn clockwise
- c** a half turn.



2 Rotate this shape, on grid paper, through a quarter turn, a half turn and a three quarter turn clockwise.



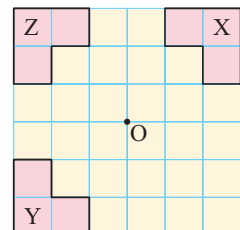
3 Rotate these shapes, on grid paper, through a quarter turn, a half turn and a three quarter turn clockwise.



4 Draw a simple shape of your own choosing. Make a pattern by showing a quarter turn, a half turn and a three quarter turn clockwise with it.

5 The shape X is rotated about the point O.

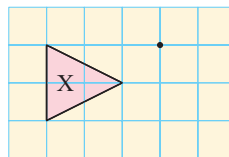
- a** What turn is needed to rotate X onto Y?
- b** What clockwise turn is needed to rotate Y onto Z?
- c** What clockwise turn is needed to rotate X onto Z?



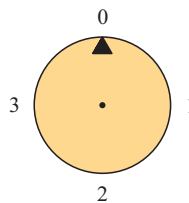
When we rotate in the direction of the hands of a clock we rotate **clockwise**.

When we rotate in the opposite direction we rotate **anticlockwise**.

- 6 a Rotate this shape, on grid paper, through a quarter turn clockwise. Mark the new position Y.
- b Now rotate this shape from Y anticlockwise through a three quarter turn. Mark the new position Z.
- c What clockwise turn is needed to rotate from X to Z?
- d What anticlockwise turn is needed to rotate from X to Z?



- 7 Find the position of the arrow on this dial if it is turned through
 - a a quarter turn anticlockwise then a quarter turn clockwise
 - b a half turn clockwise then a quarter turn anticlockwise
 - c a half turn clockwise then a half turn clockwise
 - d a quarter turn clockwise then a half turn anticlockwise
 - e a three quarter turn anticlockwise then a quarter turn clockwise.



- 8 Give *one* rotation that would be the same as each of these pairs of rotations.
 - a A quarter turn clockwise followed by a quarter turn clockwise.
 - b A quarter turn clockwise followed by a quarter turn anticlockwise.
 - c A half turn clockwise followed by a half turn clockwise.
 - d A half turn anticlockwise followed by a half turn clockwise.
 - e A quarter turn clockwise followed by a three quarter turn clockwise.

D

REFLECTIONS

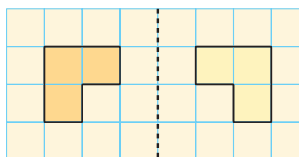
A **reflection** of a shape gives its mirror image.

We could use this shape



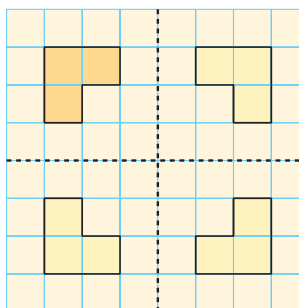
to make a pattern using reflections. The dotted lines are mirror lines.

mirror line



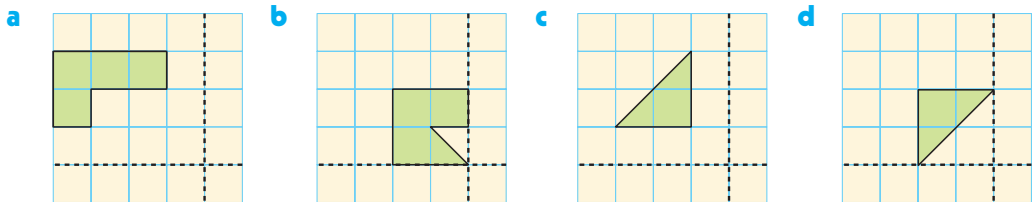
First we reflect in the vertical line, then we reflect both shapes in the horizontal line.

second mirror line

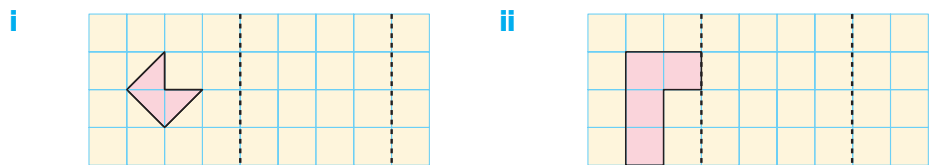
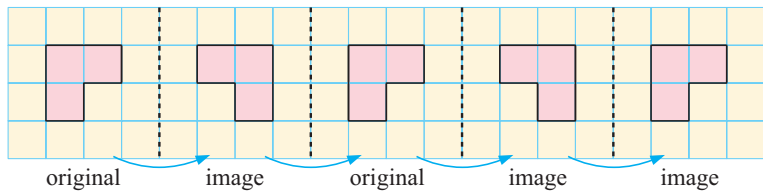


EXERCISE 14D

- 1 Copy these shapes onto grid paper. Make a pattern using reflections. The dotted lines are mirror lines.



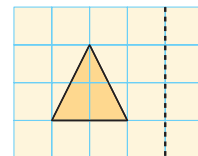
- 2 a Copy these shapes onto grid paper. Make a pattern by reflecting in the vertical line, then reflecting again in a vertical line, and so on. Look at this example.



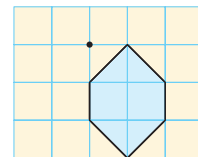
- b Do you get the original shape or the image if you reflect
 i 3 times ii 4 times iii 10 times?

Challenge

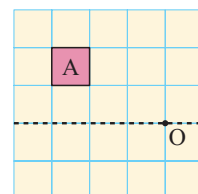
- 3 Copy the shape onto grid paper. Reflect the shape in the mirror line. Then slide it 2 units right and 1 unit up.



- 4 Copy the shape onto grid paper. Rotate the shape through a quarter turn clockwise. Then slide it 2 units right and 2 units up.



- 5 a Copy the shape A onto grid paper. Rotate the shape through a half turn about O. Then reflect it in the dotted line. Label your answer B.

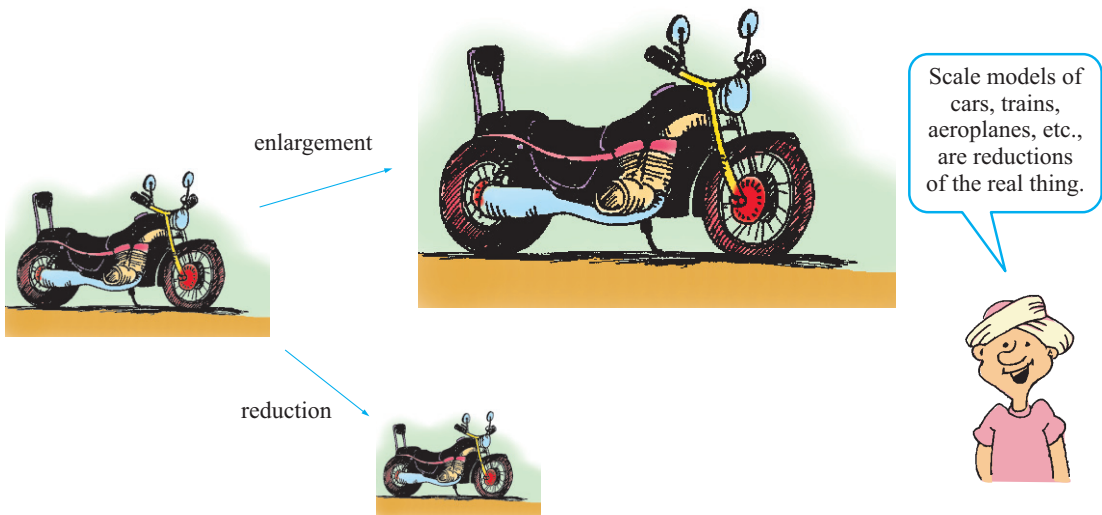


- b Give *one* transformation that would move A onto B. There may be more than one answer.

For translations, rotations and reflections the image is the same size and shape as the original. We say that the image and its original are **congruent**.

E ENLARGING AND REDUCING

Enlargements of shapes are larger versions and have the same details.
Reductions of shapes are smaller versions and have the same details.

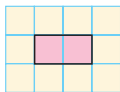


For enlargements and reductions the image is not the same size as the original shape, so the original and the image are not congruent.

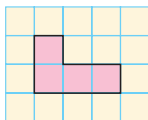
EXERCISE 14E

1 Copy onto grid paper. Enlarge the sides to double the lengths given. This is enlarging with scale factor 2.

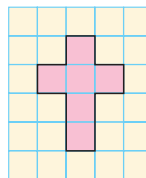
a



b

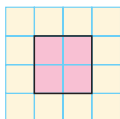


c

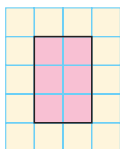


2 Copy onto grid paper. Reduce the sides to half the lengths given. This is enlarging with scale factor $\frac{1}{2}$.

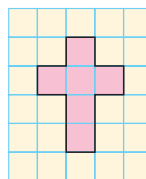
a



b

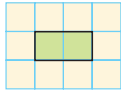


c

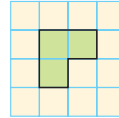


3 Copy onto grid paper. Enlarge with scale factor 3.

a

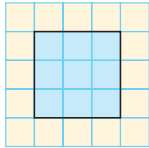


b

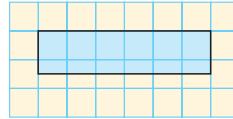


4 Copy onto grid paper. Enlarge with scale factor $\frac{1}{3}$, that is, *reduce* the sides to one third the lengths given.

a



b

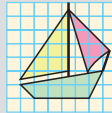
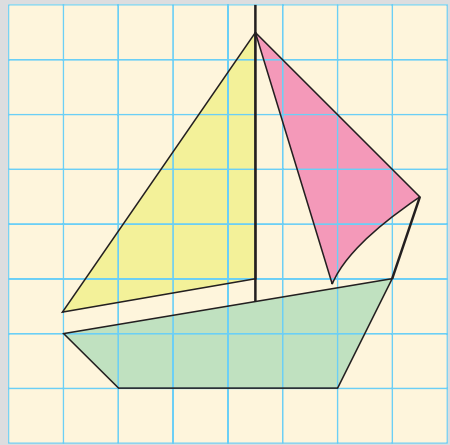
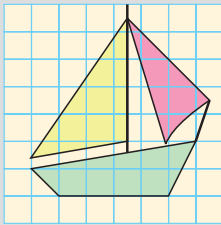


ACTIVITY

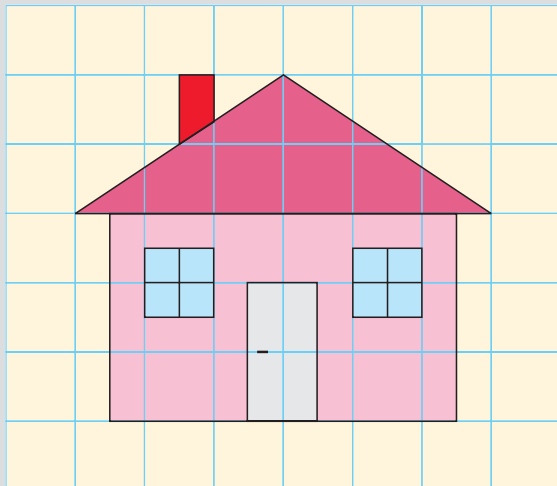
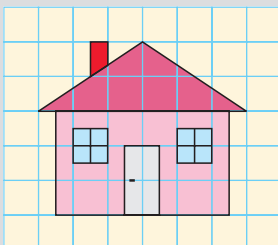
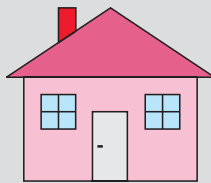
ENLARGING WITH GRIDS



Grid lines can be used to enlarge or reduce figures. For example,

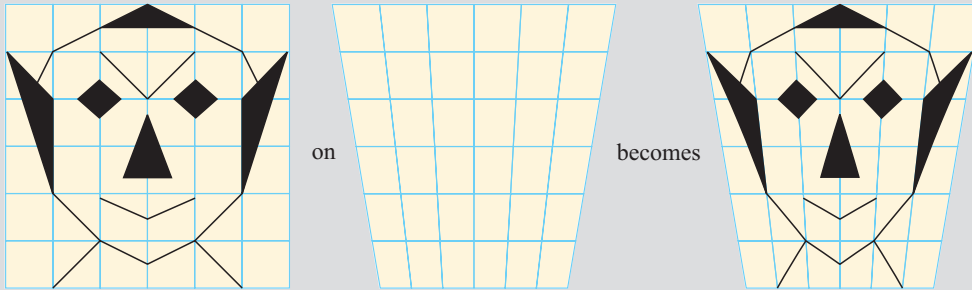


Here is a picture of a house. We want to enlarge to double the line lengths given (scale factor 2). To do this we draw a square grid over it. We then draw a square grid with lines twice as far apart and draw the house on it.



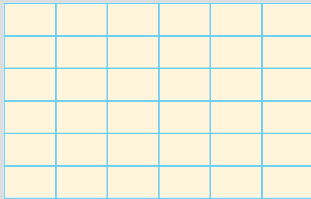
What to do:

- 1 Draw your own picture which has mainly straight lines. Enlarge it to double the lengths given, using the method shown above.
- 2 Sometimes we can make up crazy grids and have lots of fun producing distorted figures. For example:

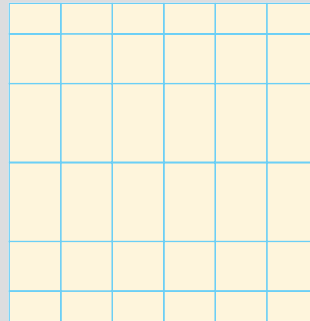


Reduce this picture onto these grids.

a



b



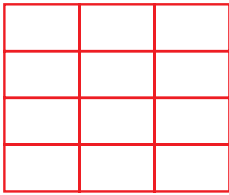
F TESSELLATIONS

A **tessellation** of a geometric shape is a pattern which fits together without having any gaps or overlaps.

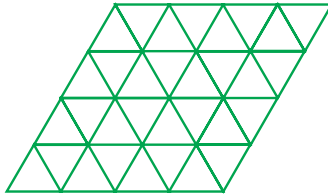
Tessellations are found in bathroom tiling and in brick paving. Here are some brick paving tessellations.



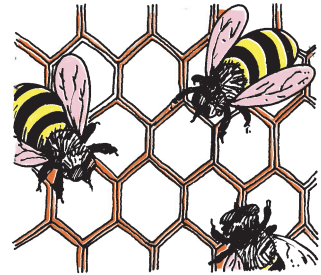
Here are some examples of simple tessellations.



using rectangles



using equilateral triangles



honeycomb made by bees

ACTIVITY

TESSELLATIONS

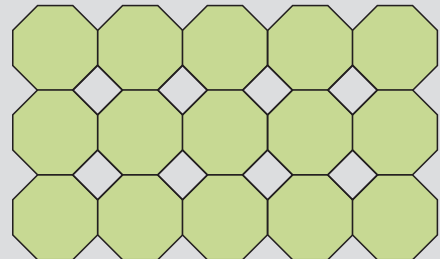


Which of the regular polygons tessellate?

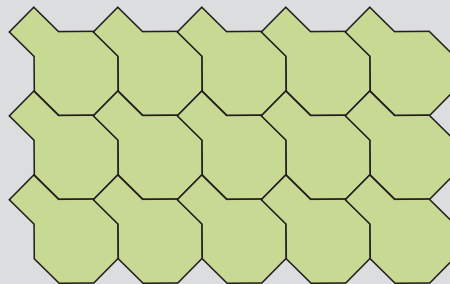


What to do:

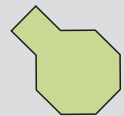
- 1 Click on the icon to obtain sheets of squares, pentagons, hexagons and octagons.
- 2 Cut out each of them.
- 3 Try tessellating them.
Which regular polygons tessellate?
- 4 Trying to tessellate octagons produces this result.



Because there are holes, we say that regular octagons do not tessellate. Remove a line joining the octagon to a square in the same position on each tile. Then we do get a shape which tessellates.



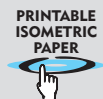
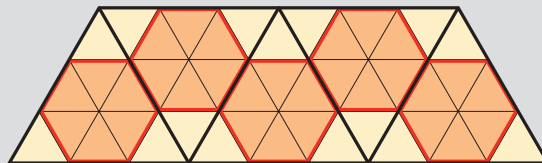
So,



tessellates.

Create a tessellation pattern by considering hexagons and small equilateral triangles.

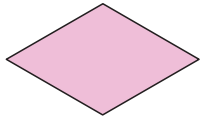
Remember only **one** shape is allowed in your final tessellation.



EXERCISE 14F

1 Using freehand sketches, show how to tessellate with these shapes.

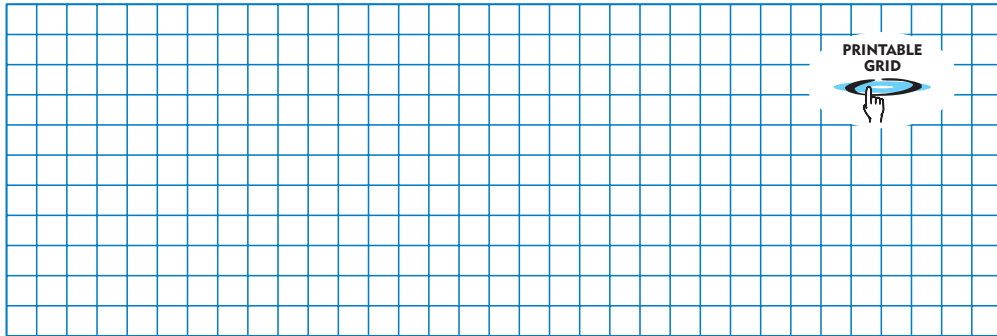
a



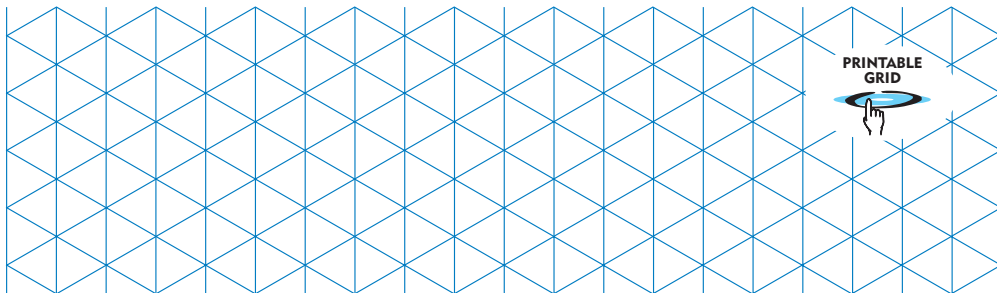
b



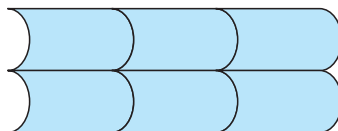
2 Click on the icon to obtain grid paper like that shown below. Use it to create your own tessellation.



3 Click on the icon to obtain isometric paper like that shown below. Use it to create your own tessellation.

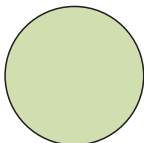


4 If you were to cut out the shape  it would tessellate as



By making cardboard shapes, decide which of these will tessellate.

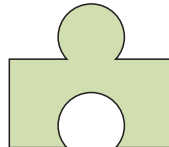
a



b



c

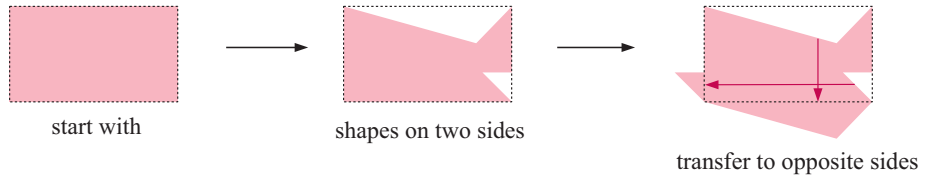


d

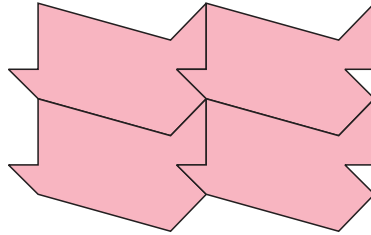


- 5 Start with a rectangle. Change the shape by removing part of the top and part of the right side. Transfer the removed parts to the opposite sides. You have created a pattern which will tessellate.

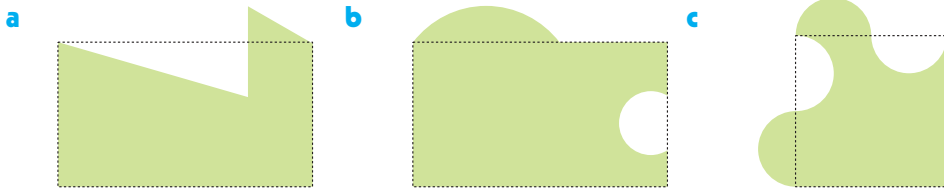
For example,



then



By transferring the removed parts, show how to make shapes which will tessellate using these bases.



ACTIVITY

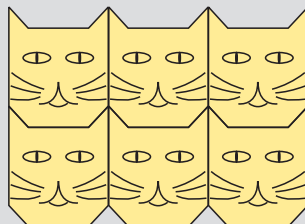
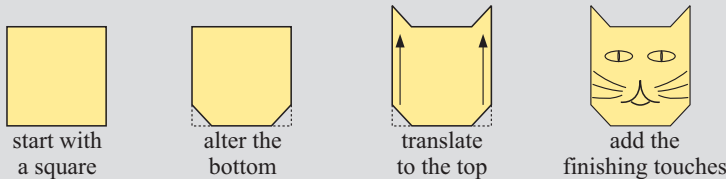
TESSELLATION FUN



You can make interesting works of art using tessellations.

What to do:

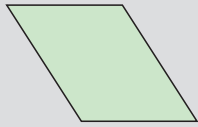
- 1 Make this cat face tessellation using the steps shown.



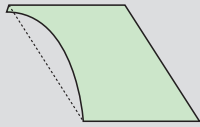
Your teacher may be able to photocopy one cat face several times to help you.



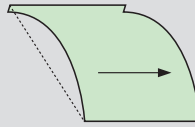
2 Make this mini elephant tessellation using the steps shown.



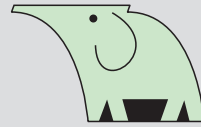
start with parallelogram



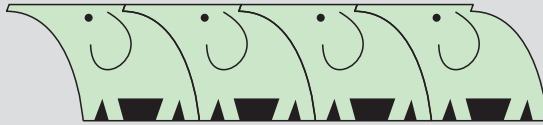
alter the side



translate to the other side



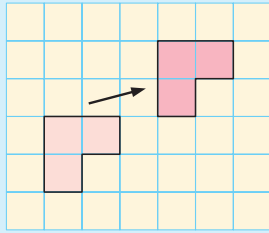
add the final detail



3 Create your own tessellation pattern using either a square grid or an isometric grid.

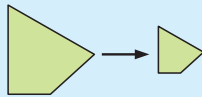
MENTAL SET 14A

1 What transformation is shown here?

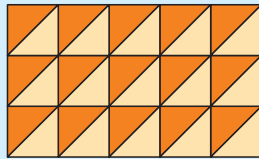


2 Predict the result of a half turn clockwise followed by a quarter turn clockwise.

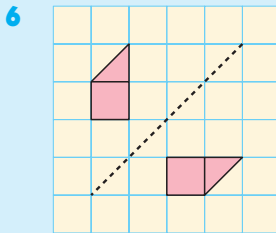
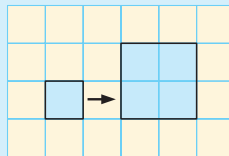
3 This is an example of a



4 This pattern of triangles is called a

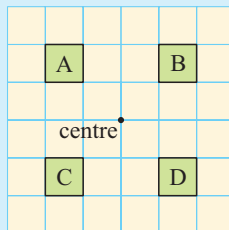


5 The small square has been enlarged with scale factor



This diagram shows a

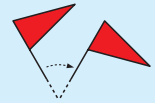
7 The square at A is rotated through a half turn about the centre then translated 3 units up. Is it at A, B, C or D?



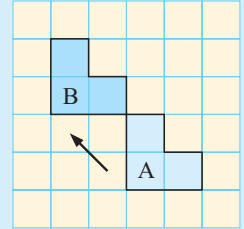
8 When a shape is translated its size and shape remain

MENTAL SET 14B

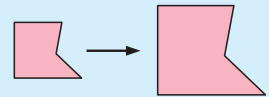
1 This is an example of a



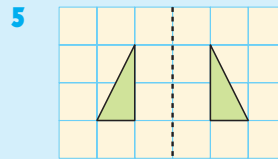
2 The shape at A has slid to B. Describe the translation.



3 This is an example of

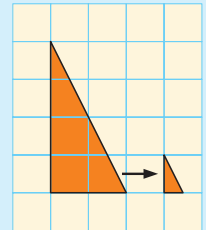


4 Predict the result of a half turn clockwise followed by a half turn anticlockwise.

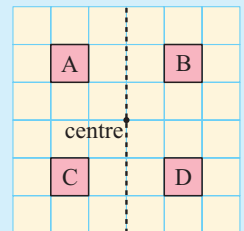


This diagram shows a reflection. What does the dotted line represent?

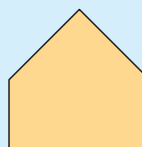
6 The large triangle has been reduced with sides the lengths given.



7 The square at A is rotated a quarter turn clockwise about the centre, then reflected in the mirror. Is it at A, B, C or D?

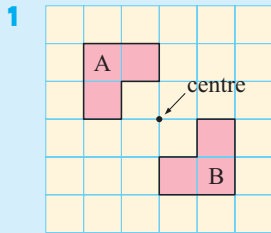


8



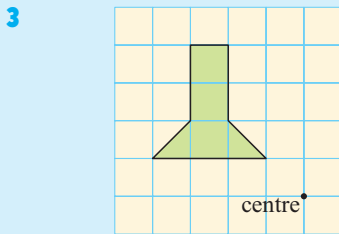
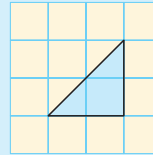
Could you tessellate with this shape?

REVIEW EXERCISE 14



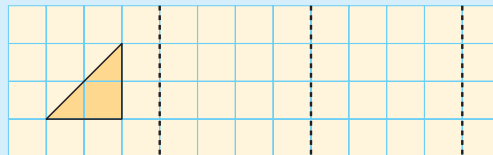
The shape at A can be rotated to position B.
What part of a clockwise turn would be needed?

2 Copy this shape onto grid paper. Make a pattern by sliding the shape 2 units right then sliding it 3 units down. Repeat twice more.

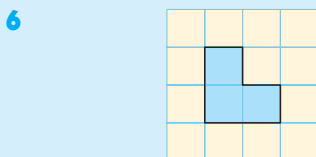
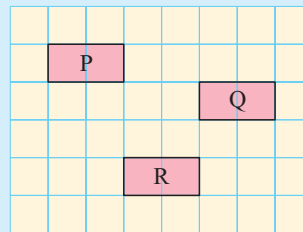


On grid paper, rotate this shape clockwise through
a a quarter turn
b a half turn
c a three-quarter turn.

4 Copy this shape onto grid paper. Make a pattern by reflecting the shape in the mirror line. Repeat twice more.

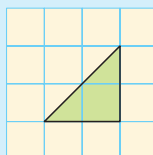


5 **a** Give the translation from
i P to Q **ii** Q to R.
b Use your answers from **a** to predict the translation from P to R.
c Check your result from the diagram.

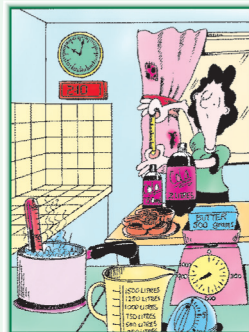
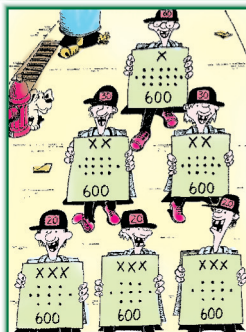
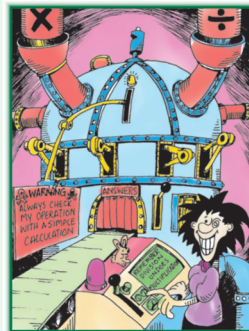
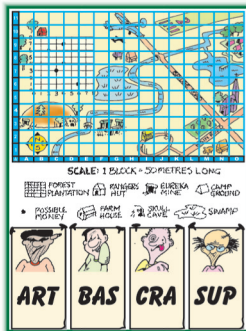
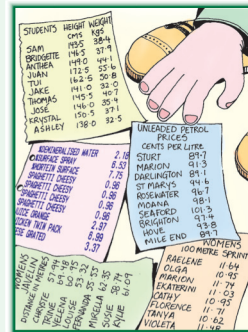
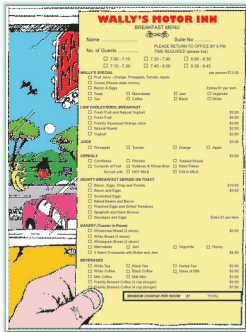


Copy the shape onto grid paper.
Enlarge with sides three times the lengths given.

7 Show a tessellation using this shape.




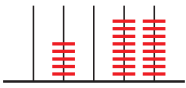

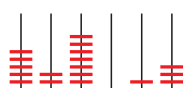
ANSWERS



EXERCISE 1A

- 1 a 5 b 7 c 9 d 11
 2 a III b VI c VIII d XII
 3 a 8 b 11 c 14 d 26 e 44 f 96
 4 a XV b XIX c XXVI d XXXVIII
 e LXXIII f LXXXVI
 5 a XXV b XXXV c XXVIII d II

EXERCISE 1B

- 1 a 3637 b 4055 c 8706 d 9760 e 2005
 f 16 511 g 38 077 h 40 098 i 165 002
 j 408 760
 2 a $3000 + 700 + 20 + 5$ b $7000 + 30 + 2$
 c $4000 + 300$ d $5000 + 6$
 e $20\,000 + 600 + 70 + 3$
 f $50\,000 + 3000 + 200 + 10$
 g $10\,000 + 6000 + 900 + 20 + 7$
 h $100\,000 + 40\,000 + 700 + 6$
 3 a 35 068 is 35 thousands and 68 units,
 350 hundreds and 68 units,
 3506 tens and 8 units
 b 42 107 is 42 thousands and 107 units,
 421 hundreds and 7 units,
 4210 tens and 7 units
 c 52 179 is 52 thousands and 179 units,
 521 hundreds and 79 units,
 5217 tens and 9 units
 d 18 006 is 18 thousands and 6 units,
 180 hundreds and 6 units,
 1800 tens and 6 units
 4 a 5000 b 500 c 5 d 50 e 5 f 500
 g 50 000 h 5000 i 50 j 5
 5 a 2000 b 200 c 20 000 d 200 000 e 20 000
 6 a 3425 b 7063 c 9207 d 8400
 e 17 269 f 92 034 g 38 706 h 436 000
 i 705 040
 7 a  b 
 c  d 
 8 a 19, 31, 39, 91, 93 b 109, 207, 208, 301, 308
 c 2017, 2071, 2170, 2701, 2710
 d 17 394, 31 749, 47 193, 47 913, 91 347
 9 a 72, 57, 53, 35, 27 b 432, 423, 342, 324, 234
 c 9782, 8279, 7892, 2987, 2789
 d 932 512, 925 312, 912 533, 852 312, 832 215

EXERCISE 1C

	<i>HTh</i>	<i>TTh</i>	<i>Th</i>	<i>H</i>	<i>T</i>	<i>O</i>
a			5	7	4	4
b			2	9	1	1
c			8	0	0	8
d		1	5	2	3	7
e		2	4	6	0	1
f		8	8	8	0	0
g	1	5	9	0	6	6
h	4	7	2	6	1	7

- 2 a six hundred and eighty
 b one thousand and twenty nine
 c seven thousand nine hundred and ninety
 d two thousand
 e eight thousand four hundred and six
 f thirty thousand five hundred and one
 g fifty four thousand and two
 h one hundred and seventy six thousand,
 four hundred and ninety seven
 3 a 9432 is largest, 2349 is smallest
 b 98532 is largest, 23589 is smallest
 c 87 430 is largest, 30 478 is smallest
 4 a 600 b 1300 c 4300
 5 a \$4463 b \$5840 c \$9800
 6 a fourteen, sixteen, forty, forty six, sixty,
 sixty four
 b one thousand and fifty three, 1305, 1503,
 fifteen hundred and thirty
 7 a seventy five, seventy, fifty seven,
 seventeen, fifteen
 b 2470, two thousand and forty seven,
 seven hundred and twenty four, 247.

EXERCISE 1D

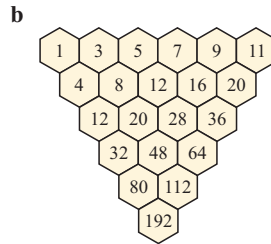
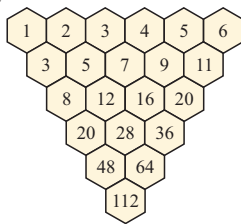
- 1 a 10 b 30 c 90 d 20 e 30 f 80
 g 10 h 20 i 70 j 70 k 90 l 100
 2 a 120 b 160 c 210 d 360 e 410
 f 500 g 610 h 490 i 840 j 780
 k 560 l 1000
 3 a 100 b 100 c 200 d 300 e 500
 f 600 g 800 h 800 i 900 j 900
 4 a 1500 b 2900 c 3000 d 3500 e 5000
 f 5000 g 5100 h 6700 i 9100 j 9600
 5 a 800 b \$2400 c 3300 d 7600
 6 a 2000 b 7000 c 9000 d 6000 e 9000
 f 9000 g 1000 h 5000 i 8000 j 2000
 7 a 12 000 b 79 000 c 14 000 d 25 000
 e 20 000 f 80 000 g 87 000 h 50 000
 i 92 000 j 97 000
 8 a 66 000 b \$28 000 c 97 000 d \$35 000
 9 a yes b no c yes d no e yes f no g yes
 10 a false b false c true d false

EXERCISE 1E

- 1 a 700 b 800 c 700 d 900
 2 a 500 b 700 c 100 d 500
 3 a 6000 b 9000 c 9000 d 9000
 4 a 2000 b 1000 c 1000 d 1000
 5 a \$800 b 900 km c 1900 kg d 7000 m

EXERCISE 1F

- 1 a 7 b 8 c 14
 7 9 6
 12 11 15
 17 12 11
 11 13 8
 9 16 7
 13 10 11
 10 13 15
 14 8 12
 9 13 18
- 2 a 9 b 10 c 11 d 6 e 7 f 1 g 4
 h 9 i 7 j 8 k 3 l 9 m 7 n 7 o 10
- 3 a 9, 90, 900, 9000 b 10, 100, 1000, 10 000
 c 11, 110, 1100, 11 000 d 16, 160, 1600, 16 000
- 4 a



- 5 a 759 and 443 b 1202 c
- | | | | |
|-----------|----------|-----------|----------|
| <i>Th</i> | <i>H</i> | <i>T</i> | <i>O</i> |
| | 7 | 5 | 9 |
| | <u>1</u> | <u>14</u> | <u>3</u> |
| | 1 | 2 | 0 |
- 6 a 379 b 585 c 845 d 924 e 630
 f 1231 g 1229 h 1171 i 1332 j 1575
 k 481 l 616 m 600 n 950 o 1665
- 7 a 800, 797 b 1100, 1131 c 1700, 1737
 d 700, 738 e 1600, 1642 f 2000, 1991
- 8 a
- | | | | |
|--------------|--------------|--------------|--------------|
| 238 | 467 | 193 | 176 |
| <u>+ 174</u> | <u>+ 242</u> | 585 | 238 |
| 412 | 709 | <u>+ 197</u> | <u>+ 303</u> |
| | | 975 | 717 |
- 9 a 3409 b 7831 c 9080 d 7814 e 9934
 f 6994 g 28 987 h 48 899 i 99 645
- 10 a 10 000, 9795 b 9000, 9331
 c 10 000, 10 564 d 51 000, 50 638
 e 101 000, 101 393 f 132 000, 132 684
 g 176 000, 177 027 h 902 000, 902 672
 i 1 021 000, 1 020 889
- 11 a
- | | | |
|---------------|---------------|---------------|
| 1384 | 2687 | 8053 |
| <u>+ 2769</u> | <u>+ 3455</u> | <u>+ 8422</u> |
| 4153 | 6142 | 16 475 |

- 12 2200 m 13 419 cards 14 1292 students
 15 year 2002 16 \$2216 17 5099 km
 18 4738 people 19 \$3610 20 \$55 700
 21 105 796

EXERCISE 1G

- 1 a 143 b 174 c 59 d 332 e 228
 f 142 g 361 h 278 i 269
- 3 a 115 b 208 c 224 d 286 e 253
 f 259 g 83 h 146 i 177
- 4 a 2232 b 3615 c 3192 d 3000
 e 925 f 3868 g 103 h 4954 i 1013
- 5 a 1766 b 3521 c 1797 d 902
 e 843 f 1103 g 11 h 5924 i 1385
- 6 a \$2235 b \$2683 c \$4093
- 7 a 2928 b 3004 c 2080 d 4588 e 1319
 f 907 g 33 009 h 20 859 i 42 719
 j 36 544 k 18 426 l 349 143 m 426 173
 n 62 069 o 249 803
- 8 17 cm 9 91 pages 10 237 tickets
- 11 \$228 needed 12 \$768
- 13 a i decrease ii 525 cars b 2706 cars
- 14 213 were left 15 43 723 16 \$1986
- 17 137 541

EXERCISE 1H

- 1 a F b T c T d T e F f F g F h F
- 2 a 45 < 54 b 239 < 329 c 555 < 556
 d 4672 > 4267 e 6010 < 60100
 f 9476 < 12 114
- 3 a T b F c T d T e T f F
- 4 a 74 ≠ 47 b 507 + 92 = 599
 c 3000 - 149 ≠ 2951
 d 568 + 342 ≠ 444 + 456
 e 7559 - 1023 ≠ 4803 + 1732

EXERCISE 1I

- 1 a 107 b 26 c 132 d 2265 e 5063
 f 4307 g 8846 h 54 517 i 1683 j 8051
 k 236 293 l 159 214
- 2 a 140, 141 b 50, 48 c 600, 615
 d 400, 359 e 8000, 8384 f 2000, 1930
 g 124 000, 123 613 h 24 000, 24 355
- 3 a 3507 b 339

EXERCISE 1J

- 1 \$1109 2 18 cm 3 a 173 runs b 55 runs
 4 159 cm 5 5831 people 6 4990 kg 7 21 414
 8 2615 L 9 \$544 10 \$487
- 11 a \$1563 b i \$498 ii \$60 c \$2245

REVIEW EXERCISE 1

- 1 a 20 000 b 200 c 20 d 2000
 2 a 13 156 b 40 360

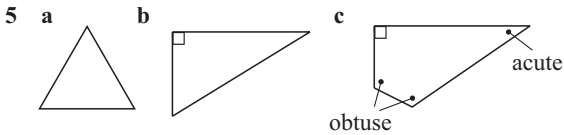
3 a

	T	Th	Th	H	T	O
a			3	2	0	1
b	4		9	8	6	3
c	3		0	0	0	5

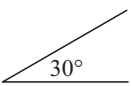
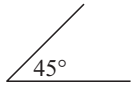
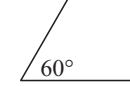

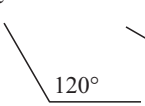
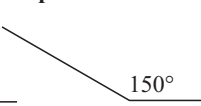
- 4 a three thousand, four hundred and two
 b thirty five thousand, five hundred and fifty seven
- 5 a 23 689 b 98 632
- 6 654, 645, 564, 546, 465, 456
- 7 1306, 1326, 1360, 2603, 3061, 3601
- 8 a i 600 students ii \$2500
 b i \$72 000 ii 11 000 people
- 9 a 400 b 6000 10 a 6560 b 3404
- 11 715 km 12 1442 kg
- 13 $59\,674 > 59\,070 + 64$

EXERCISE 2A

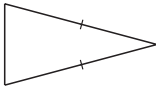

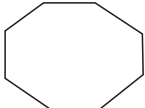
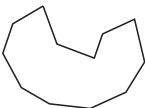
- 1 a right angle b straight angle c acute angle
 d obtuse angle e reflex angle f acute angle
 g right angle h obtuse angle
- 2 a reflex angle b right angle c acute angle
 d obtuse angle e straight angle
- 3 a 8 b 8
- 4 a straight angle b right angle
 c obtuse angle d acute angle



EXERCISE 2B

- 1 a 60° b 40° c 90° d 20° e 110°
 f 25° g 75° h 45° i 135° j 155°
- 2 a  b  c 
 d  e  f 
- 3 a 55° b 90° c 15° d 160° e 135°
- 4 The same answers as 2.

EXERCISE 2C



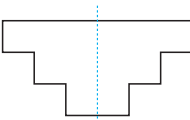
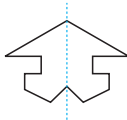
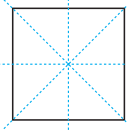
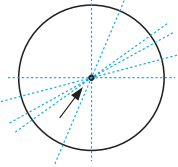

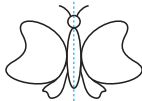
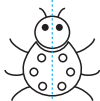
- 1 a triangle b quadrilateral c hexagon
 d pentagon e heptagon f octagon
 g nonagon h decagon
- 3 a  b 
 c  

- 4 a It has a gap. b It must have straight line sides.
 c It must not cross itself.
 d It must have all straight line sides.
- 6 a No b Yes c No d No e Yes f No
- 7 a True b True c False, as it has 6 sides.
 d False e False, as it must have the same of each.

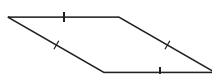



EXERCISE 2D

- 1 A, E, F, G, H, I, K, L, O, P
- 2 a an intersection b a T-junction
 c there are two side roads coming in on the left hand side d two-way road
 e left lane blocked, other two lanes open
 c, d and e show parallel lanes or roads
- 3 • top and bottom of windows
 • telegraph poles
 • the kerb on either side of the roadway

EXERCISE 2E

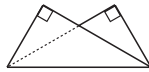
- 1 Examples  
- 2 a  b 
- 3 a  b 
 any line passing through the centre
- c 
- 4  
- 5 **A B C D E H I K**
M O T U V W X Y

EXERCISE 2F

- 1 a scalene b equilateral c isosceles
- 2 a  b 
 c  d 

- 3 a a square b a trapezium c a rhombus
d a rectangle e a kite f a trapezium
g a parallelogram h a square

4 It does not fold onto itself.



	sides/ angles	parallel sides	line symmetry	Regular
a	3	no	1	no
b	3	no	3	yes
c	4	yes	4	yes
d	4	yes	2	no
e	3	no	0	no
f	4	yes	0	no
g	4	no	1	no
h	4	yes	1	no
i	5	no	5	yes
j	6	yes	6	yes
k	5	yes	0	no
l	8	yes	8	yes

- 6 a True b True c True d True

Name	rect.	|| gram	rhombus	trapezium
Opp. angles	yes	yes	yes	no
Opp. sides	yes	yes	yes	no
Regular	no	no	no	no

- 8 a yes b yes c no d yes e yes f yes
g no h no

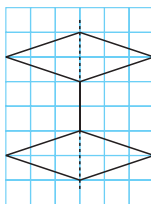
EXERCISE 2G

- 1 a 4 cm b 8 cm 3 a 10 cm b 6 cm
4 a O b OB and OC c AB
d i 22 mm ii 44 mm
7 They become more like a circle.

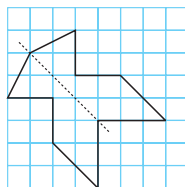
REVIEW EXERCISE 2

- 1 a obtuse b right angle c reflex d acute
2 a equilateral triangle b a square c a kite
d a rhombus e a trapezium
f an isosceles triangle

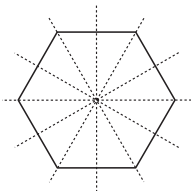
3 a



b



4



5 115°

- 6 b 4 cm
d 8 cm

EXERCISE 3A

- 1 a 1, 6 and 2, 3 b 1, 7 c 1, 10 and 2, 5
d 1, 11 e 1, 12 and 2, 6 and 3, 4
f 1, 16 and 2, 8 and 4, 4
g 1, 24 and 2, 12 and 3, 8 and 4, 6
2 a 1, 3 b 1, 2, 4 c 1, 2, 3, 6 d 1, 3, 9
e 1, 2, 5, 10 f 1, 2, 3, 6, 9, 18
g 1, 2, 3, 4, 6, 9, 12, 18, 36
3 a 1, 2, 4, 5, 8, 10, 20, 40
b 1, 2, 3, 4, 6, 8, 12, 16, 24, 48
c 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
d 1, 3, 5, 15, 25, 75
e 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
4 a yes b no c yes d no e no
5 a, b

No.	Factors	No.	Factors
1	1	16	1, 2, 4, 8, 16
2	1, 2	17	1, 17
3	1, 3	18	1, 2, 3, 6, 9, 18
4	1, 2, 4	19	1, 19
5	1, 5	20	1, 2, 4, 5, 10, 20
6	1, 2, 3, 6	21	1, 3, 7, 21
7	1, 7	22	1, 2, 11, 22
8	1, 2, 4, 8	23	1, 23
9	1, 3, 9	24	1, 2, 3, 4, 6, 8, 12, 24
10	1, 2, 5, 10	25	1, 5, 25
11	1, 11	26	1, 2, 13, 26
12	1, 2, 3, 4, 6, 12	27	1, 3, 9, 27
13	1, 13	28	1, 2, 4, 7, 14, 28
14	1, 2, 7, 14	29	1, 29
15	1, 3, 5, 15	30	1, 2, 3, 5, 6, 10, 15, 30

- c 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
6 11, 13, 17, 19 7 4, 6, 8, 9, 10, 12, 14
8 a $12 = 2 \times 2 \times 3$ b $24 = 2 \times 2 \times 2 \times 3$
c $36 = 2 \times 2 \times 3 \times 3$ d $60 = 2 \times 2 \times 3 \times 5$

EXERCISE 3B

- 1 a 4, 8, 12, 16, 20, 24, 28, 32, 36, 40
b 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
c 6, 12, 18, 24, 30, 36, 42, 48, 54, 60
d 8, 16, 24, 32, 40, 48, 56, 64, 72, 80
e 11, 22, 33, 44, 55, 66, 77, 88, 99, 110

2 a b c

d e f

- 3 24, 28 4 60
 5 a 20, 40, 60, 80, 100 b 25, 50, 75, 100
 6 1, 4, 9, 16, 25, 36, 49, 64, 81, 100
 7 a $11 \times 11 = 121$ b $20 \times 20 = 400$
 c $30 \times 30 = 900$
 8 a $4^2 = 16$ b $5^2 = 25$ c $9^2 = 81$ d $11^2 = 121$

EXERCISE 3C

- 1 a 70 b 80 c 50 d 90 e 10 f 2
 g 160 h 420 i 720 j 10 k 53 l 61
 2 a 800 b 700 c 600 d 100 e 100 f 9
 g 2400 h 3200 i 6900 j 100 k 36 l 100
 3 a three b four
 4 a 4000 b 7000 c 1000 d 60 000 e 9 f 10 000
 5 a 10 b 100 c 1000 d 100 e 10 f 1000
 g 1000 h 100 i 10 j 100 k 10 l 1000
 6 a 430 b 4300 c 43 000 d 430 e 4300
 f 43 000 g 100 h 1000 i 10 000
 j 10 000 k 100 000 l 1140 m 11 400
 n 114 000 o 8710 p 87 100
 7 a 15 b 150 c 1500 d 15 000 e 150
 f 1500 g 15 000 h 1500
 8 a 28 b 280 c 2800 d 28 000 e 280
 f 2800 g 28 000 h 2800
 9 a 63 b 630 c 6300 d 63 000 e 630
 f 6300 g 63 000 h 6300
 10 a 10 b 100 c 1000 d 10 000 e 100
 f 1000 g 10 000 h 1000
 11 a $8 \times 50 = 80 \times 5$ b $8 \times 500 < 8000 \times 5$
 c $800 \times 5 = 8 \times 500$ d $8 \times 5000 > 80 \times 50$

EXERCISE 3D

- 1 a 300 b 400 c 700 d 600 e 2100
 2 a 400 b 1200 c 1800 d 1600
 3 a 8000 b 25 000 c 15 000 d 8000
 4 a 1000 b 3000 c 2000 d 14 000 e 21 000
 5 \$400 6 1800 pamphlets 7 \$3000

EXERCISE 3E

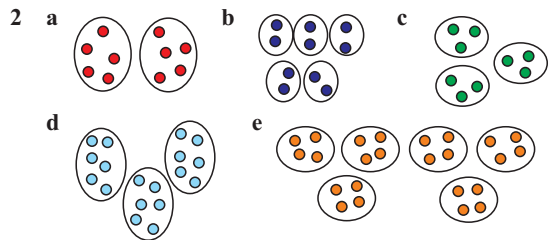
- 1 a $163 = 100 + 60 + 3$ b $293 = 200 + 90 + 3$
 c $318 = 300 + 10 + 8$ d $406 = 400 + 6$
 e $728 = 700 + 20 + 8$ f $2305 = 2000 + 300 + 5$
 2 a
$$\begin{array}{r} 213 \\ \times 5 \\ \hline 15 \\ 50 \\ 1000 \\ \hline 1065 \end{array}$$
 $\leftarrow 3 \times 5$
 $\leftarrow 10 \times 5$
 $\leftarrow 200 \times 5$
 $\leftarrow 213 \times 5$
 b
$$\begin{array}{r} 324 \\ \times 4 \\ \hline 16 \\ 80 \\ 1200 \\ \hline 1296 \end{array}$$
 $\leftarrow 4 \times 4$
 $\leftarrow 20 \times 4$
 $\leftarrow 300 \times 4$
 $\leftarrow 324 \times 4$
 c
$$\begin{array}{r} 436 \\ \times 6 \\ \hline 36 \\ 180 \\ 2400 \\ \hline 2616 \end{array}$$
 $\leftarrow 6 \times 6$
 $\leftarrow 30 \times 6$
 $\leftarrow 400 \times 6$
 $\leftarrow 436 \times 6$
 d
$$\begin{array}{r} 502 \\ \times 7 \\ \hline 14 \\ 00 \\ 3500 \\ \hline 3514 \end{array}$$
 $\leftarrow 2 \times 7$
 $\leftarrow 0 \times 7$
 $\leftarrow 500 \times 7$
 $\leftarrow 502 \times 7$

- e
$$\begin{array}{r} 675 \\ \times 8 \\ \hline 40 \\ 560 \\ 4800 \\ \hline 5400 \end{array}$$
 $\leftarrow 5 \times 8$
 $\leftarrow 70 \times 8$
 $\leftarrow 600 \times 8$
 $\leftarrow 675 \times 8$
 f
$$\begin{array}{r} 839 \\ \times 9 \\ \hline 81 \\ 270 \\ 7200 \\ \hline 7551 \end{array}$$
 $\leftarrow 9 \times 9$
 $\leftarrow 30 \times 9$
 $\leftarrow 800 \times 9$
 $\leftarrow 839 \times 9$

- 3 a 1038 b 2030 c 984 d 1404 e 2156
 f 1665 g 7227 h 2720 i 1161 j 1248
 k 2736 l 6748
 4 a 1526 b 2900 c 2952 d 2105 e 2664
 f 5632 g 2754 h 4170 i 4212 j 831
 k 5184 l 6279
 5 a \$1476 b \$3762 c \$5166 d \$6464
 6 a 396 sheep b \$1148 c \$6881 d 5240 m
 e 3390 kg f \$1500 g \$1797 h 1461 days
 7 a 11 384 b 6520 c 6402 d 21 294
 e 16 272 f 17 271 g 9264 h 21 120
 8 a 144 b 435 c 556 d 1242 e 1425
 f 2799 g 1264 h 2590 i 1266 j 2436
 k 5620 l 4890 m 18 009 n 10 592
 o 21 231 p 8415 q 12 188 r 40 072
 s 22 232 t 39 429
 9 a 319 b 385 c 451 d 869 e 648
 f 876 g 576 h 1140

EXERCISE 3F

- 1 a $6 \div 2 = 3$ b $6 \div 3 = 2$ c $12 \div 3 = 4$
 d $15 \div 5 = 3$ e $24 \div 4 = 6$ f $30 \div 10 = 3$



- 3 a 6 b 5 c 5 d 5 e 4 f 4 g 6
 h 7 i 7 j 6
 4 a $14 \div 3 = 4 \text{ r } 2$ b $15 \div 4 = 3 \text{ r } 3$
 c $17 \div 5 = 3 \text{ r } 2$ d $23 \div 7 = 3 \text{ r } 2$
 5 a $8 \div 3 = 2 \text{ r } 2$ b $10 \div 4 = 2 \text{ r } 2$
 c $11 \div 5 = 2 \text{ r } 1$ d $13 \div 5 = 2 \text{ r } 3$
 e $13 \div 6 = 2 \text{ r } 1$ f $13 \div 7 = 1 \text{ r } 6$
 g $25 \div 4 = 6 \text{ r } 1$ h $25 \div 5 = 5 \text{ r } 0$
 i $27 \div 5 = 5 \text{ r } 2$ j $18 \div 4 = 4 \text{ r } 2$
 k $18 \div 5 = 3 \text{ r } 3$ l $18 \div 6 = 3 \text{ r } 0$
 m $28 \div 3 = 9 \text{ r } 1$ n $28 \div 5 = 5 \text{ r } 3$
 o $39 \div 7 = 5 \text{ r } 4$
 6 a Each person gets 4 and 2 are left over.
 b There are 8 teams and 3 players left over.
 c Each person gets 5 chocolates and 2 are left over.
 d Each box has 12 books and 2 books are left over
 e 8 dingoes go to each pen and 3 are left over.

- 7 a 13 b 37 c 36 d 434 e 30 f 51
g 41 h 42
- 8 a 31 r 1 b 223 r 1 c 64 r 2 d 72 r 5
e 88 r 1 f 349 r 1 g 57 r 3 h 37 r 4
i 301 r 2 j 22 r 2 k 93 r 1 l 145 r 1
- 9 a 404 b 2205 r 2 c 2475 d 301 r 5
e 126 f 1882 r 3 g 173 r 1 h 357 r 8
- 10 a each get \$45 b each piece is 107 m long
c each gets 69 marbles and 2 are left over
d each pays \$67 e each mass is 640 kg
f each paid \$63 g \$3257 each
h each contains 1440 L
i 406 each with 2 left over
j 1204 each with 2 left over

EXERCISE 3G

- 1 a 40 b 5 c 5 d 30 e 10
2 a 50 b 400 c 100 d 200 e 200
3 100 m 4 20 km 5 5 kg 6 9 cm
7 a 200 b 1000 c 1000 d 3000

EXERCISE 3H

- 1 a 425 b 2142 c 3366 d 15 557
2 a 133 b 63 c 57 d 49
4 a 27 b 27 c 336 d 336
5 b 21 and 53 c 29 and 85
6 a \$1411 b 8725 kg c \$57 d 443 km
e 3 years f \$14004

EXERCISE 3I

- 1 2568 trees
2 649 were filled and there were 5 left over
3 336 skiers 4 \$833 5 \$4785 6 312 km
7 1255 kg 8 a \$1080 b \$3925 9 1296 items
10 573 cartons with 3 eggs left over 11 2120 m
12 \$733

EXERCISE 3J

- 1 187 trees 2 153 students 3 \$785
4 2151 bottles 5 396 boxes 6 \$135 7 \$2240
8 448 windows 9 \$1645 10 \$245 11 729 cows

EXERCISE 3K











- 1 a 7 b 14 c 26 d 7 e 6 f 36
g 63 h 60 i 1 j 8 k 28 l 3
2 a 1 b 1 c 8 d 0 e 8 f 10 g 19
h 17 i 5 j 15 k 2 l 6
3 a 4 b 10 c 1 d 9 e 64 f 16 g 21
h 16 i 1 j 6 k 2 l 8
4 a 18 b 83 c 41 d 0 e 24 f 6 g 8
h 6 i 2 j 72 k 6 l 30 m 5 n 3
o 35 p 27 q 75 r 7
5 a $4 + 6 - 2 = 8$ b $4 \times 6 + 2 = 26$
c $4 \times 6 - 2 = 22$ d $4 + 6 \div 2 = 7$
e $4 \div (6 - 2) = 1$ f $14 + 7 - 2 = 19$

- g $14 - 7 + 2 = 9$ h $14 \div 7 + 2 = 4$
i $14 - 7 - 2 = 5$ j $14 - 7 \times 2 = 0$

REVIEW EXERCISE 3

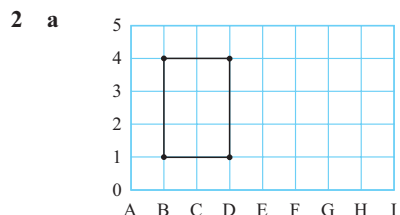
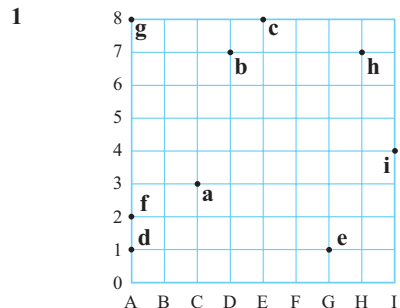
- 1 a 1, 24 and 2, 12 and 3, 8 and 4, 6
b 1, 2, 3, 4, 6, 8, 12, 24 c 2 and 3
2 21, 28, 35 3 36
4 $5 \times 6 = 30$, $5 \times 60 = 300$, $500 \times 6 = 3000$
 $50 \times 6 = 300$, $5 \times 6000 = 30000$, $50 \times 60 = 3000$
5 7200
6 a 1498 b \$1848 c 16 263 7 \$1175
8 a 1 b $25 \div 3 = 8$ r 1
9 a 67 b 117 r 2 c 843 r 1 10 365 kg
11 a 120 rooms b 20 cleaners 12 \$637
13 a 14 b 4 c 10 d 60 e 30 f 52

EXERCISE 4A

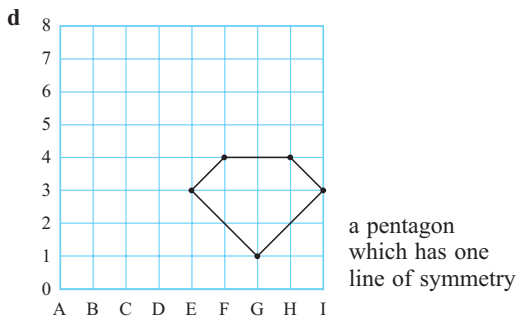
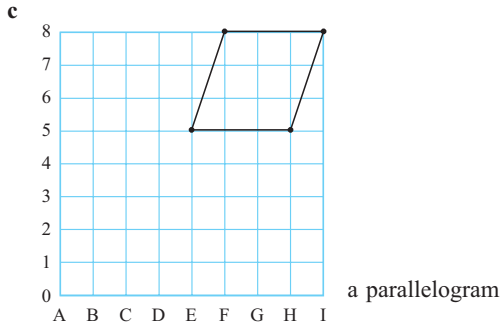
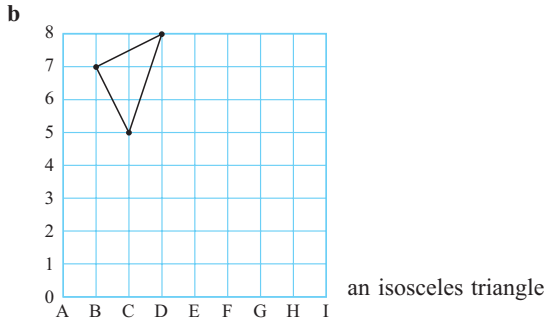
- 1 a  b  c  d 
e ,  and 
f  and  g 

- 2 a 18 b a boy wearing a track suit
c blond girl with short skirt and big blond girl with long dress
d 3 e the person on each end
3 Botanic Drive
4 a J6 b A3 c C7 d G7 e G2 f C5
5 a D7 b B3
6 a Torrens Parade Grounds b University Oval
c Memorial Hospital d Sold. Mem. Gardens
e ACC Nursery f Zoo

EXERCISE 4B



a rectangle



- 3 a i H5 ii G1 iii E3 b i 90 m ii 90 m
 4 a i F3 ii H5 iii D1
 b i go left 3 units and up 2 units
 ii go right 3 units and down 2 units
 iii go left 6 units and down 3 units
 5 a i E1 ii B7 iii C4 iv D2
 b i go right 5 units and up 5 units
 ii go right 5 units and down 3 units
 iii go left 3 units and up 3 units

EXERCISE 4C

- 1 a i West ii East iii North iv South
 v East vi West
 b i 3 km ii 5 km iii 5 km iv 9 km
 2 a South b North-West c North-East
 d South-West e South-East f East
 g North-East h South-West
 3 a WA, NT, SA, NSW
 b i QLD ii WA iii TAS
 c QLD, NSW, VIC, TAS d QLD, NSW, VIC, TAS
 4 a Pia or Joe b Tom c i Yes ii No

EXERCISE 4D

- 1 a 2 cm represents 20 km b 3 cm rep. 15 km
 5 cm represents 50 km 10 cm rep. 50 km
 $\frac{1}{2}$ cm represents 5 km 1 mm rep. $\frac{1}{2}$ km
 1 mm represents 1 km $\frac{1}{2}$ cm rep. $2\frac{1}{2}$ km
 30 km is rep. by 3 cm 20 km is rep. by 4 cm
 56 km is rep. by 56 mm
 2 a 4 km b 10 km c 6 km d 9 km
 e 6600 m f 8200 m
 3 a 90 m b 63 m c 60 m d 144 m e 297 m
 4 a i 45 mm ii 45 mm iii 65 mm
 b i 45 km ii 45 km iii 65 km

5

Room	Drawing sizes	Real sizes
Living	5 cm by 3 cm	5 m by 3 m
Kitchen	4 cm by 2.4 cm	4 m by 2.4 m
Bed 1	4 cm by 3.3 cm	4 m by 3.3 m
Bed 2	4 cm by 2.4 cm	4 m by 2.4 m

6 a

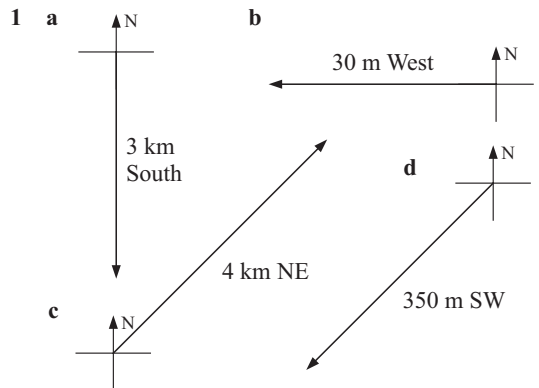
Part of race	Direction	Map Distance
A to B	East	5 cm
B to C	North-West	7.1 cm
C to D	East	3 cm
D to E	South-East	2.8 cm
E to F	West	2 cm
F to A	South-West	4.2 cm
Total		24.1 cm

- b 48.2 km
 7 a 1400 km b 1200 km c 1550 km
 d 1050 km e 8400 km

EXERCISE 4E

- 1 a F b B c D d A e C f E
 2 a 90° clockwise
 b $90^\circ + \frac{1}{2}$ of $90^\circ = 135^\circ$ clockwise
 3 a South-East b East

EXERCISE 4F

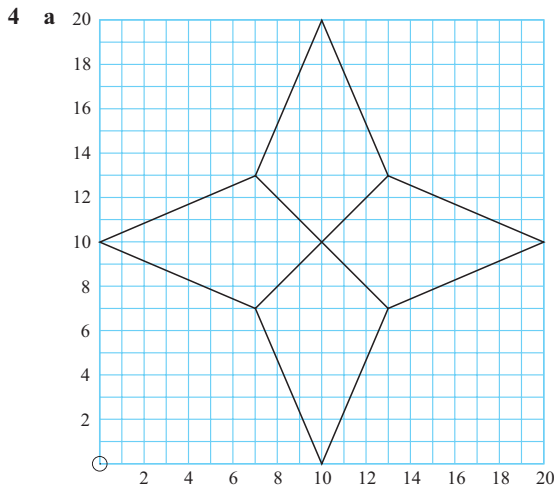
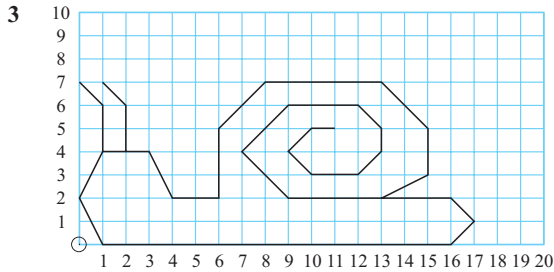


- 2 a H4 b L9 c H13 3 At the bridge

EXERCISE 4G

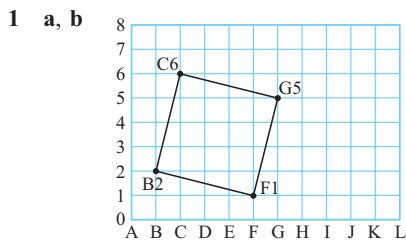
- 1 a i (2, 7) ii (1, 5) iii (7, 3) iv (4, 4)
 b i hurdles ii soccer iii cricket
 iv water skiing
 c i (3, 0) ii (7, 0)
 The second coordinate is 0.
 d i (0, 2) ii (0, 5) iii (0, 7)
 The first coordinate is 0.

2 HAVE A GOOD DAY



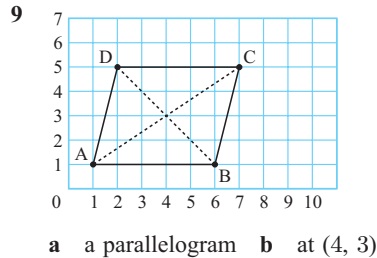
- 5 (2, 8), (3, 7), (4, 7), (5, 8), (5, 5), (9 $\frac{1}{2}$, 5), (9 $\frac{1}{2}$, 8), (9, 8 $\frac{1}{2}$), (8, 9), (9 $\frac{1}{2}$, 9), (10, 8), (10, 3), (9, 1), (9, 0), (8 $\frac{1}{2}$, 0), (8 $\frac{1}{2}$, 2), (8, 2), (8, 0), (7 $\frac{1}{2}$, 0), (7 $\frac{1}{2}$, 2), (5 $\frac{1}{2}$, 2), (5 $\frac{1}{2}$, 0), (5, 0), (5, 2), (4 $\frac{1}{2}$, 2), (4 $\frac{1}{2}$, 0), (4, 0), (4, 2), (3, 3), (3, 4), (2, 5), (2, 8)
 Now join (1, 4) to (2, 5) then (2, 5) to (1, 5).
 Then join (5, 5) to (6, 4). Then join (3, 5) to (4, 5).
 Put dots at (3, 6) and (4, 6).

REVIEW EXERCISE 4



c a square

- 2 a i C5 ii G1 iii C2
 b i go right 2 units then down 3 units
 ii go left 4 units then up 4 units
 3 a i 6 km ii 4 km
 b i South ii South-West iii West
 iv South-East
 4 a Andrea b Michael c Yes
 5 a 3 cm represents 1500 m
 b 1 mm represents 50 m
 c 1500 m is represented by 3 cm
 d 250 m is represented by 5 mm
 6 The treasure is on the beach at J1.
 7 a 600 km b 300 km c 720 km
 8 a South West b 180°



EXERCISE 5A

- 1 a $\frac{6}{10}$ b $\frac{6}{11}$ c $\frac{8}{15}$
 2 a $\frac{1}{2}$ b $\frac{1}{2}$ c $\frac{1}{4}$ d $\frac{2}{4}$ e $\frac{3}{4}$ f $\frac{1}{4}$ g $\frac{1}{8}$
 h $\frac{3}{8}$ i $\frac{1}{16}$ j $\frac{3}{16}$ k $\frac{5}{16}$ l $\frac{11}{16}$
 Two correct answers for d are $\frac{2}{4}$ or $\frac{1}{2}$
 3 a $\frac{5}{8}$ b $\frac{3}{8}$
 4 a i $\frac{6}{11}$ ii $\frac{5}{11}$ b i $\frac{4}{11}$ ii $\frac{7}{11}$
 5 a i $\frac{2}{7}$ ii $\frac{5}{7}$ b i $\frac{4}{7}$ ii $\frac{3}{7}$
 6 a b c d
 7 a, e
 8 a $\frac{3}{4}$ b $\frac{2}{3}$ c $\frac{2}{5}$ d $\frac{4}{5}$ e $\frac{3}{8}$ f $\frac{5}{8}$ g $\frac{2}{7}$
 h $\frac{3}{10}$ i $\frac{1}{100}$
 9 a two thirds b three quarters c three fifths
 d seven eighths e four ninths f five sevenths
 g five twelfths h seventeen twentieths
 i eleven thirtieths j four twenty fifths
 k three hundredths l ninety seven hundredths
 10 a $\frac{1}{2}$ b $\frac{1}{5}$ c $\frac{1}{4}$ d $\frac{1}{6}$ e $\frac{1}{2}$ f $\frac{1}{4}$

EXERCISE 5B

- 1 $\frac{5}{8}$

2 a i $\frac{1}{1}$ ii $\frac{0}{1}$ iii $\frac{1}{1} + \frac{0}{1} = 1$

b i $\frac{1}{2}$ ii $\frac{1}{2}$ iii $\frac{1}{2} + \frac{1}{2} = 1$

c i $\frac{1}{4}$ ii $\frac{3}{4}$ iii $\frac{1}{4} + \frac{3}{4} = 1$

d i $\frac{3}{4}$ ii $\frac{1}{4}$ iii $\frac{3}{4} + \frac{1}{4} = 1$

e i $\frac{1}{4}$ ii $\frac{3}{4}$ iii $\frac{1}{4} + \frac{3}{4} = 1$

f i $\frac{2}{4}$ ii $\frac{2}{4}$ iii $\frac{2}{4} + \frac{2}{4} = 1$

g i $\frac{3}{9}$ ii $\frac{6}{9}$ iii $\frac{3}{9} + \frac{6}{9} = 1$

h i $\frac{6}{16}$ ii $\frac{10}{16}$ iii $\frac{6}{16} + \frac{10}{16} = 1$

3 a $\frac{1}{12}$ b i $\frac{11}{12}$ ii $\frac{7}{12}$ iii $\frac{5}{12}$ iv $\frac{1}{12}$

4 $\frac{5}{6}$ 5 $\frac{1}{3}$ 6 $\frac{3}{7}$ 7 a $\frac{5}{12}$ b 7 c $\frac{7}{12}$

8 a $\frac{3}{11}$ b i 3 ii $\frac{3}{11}$ 9 a $\frac{3}{5}$ b Yes

10

	<i>pieces eaten</i>	<i>fraction eaten</i>	<i>pieces remaining</i>	<i>fraction remaining</i>
a	1	$\frac{1}{16}$	15	$\frac{15}{16}$
b	13	$\frac{13}{16}$	3	$\frac{3}{16}$
c	5	$\frac{5}{16}$	11	$\frac{11}{16}$
d	9	$\frac{9}{16}$	7	$\frac{7}{16}$

EXERCISE 5C

1 a 7 b 10 c 18 d 50 e 60 cents

f 250 mL

2 a 3 b 5 c 8 d 33 e \$1.10 f 200 mL

3 a 2 b 4 c 5 d 15 e \$10 f 3 kg

4 a 1 b 2 c 4 d 3 mm e 5 kg f \$20

5 8 lollipops 6 8 points

7

a	$\frac{1}{3}$ of 12 = 4	$\frac{2}{3}$ of 12 = 8
b	$\frac{1}{4}$ of 40 = 10	$\frac{3}{4}$ of 40 = 30
c	$\frac{1}{5}$ of 35 = 7	$\frac{4}{5}$ of 35 = 28
d	$\frac{1}{10}$ of 30 = 3	$\frac{3}{10}$ of 30 = 9
e	$\frac{1}{8}$ of 16 = 2	$\frac{5}{8}$ of 16 = 10

8 a $\frac{2}{3}$ of \$12 = \$12 \div 3 \times 2

b $\frac{3}{4}$ of \$20 = \$20 \div 4 \times 3

c $\frac{4}{5}$ of 20 = 20 \div 5 \times 4

d $\frac{2}{5}$ of 35 = 35 \div 5 \times 2

e $\frac{3}{4}$ of 36 = 36 \div 4 \times 3

f $\frac{2}{3}$ of 24 = 24 \div 3 \times 2

g $\frac{4}{5}$ of \$100 = \$100 \div 5 \times 4

h $\frac{7}{10}$ of \$200 = \$200 \div 10 \times 7

i $\frac{3}{10}$ of 50 = 50 \div 10 \times 3 j $\frac{4}{7}$ of 28 = 28 \div 7 \times 4

9 a \$8 b 60 kg c 25 cm d \$98 10 \$12

11 10 plants

12 a 12 b 8 c 18 d 15 e 20

13 a 8 b 4 c 24 d 6

14 a \$10 b \$20 c \$35

d i \$65 ii $\frac{65}{100}$ iii \$35 iv $\frac{35}{100}$

EXERCISE 5D

1 a $1\frac{3}{4}$ L b $4\frac{1}{4}$ kg

2 a 16, 8 = $\frac{16}{2}$ b 20, 5 = $\frac{20}{4}$ c 9, 3 = $\frac{9}{3}$

d 16, 2 = $\frac{16}{8}$

3 a 3 b $1\frac{1}{2} = \frac{3}{2}$ 4 a $3\frac{1}{4}$ b $3\frac{1}{4} = \frac{13}{4}$

5 a $1\frac{1}{3}$ b $1\frac{1}{3} = \frac{4}{3}$ 6 a $5\frac{5}{6}$ b $5\frac{5}{6} = \frac{35}{6}$

7 a $1\frac{7}{16}$ b $1\frac{7}{16} = \frac{23}{16}$

8 a $\frac{5}{4}$ b $\frac{5}{2}$ c $\frac{10}{3}$ d $\frac{7}{4}$ e $\frac{13}{5}$ f $\frac{11}{10}$

g $\frac{11}{5}$ h $\frac{21}{2}$ i $\frac{8}{3}$ j $\frac{23}{6}$ 9 $2\frac{3}{4}$

10 a 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$ b 1, $1\frac{1}{3}$, $1\frac{2}{3}$, 2, $2\frac{1}{3}$, $2\frac{2}{3}$

c 1, $1\frac{1}{4}$, $1\frac{2}{4}$ or $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{4}$

11 a $1\frac{1}{5}$ b $1\frac{3}{5}$ c $1\frac{1}{6}$ d $2\frac{5}{6}$ e $1\frac{3}{8}$ f $1\frac{7}{8}$

g $1\frac{7}{10}$ h $2\frac{1}{10}$

EXERCISE 5E

1 a $\frac{1}{3} = \frac{2}{6}$ b $\frac{2}{3} = \frac{4}{6}$ c $\frac{1}{2} = \frac{3}{6}$

2 a $\frac{1}{2} = \frac{2}{4}$ b $\frac{1}{2} = \frac{3}{6}$ c $\frac{1}{2} = \frac{4}{8}$ d $\frac{1}{2} = \frac{8}{16}$

e $\frac{2}{6} = \frac{1}{3}$ f $\frac{2}{8} = \frac{1}{4}$ g $\frac{4}{6} = \frac{2}{3}$ h $\frac{6}{8} = \frac{3}{4}$

i $\frac{2}{5} = \frac{4}{10}$ j $\frac{5}{10} = \frac{1}{2}$ k $\frac{4}{12} = \frac{1}{3}$ l $\frac{9}{12} = \frac{3}{4}$

3 a $\frac{1}{2} = \frac{10}{20}$ b $\frac{1}{3} = \frac{5}{15}$ c $\frac{2}{3} = \frac{4}{6}$ d $\frac{1}{5} = \frac{2}{10}$

e $\frac{2}{5} = \frac{6}{15}$ f $\frac{4}{5} = \frac{16}{20}$ g $\frac{4}{8} = \frac{1}{2}$ h $\frac{8}{12} = \frac{2}{3}$

i $\frac{9}{18} = \frac{1}{2}$ j $\frac{4}{10} = \frac{2}{5}$ k $\frac{12}{16} = \frac{3}{4}$ l $\frac{6}{9} = \frac{2}{3}$

m $\frac{3}{4} = \frac{12}{16}$ n $\frac{2}{9} = \frac{4}{18}$ o $\frac{3}{8} = \frac{15}{40}$

4 a $\frac{1}{6}, \frac{1}{2} = \frac{3}{6}, \frac{5}{6}$ b $\frac{1}{8}, \frac{1}{4} = \frac{2}{8}, \frac{3}{8}$

c $\frac{4}{10}, \frac{1}{2} = \frac{5}{10}, \frac{9}{10}$ d $\frac{4}{9}, \frac{2}{3} = \frac{6}{9}, \frac{7}{9}$

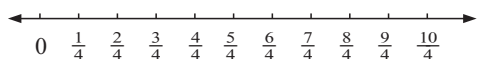
e $\frac{5}{12}, \frac{5}{6} = \frac{10}{12}, \frac{11}{12}$ f $\frac{1}{4} = \frac{2}{8}, \frac{3}{8}, \frac{1}{2} = \frac{4}{8}$

5 a $\frac{1}{3}$ b $\frac{1}{4}$ c $\frac{1}{3}$ d $\frac{1}{3}$ e $\frac{1}{5}$ f $\frac{1}{2}$ g $\frac{2}{5}$

h $\frac{2}{3}$ i $\frac{2}{3}$ j $\frac{2}{5}$ k $\frac{3}{4}$ l $\frac{3}{4}$ m $\frac{4}{5}$

n $\frac{2}{3}$ o $\frac{4}{5}$

6



$\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, 1\frac{1}{4}, 1\frac{1}{2}, 1\frac{3}{4}, 2$

7 a $\frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, 2$

b $\frac{1}{6}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, \frac{5}{6}, 1, 1\frac{1}{6}, 1\frac{1}{3}, 1\frac{1}{2}, 1\frac{2}{3}, 1\frac{5}{6}, 2$

EXERCISE 5F

- 1 a $\frac{3}{4}$, $3 \div 4 = \frac{3}{4}$ of a pizza
 b $\frac{2}{3}$, $2 \div 3 = \frac{2}{3}$ of a pizza
 c $\frac{2}{6}$ or $\frac{1}{3}$, $2 \div 6 = \frac{2}{6}$ of a pizza (or $\frac{1}{3}$ of a pizza)
- 2 a 5 halves b 5 thirds c 10 fifths d 9 quarters
- 3 a $\frac{1}{3}$ b $\frac{1}{5}$ c $\frac{1}{8}$ d $\frac{1}{10}$ e $\frac{2}{5}$ f $\frac{3}{8}$ g $\frac{7}{8}$
 h $\frac{9}{10}$ i $\frac{15}{5}$ j $\frac{9}{6}$
- 4 a $\frac{12}{4} = 3$ b $\frac{20}{5} = 4$ c $\frac{16}{2} = 8$ d $\frac{8}{4} = 2$ e $\frac{9}{3} = 3$
 f $\frac{18}{6} = 3$ g $\frac{24}{8} = 3$ h $\frac{20}{4} = 5$ i $\frac{30}{5} = 6$ j $\frac{56}{8} = 7$
- 5 a $\frac{2}{3} = 2 \div 3$ b $\frac{4}{5} = 4 \div 5$ c $\frac{5}{8} = 5 \div 8$
 d $\frac{3}{10} = 3 \div 10$ e $\frac{6}{7} = 6 \div 7$ f $\frac{11}{12} = 11 \div 12$

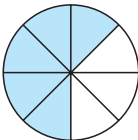
EXERCISE 5G

- 1 a $\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$ b $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$ c $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$
 d $\frac{1}{2} + \frac{1}{2} = 1$ e $\frac{2}{8} + \frac{5}{8} = \frac{7}{8}$ f $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$
 g $\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$ h $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$ i $\frac{5}{6} - \frac{5}{6} = 0$
 j $\frac{7}{8} - \frac{5}{8} = \frac{2}{8}$
- 2 a $\frac{5}{6}$ b $\frac{3}{7}$ c $\frac{5}{9}$ d 1 e $\frac{4}{5}$ f $\frac{4}{5}$ g $\frac{6}{7}$
 h $\frac{7}{10}$ i $\frac{1}{5}$ j $\frac{5}{7}$ k $\frac{2}{7}$ l $\frac{1}{3}$ m $\frac{3}{6}$
 n $\frac{4}{9}$ o 0 p $\frac{1}{5}$
- 3 a $\frac{1}{3} + 1\frac{1}{3} = 1\frac{2}{3}$ b $1\frac{1}{4} + 1\frac{1}{4} = 2\frac{2}{4}$
 c $1\frac{2}{5} + 2\frac{3}{5} = 4$ d $1\frac{7}{8} - \frac{3}{8} = 1\frac{4}{8}$
 e $1\frac{2}{4} - 1\frac{1}{4} = \frac{1}{4}$ f $2\frac{5}{8} - 1\frac{2}{8} = 1\frac{3}{8}$
- 4 a ii 3 b ii $1\frac{2}{4}$ c ii $2\frac{2}{3}$ d ii $2\frac{6}{8}$
- 5 a ii 1 b ii $1\frac{2}{4}$ c ii $1\frac{1}{5}$ d ii $1\frac{1}{3}$
- 6 4 bags 7 a $\frac{4}{8}$ or $\frac{1}{2}$ b $\frac{1}{2}$
- 8 a $\frac{6}{9}$ or $\frac{2}{3}$ b $\frac{3}{9}$ or $\frac{1}{3}$ 9 $3\frac{1}{3}$ bags
- 10 $2\frac{1}{2}$ pages 11 a $\frac{1}{3}$ page b $1\frac{2}{3}$ pages
- 12 $\frac{4}{8}$ or $\frac{1}{2}$ tonne

REVIEW EXERCISE 5A

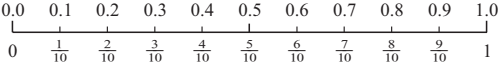
- 1 a $\frac{5}{9}$ b seventeen twentieths 2 $\frac{9}{25}$ 3 $\frac{5}{12}$
- 4 a 10 b 5 5 28
- 6 a $\frac{1}{3} = \frac{4}{12}$ b $\frac{3}{4} = \frac{12}{16}$ 7 $\frac{3}{8}$
- 8 a $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$ b $\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$ (or $\frac{1}{2}$)
- 9 a $\frac{3}{10}$ b $\frac{7}{9}$ c 4

REVIEW EXERCISE 5B

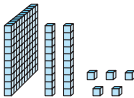

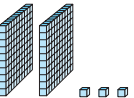
- 1 a 12 b $\frac{1}{12}$ c one twelfth
- 2  3 $\frac{1}{8}$

- 4 a $\frac{11}{15}$ b i 1 ii $\frac{1}{15}$ 5 a 9 b 6
- 6 a $2\frac{1}{4}$ b $2\frac{1}{4} = \frac{9}{4}$
- 7 a $\frac{2}{3} = \frac{14}{21}$ b $\frac{3}{4} = \frac{12}{16}$ c $\frac{16}{20} = \frac{4}{5}$
- 8 a $\frac{3}{7} = 3 \div 7$ b $\frac{7}{12} = 7 \div 12$
- 9 a $\frac{4}{8} + 1\frac{1}{8} = 1\frac{5}{8}$ b $1\frac{3}{4} - 1\frac{2}{4} = \frac{1}{4}$

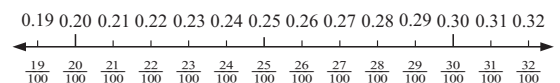
EXERCISE 6A

- 1 a 0.2 b 0.4 c 0.7 d 2.6
- 2 a 4.1 b 1.3 c 2.4 d 0.7
- 3 
- 4 a 0.4 b 0.7 c 0.9 d 1.1 e 2.3
 f 3.5 g 8.6 h 11.8
- 5 a $\frac{2}{10}$ b $\frac{7}{10}$ c $\frac{4}{10}$ d $\frac{5}{10}$
- 6 a $1\frac{7}{10}$ b $3\frac{8}{10}$ c $2\frac{9}{10}$ d $10\frac{1}{10}$ e $5\frac{4}{10}$
 f $12\frac{2}{10}$ g $26\frac{3}{10}$ h $66\frac{5}{10}$
- 7 a 0.5 b 7.7 c 12.4 d 26.9
- 8 a zero decimal seven or zero point seven
 b four point two c five point nine
 d eleven point two

EXERCISE 6B

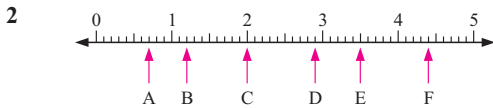
- 1 a 0.23 b 0.37 c 0.58 d 0.72
- 2 a 1.34 b 2.78 c 3.64 d 4.02 e 6.05
- 3 a 5.35 b 8.91 c 0.59 d 2.4 e 4.05 f 0.03
- 4 a  b  c 
- 5 a 0.34 b 0.98 c 0.13 d 10.25 e 0.07
 f 4.19 g 11.01 h 25.68 i 4.12 j 0.77
 k 15.52 l 25.04
- 6 a $\frac{82}{100}$ b $\frac{11}{100}$ c $\frac{59}{100}$ d $\frac{2}{100}$ e $\frac{99}{100}$
 f $\frac{64}{100}$ g $\frac{7}{100}$ h $\frac{1}{100}$
- 7 a $1\frac{47}{100}$ b $6\frac{94}{100}$ c $14\frac{49}{100}$ d $26\frac{1}{100}$
 e $22\frac{21}{100}$ f $33\frac{33}{100}$ g $10\frac{1}{100}$ h $166\frac{6}{100}$
- 8 a 59.82 b 70.77 c 53.05 d 7.39 e 11.08
- 9 a one point zero seven b twelve point eight two
 c six hundred and ninety six point nine six
 d zero point two three
 e five hundred point zero five

10



EXERCISE 6C

- 1 a 0.3 b 1.8 c 4.5 d 12.7 e 18.1 f 30.9



- 3 76.3 cm 4 0.7 L 5 4.5 kg
 6 a 37.0°C b 39.2°C 7 2.07 m 8 5.93 m
 9 a 0.14 b 0.88 c 1.65 d 2.46 e 10.21 f 15.53

EXERCISE 6D

	decimal	place value				
	number	tens	ones	.	tenths	hundredths
a	6.75		6	.	7	5
b	3.11		3	.	1	1
c	12.06	1	2	.	0	6
d	5.26		5	.	2	6
e	0.99		0	.	9	9
f	0.47		0	.	4	7
g	79.19	7	9	.	1	9
h	30.03	3	0	.	0	3
i	88.8	8	8	.	8	

- 2 a i $\frac{5}{100}$ ii 5 b i $\frac{7}{10}$ ii $\frac{7}{100}$ iii 70
 c i 6 ii $\frac{6}{100}$ iii $\frac{6}{100}$
 3 a 3.4 b 25.37 c 0.08 d 9.13 e 0.74
 f 30.63 g 100.07

EXERCISE 6E

- 1 a 2.7, 2.9, 3.1, 3.5, 4.0, 4.3
 b 10.3, 10.8, 11.4, 11.8, 11.9, 12.1
 2 a 11.1, 10.9, 10.7, 10.1, 9.8, 8.9
 b 17.1, 16.7, 16.5, 16.1, 15.7, 15.6
 3 a i Saturday ii Tuesday
 iii Tuesday and Wednesday
 b i Wednesday ii Saturday
 iii Tuesday, Wednesday and Thursday
 4 a 2.23, 2.36, 2.63, 2.66, 3.32, 3.62
 b 31.45, 31.47, 31.84, 33.88, 34.18, 34.21
 5 a 0.78, 0.75, 0.72, 0.69, 0.61, 0.57
 b 10.52, 10.46, 10.39, 9.92, 9.86, 9.76
 6 a Sue, Jess, Leah, Maria, Kim
 b Tony, Yannis, Tan, Carlo, Martin, John
 c i John ii Sue
 iii Kim, Maria, John, Martin
 iv Sue, Yannis, Tony
 7 a 45.27 sec, 45.29 sec, 46.06 sec, 46.44 sec
 b 44.61 sec, 44.76 sec, 45.11 sec, 46.12 sec
 c Patrick Dwyer d Clinton Hill
 e John Steffensen f the Australian team
 8 a 50.01, 50.11, 50.18, 50.21, 50.28, 50.32, 50.42,
 51.06
 b Heat 1: 50.01, 50.11, 50.18, 50.21
 Heat 2: 50.28, 50.32, 51.06, 51.21
 c Sandie Richards d Olga Kotlyarova
 e Cathy Freeman

EXERCISE 6F

- 1 a 2.94 b 3.79 c 6.52 d 8.18
 2 a 0.32 b 0.91 c 0.92 d 0.61 e 3.21
 f 2.35 g 2.73 h 4.78 i 4.56 j 3.94
 k 7.78 l 7.77 m 0.13 n 0.54 o 1.56
 p 5.88 q 2.33 r 3.4 s 12.11 t 2.95
 u 4.54 v 11.46 w 3.26 x 11.23
 3 a 30.63 m b 43.84 kg c 68.69 litres
 4 6.09 kg 5 2.23 m 6 5.78 kg 7 1.82 m
 8 No, as they weigh 2.4 kg in total
 9 a John b Daniel
 c 200.58 sec or 3 min 20.58 sec

EXERCISE 6G

- 1 a 0.11 b 0.17 c 0.17 d 0 e 1.23
 f 2.32 g 3.19 h 0.76 i 2.33 j 1.47
 k 1.44 l 3.12 m 0.11 n 0.32 o 2.91
 p 0.64 q 0.49 r 1.86 s 1.26 t 2.79
 u 1.36 v 4.18 w 1.8 x 3.41
 2 a 0.07 m or 7 cm b 1.08 kg c 1.85 m
 d 39.38 sec

EXERCISE 6H

- 1 a 0.3 b 0.7 c 5 d 8 e 9.2 f 16.3
 g 20.8 h 317
 2 a 3 b 7 c 92 d 163 e 208 f 50
 g 80 h 3170
 3 a 3 b 180 c 2.5 d 379 e 429 f 82
 g 0.9 h 2
 4 a 2500 b 250 c 25 d 3500 e 350
 f 35 g 42 800 h 2480 i 248
 5 a 0.5 b 0.2 c 0.66 d 0.88 e 1.37
 f 0.03 g 0.002 h 0.015
 6 a 5.63 b 3.2 c 1.965 d 0.56 e 0.212
 f 0.457 g 0.086 h 0.0018
 7 a 1.217 b 5.62 c 0.72 d 0.1467
 e 0.021 f 0.046 g 0.009 h 0.0027

EXERCISE 6I

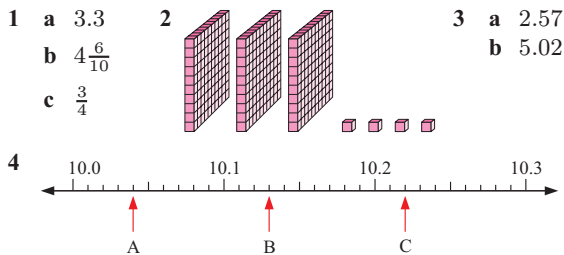
- 1 a 9.97 b 8.07 c 14 d 11.46 e 0.21
 f 0.53 g 0.72 h 7.56 i 44.85
 j 107.35 k 131.1 l 95.79
 2 b i 0.3 ii 0.3 They are equal
 3 a 2.53 m b 1.64 m c 16.46 kg

EXERCISE 6J

- 1 a 3% b 17% c 36% d 50% e 75%
 f 99% g 100% h 200%
 2 a $\frac{7}{100}$ b $\frac{20}{100}$ c $\frac{37}{100}$ d $\frac{63}{100}$ e $\frac{81}{100}$
 f $\frac{100}{100}$ g $\frac{103}{100}$ h $\frac{200}{100}$
 3 a 3% b 17% c 36% d 50% e 75%
 f 99% g 100% h 300%
 4 a 0.07 b 0.20 c 0.37 d 0.63 e 0.81
 f 1.00 g 1.03 h 2.00

- 5 a i $\frac{10}{100}$ ii 10% b i $\frac{30}{100}$ ii 30%
 c i $\frac{70}{100}$ ii 70% d i $\frac{90}{100}$ ii 90%
 e i $\frac{20}{100}$ ii 20% f i $\frac{40}{100}$ ii 40%
 g i $\frac{60}{100}$ ii 60% h i $\frac{80}{100}$ ii 80%
 i i $\frac{5}{100}$ ii 5% j i $\frac{15}{100}$ ii 15%
 k i $\frac{16}{100}$ ii 16% l i $\frac{68}{100}$ ii 68%
- 6 a $\frac{1}{10}$ b $\frac{1}{2}$ c $\frac{4}{5}$ d $\frac{1}{4}$ e $\frac{3}{4}$ f $\frac{3}{20}$
 g $\frac{13}{20}$ h $\frac{19}{20}$
- 7 15% 8 $\frac{1}{10}$ 9 a 90% b 98%
- 10 a $\frac{1}{4}$ b 18 students

REVIEW EXERCISE 6A




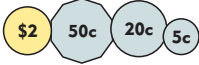










- 5 Peter, Jane, Lauren, Debbie, Kim
 6 a 7.53 b 4.86 c 465
 7 a 0.56 b 0.6 c 400%
 8 a 0.68 kg and 0.81 kg b 0.01 kg (10 g) short




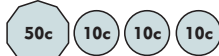









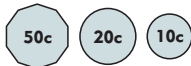

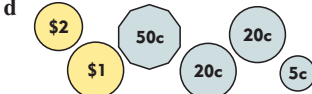
REVIEW EXERCISE 6B

- 1 a seven point six three b $\frac{7}{10}$ c 3.27
 2 39.6°C 3 a $\frac{3}{10}$ b 30 c $\frac{3}{100}$
 4 a 4.3 b 21.43 c 9.05 d 0.62
 5 a Anton b Jai c 0.3 sec
 6 a 13.4 b 5.91 c 327
 7 a $\frac{11}{20}$ b i $\frac{28}{100}$ ii 28% 8 1.25 m

EXERCISE 7A

- 1 a \$0.30 b \$0.55 c \$1.05 d \$0.95 e \$2.40
 f \$4.70 g \$5.85 h \$10.20 i \$20.15
 j \$122.80 k \$56.25
- 2 a  b 
 c  d 
 e  f 
 g 
 h 

- i 
 j 
 k 
 l 

- 3 a eighty cents b thirty five cents
 c three dollars and eighty five cents
 d ten dollars and ten cents
- 4 a twenty two dollars forty five cents
 b thirteen dollars five cents
 c seventeen dollars fifty cents
 d twenty one dollars sixty five cents
 e eighty five dollars ninety cents
 f one hundred and ten dollars ten cents
 g three hundred and thirty two dollars fifty cents
 h nine hundred and six dollars forty five cents
- 5 a \$17.10 b \$70.25 c \$253.40 d \$600.80
 e \$978.45
- 6 a \$0.55 b \$0.90 c \$0.10 d \$2.00
 e \$1.55 f \$3.65 g \$5.70 h \$10.00
 i \$20.00 j \$5.20 k \$32.90
- 7 a 125 cents b 430 cents c 285 cents
 d 1505 cents e 1020 cents f 2535 cents
 g 4615 cents h 7040 cents
- 8 a 1% b 5% c 20% d 50%
- 9 a  or 
 b  or 
 c  or 
 d  or 
 e  or 
 f  or 
- 10 a  b 
 c  d 



- 11 3 50-cent coins, 1 20-cent and 1 10-cent
 12 Joanna 8 5-cent coins Kylie 4 10-cent coins
 Ben 2 20-cent coins

EXERCISE 7B

- 1 a \$1 b \$9 c \$13 d \$20 e \$23
 f \$30 g \$71 h \$25 i \$177 j \$246
 2 a \$10 b \$18 c \$21
 3 a \$6 b \$26 c \$27 d \$61
 4 a \$3.65 b \$6.65 c \$2.85 d \$27.75
 e \$22.25 f \$400.80 g \$38.55 h \$54.65
 i \$399.60 j \$38.70 k \$485.55 5 \$11.35
 6 a 35 cents b 75 cents c \$1.90 d 75 cents e \$8.25
 f \$28.45 g \$168.85 h \$344.55 i \$100.95
 7 a \$1.25 b \$1.80 c \$7.40 d \$7.65 e \$14.60
 8 a \$29, yes b \$28.85 c \$1.15
 9 a \$1.15 b \$27.40 c \$34.65 d \$78.60

EXERCISE 7C

- 1 a \$14 b \$6 c \$12 d \$15 e \$56 f \$54
 2 a \$24.50 b \$360 c \$18
 3 a \$8.25 b \$6.75 c \$49.35 d \$23.40
 e \$30.00 f \$46.80 g \$112.05 h \$146.25
 i \$691.25
 4 a \$16.45 b \$3.55 5 a \$12.85 b \$7.15
 6 a \$45.15 b \$4.85 7 a \$29.55 b \$264
 8 \$53.55 9 \$78.30
 10 a \$180.25 b no, \$15.25 short
 11 a 25 cents b 30 cents c 50 cents
 12 a 30 cents b 55 cents c 49 cents
 d 80 cents e 70 cents f 95 cents
 13 \$55 14 \$135 15 \$24
 16 a \$4.10 b \$6.45 c \$17.45 d \$33.45
 e \$3.25 f \$75.25

EXERCISE 7D

- 1 a Sam b Kosta c \$9.25
 2 a Thursday, Wednesday, Friday, Monday, Tuesday
 b Tuesday
 3 \$80.90 4 \$69.50
 5 $\frac{1}{3}$ of \$24 = \$8 is larger (than \$7)
 6 4 bus tickets cost \$15.80, 15 cents more expensive.
 7 A six pack is cheaper by \$2
 8 a i \$38.85 ii \$37.10 iii \$40.95 iv \$39.20
 b the Smith family
 c \$40.95, \$39.20, \$38.85, \$37.10 d \$11.15
 9 a \$24.10 b \$29.30 c a profit d \$5.20

EXERCISE 7E

- 1 a \$294.05 b \$343.25 c \$351.75 d \$16
 2 a \$13.15 b \$13 c \$46.35 d \$217.10
 3 \$29.45 4 \$11.45
 5 a \$45.50 b \$409.50 c \$386.75

6 a

Date	Quantity (litres)	Cost (cents/litre)	Total cost
Mar 1st	35	96.7	\$33.85
Mar 9th	48	98.9	\$47.47
Mar 17th	42	99.5	\$41.79
Mar 26th	45	101.2	\$45.54

b \$168.65

EXERCISE 7F

- 1 a \$282.80 b yes c no, \$2.75 over her budget
 d yes, \$1.45 under her budget
 2 a the tent b the folding table
 c \$522.75, they are not within their budget. They could decide not to buy one of the items, or they could buy cheaper items if possible.
 3 a \$87.50 b \$445 c \$55
 d hair cuts, donations, insurance, gifts, replacement items if something breaks, etc.

REVIEW EXERCISE 7A

- 1 50 cents
 2 a b
 c
 3 45 cents or \$0.45 4 \$233.45 5 \$4.05
 6 \$21 7 \$206 8 \$65.50

REVIEW EXERCISE 7B


- 1 \$18.90
 2 a b
 3 \$22 4 \$532.60
 5 a Screamer b Big Whizz c \$27
 d \$19.70, yes by 10 cents e 2 rides on Screamer

EXERCISE 8A

- 1 a 3, 5, 7, 9, 11, 13 b 4, 7, 10, 13, 16, 19
 c 2, 9, 16, 23, 30, 37
 2 a 41, 39, 37, 35, 33, 31 b 57, 52, 47, 42, 37, 32
 c 103, 99, 95, 91, 87, 83
 3 a +2, b -2 c +5 d -10 e +3, f -5
 4 a 5, 10, 20, 40, 80 b 2, 6, 18, 54, 162
 c 3, 30, 300, 3000, 30000
 5 a 320, 160, 80, 40, 20 b 243, 81, 27, 9, 3

- 6 a 21 b 14 c 29, 23 d 33, 18 e 56, 224
 f 45, 1215 g 112, 14 h 15, 5
- 7 a, b, e, f
- 8 3, 6, 9, 2, 5, 8, 1, 4, 7 all the digits except 0 appear
- 9 8, 6, 4, 2, 0, 8, 6, 4, 2 the even digits and 0 appear in descending order (twice)
- 10 The digits 1 to 9 appear in descending order. In column 1 they appear in ascending order.


EXERCISE 8B

1 a 

b

<i>Pat. number</i>	1	2	3	4	5	6
<i>matches needed</i>	3	6	9	12	15	18


+3 +3 +3 +3 +3

2 a 

b

<i>Pat. number</i>	1	2	3	4	5	6
<i>matches needed</i>	5	10	15	20	25	30


+5 +5 +5 +5 +5

3 a 

b

<i>Pat. number</i>	1	2	3	4	5	6
<i>matches needed</i>	6	12	18	24	30	36

+6 +6 +6 +6 +6

4 a 

b

<i>no. of panels</i>	1	2	3	4	5	6
<i>no. of timbers</i>	7	14	21	28	35	42

+7 +7 +7 +7 +7

EXERCISE 8C

1

Rule: +23	
<i>Input</i>	<i>Output</i>
1	24
4	27
8	31
14	37
25	48
33	56

2

Rule: $\times 3$	
<i>Input</i>	<i>Output</i>
2	6
5	15
6	18
13	39
20	60

3

Rule: $\times 2$, then +3	
<i>Input</i>	<i>Output</i>
1	5
3	9
6	15
13	29
17	37

4

Rule: +5, then $\times 2$	
<i>Input</i>	<i>Output</i>
2	14
7	24
13	36
15	40
22	54

5

Rule: $\times 3$, then -4	
<i>Input</i>	<i>Output</i>
2	2
5	11
10	26
13	35
16	44


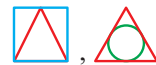
EXERCISE 8D




1 a Each member is 'a' followed by a letter of the alphabet, starting with 'a' and using the letters in alphabetical order.



b The members are pairs of letters in alphabetical order. The first member is the first two letters. The second member is the second two letters, and so on.

2 a $6 \times 6 = 36$ b $10 \times 10 = 100$

3 10, 15, 21

4  5 

6 a i  2 ii  5 iii  9

iv  14 v  20

b, c

<i>Number of sides</i>	<i>Number of diags.</i>
3	0
4	2
5	5
6	9
7	14
8	20

d Yes, to go from triangle to quadrilateral we add 2 and then add one more each time.

e i 27 ii 35 iii 65

7 a i 10 ii 15 iii 21

b

<i>Layer number</i>	<i>Number of apples</i>
1	1
2	3
3	6
4	10
5	15
6	21

c Start with 1 add 2 then add one more each time.

d i 28 ii 55 e i 35 ii 220

EXERCISE 8E

- 1 a 3 b 4 c 14 d 6 e 7 f 7 g 10

- h 7 i 12 j 20 k 4 l 20
 2 a 2 b 6 c 6 d 5 e 9 f 6 g 10
 h 16 i 14 j 6 k 11 l 8
 3 a 5 b 7 c 2 d 3 e 7 f 7 g 9 h 7 i 8
 4 a 10 b 7 c 56 d 3 e 3 f 9 g 28 h 6 i 42
 5 a 6 b 27 c 6 d 9 e 20 f 13 g 1 h 6 i 2
 6 a 3 b 3 c 1 d 11 e 7 f 3 g 2 h 7 i 8


REVIEW EXERCISE 8A

- 1 a 5, 9, 13, 17 b 875, 175, 35, 7
 2 a 64, 256 b 55, 39



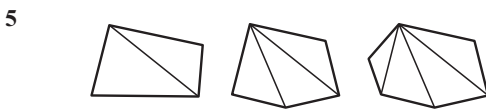
b

Pat. number	1	2	3	4	5
matches needed	6	12	18	24	30



4

Rule: $\times 3$, then -2	
Input	Output
3	7
5	13
8	22
12	34
16	46




a

Number of sides of polygon	Number of diagonals from one vertex
4	1
5	2
6	3
7	4
8	5


- b Start with 1 and add 1 each time.
 c i 6 diagonals ii 17 diagonals
 iii 97 diagonals
 6 a 13 b 18 c 9 d 12

REVIEW EXERCISE 8B

- 1 a 112, 105, 98, 91 b 4, 40, 400, 4000
 2 a 33, 51 b 63
 3 a 

b

Pat. number	1	2	3	4	5
matches needed	6	12	18	24	30



4

Rule: $+2$, then $\times 4$	
Input	Output
2	16
5	28
7	36
10	48

- 5 a 1 5 10 10 5 1
 1 6 15 20 15 6 1
 b The first number in the row is 1. Find each other number by adding the two numbers in the row above it. The last number is 1.

- 6 a 15 b 15 c 63 d 9
 7 a 31 b 15 c 10

EXERCISE 9A

- 1 a 28 mm b 75 mm c 29 mm d 44 mm
 2 a 65 mm, 6.5 cm b 18 mm, 1.8 cm
 c 32 mm, 3.2 cm d 82 mm, 8.2 cm
 3 a 20 mm b 27 mm c 34 mm d 71 mm
 e 56 mm f 98 mm g 44 mm h 115 mm
 4 a 2 cm 7 mm b 3 cm 5 mm
 c 4 cm 1 mm d 7 cm 8 mm
 5 a mm b cm c mm d km e m f cm
 6 a cm b mm c mm d cm e cm f m
 7 a B b A c B d C e B f A g B h C

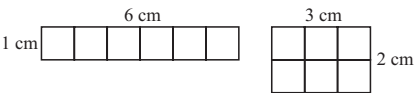
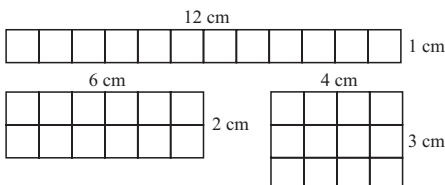
EXERCISE 9B

- 1 a 5 cm = 50 mm b 20 cm = 200 mm
 c 125 cm = 1250 mm d 6.5 cm = 65 mm
 e 14.2 cm = 142 mm f 54.5 cm = 545 mm
 2 a 10 mm = 1 cm b 5 mm = 0.5 cm
 c 2 mm = 0.2 cm d 1 mm = 0.1 cm
 e 15 mm = 1.5 cm f 35 mm = 3.5 cm
 3 a 4 m = 400 cm b 40 m = 4000 cm
 c 0.4 m = 40 cm d 1.6 m = 160 cm
 e 2.7 m = 270 cm f 14.8 m = 1480 cm
 4 a 100 cm = 1 m b 500 cm = 5 m
 c 230 cm = 2.3 m d 10 cm = 0.1 m
 e 1 cm = 0.01 m f 7 cm = 0.07 m
 5 a 2 m = 2000 mm b 20 m = 20 000 mm
 c 5.6 m = 5600 mm d 1.2 m = 1200 mm
 e 0.8 m = 800 mm f 0.5 m = 500 mm
 6 a 1000 mm = 1 m b 4800 mm = 4.8 m
 c 2200 mm = 2.2 m d 500 mm = 0.5 m
 e 350 mm = 0.35 m f 50 mm = 0.05 m
 7 a 5 km = 5000 m b 12 km = 12 000 m
 c 1.2 km = 1200 m d 0.8 km = 800 m
 e 0.55 km = 550 m f 0.02 km = 20 m
 8 a 8000 m = 8 km b 5000 m = 5 km
 c 1200 m = 1.2 km d 500 m = 0.5 km
 e 200 m = 0.2 km f 10 m = 0.01 km
 9 a 1.56 m b 0.7 m c 1.55 m d 0.285 m

EXERCISE 9C

- 1 a i 8 cm ii 12 cm iii 12 cm iv 18 cm v 18 cm
 b iv and v
 2 a 10 cm b 16 cm c 16 cm
 3 a 82 mm b 92 mm c 76 mm d 86 mm
 e 103 mm f 85 mm
 4 a c is shortest b e is longest
 5 a 39 km b 69 m c 102 mm
 6 a 108 mm b 116 mm c 122 mm

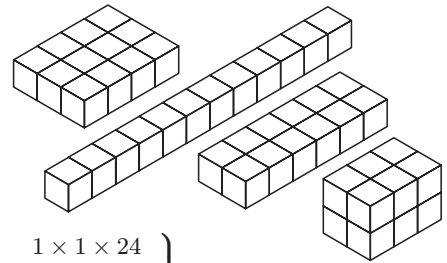
EXERCISE 9D

- 1 a i 12 cm^2 ii 7 cm^2 iii 13 cm^2
 b iii has largest area
 2 a 6 cm^2 b 10 cm^2 c 13 cm^2 d 23 cm^2
 3 
 4 
 5 It consists of 3 squares which are $1\text{ cm} \times 1\text{ cm}$ and a half square ($1\text{ cm} \times 1\text{ cm}$)
 6 a 8 cm^2 b 10 cm^2 c 7 cm^2
 7 a Yes, as each is made up of 4 squares of the same size.
 b No, perimeters are 10, 10, 8, 10, 10 units
 8 a Yes, 10 cm
 b No, areas are 4 cm^2 , 6 cm^2 , 4 cm^2
 9 a 4 ha b 8 ha c 1 ha
 10 a m^2 b m^2 c cm^2 d ha e m^2
 f ha g ha h cm^2
 11 a 18 cm^2 b 8 cm^2 c 12 cm^2 d 15 cm^2
 e 16 cm^2 f 20 cm^2
 12 32 m^2 13 63 m^2 14 3 m
 15 24 m long by 1 m wide, 12 m long by 2 m wide, 8 m long by 3 m wide

EXERCISE 9E

- 1 a A is 8 cm^3 B is 12 cm^3 C is 9 cm^3
 D is 10 cm^3 E is 11 cm^3 F is 13 cm^3
 b A, C, D, E, B, F
 2 a cubic centimetre or centimetre cube
 b cubic centimetre
 3 a 12 b 6 c multiplying them (72)
 d 24 e 3 f multiplying them (72)
 4 a 8 cm^3 b 12 cm^3 c 6 cm^3 d 24 cm^3
 e 20 cm^3 f 36 cm^3 g 24 cm^3 h 45 cm^3
 5 h

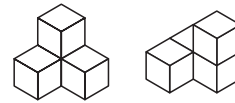
6 a



- b
$$\left. \begin{array}{l} 1 \times 1 \times 24 \\ 1 \times 2 \times 12 \\ 1 \times 3 \times 8 \\ 1 \times 4 \times 6 \\ 2 \times 2 \times 6 \\ 2 \times 3 \times 4 \end{array} \right\} \text{6 of them}$$

7 a 50 bricks b 20 c 1000 bricks

8 b



c at least 24 answers

EXERCISE 9F

- 1 a 1 L b 5 L c 8 L
 2 a 2000 mL b 4000 mL c 9000 mL
 3 a less b more c more d less e more
 f less
 4 a 6 L b 15 L c $9\frac{1}{2}$ L
 5 a 1375 mL b 2100 mL c 3475 mL
 6 a 4 b i 12 cups ii 28 cups iii 2 cups
 7 a L b L c kL d L e mL f L
 g kL h mL
 8 a $1\frac{1}{2}$ L b $2\frac{1}{4}$ L c $3\frac{3}{4}$ L d $7\frac{1}{4}$ L
 9 a 1.5 L b 2.25 L c 0.25 L d 1.75 L
 10 a C b B c B d B e C f C g C h C
 11 a 2 mL b 8 mL
 12 a 2 L = 2000 mL b 3.5 L = 3500 mL
 c 1.2 L = 1200 mL d 0.5 L = 500 mL
 e 0.2 L = 200 mL f 0.1 L = 100 mL
 13 a 5000 mL = 5 L b 8000 mL = 8 L
 c 1200 mL = 1.2 L d 2500 mL = 2.5 L
 e 500 mL = 0.5 L f 375 mL = 0.375 L
 14 a 1.5 L b 2.4 L c 0.125 L 15 B 16 B and C

EXERCISE 9G


- 1 a lighter b heavier c the same
 2 a yes b no c no d yes e no f no
 3 a 1 b 2 c 4 d 8 e $\frac{1}{2}$ f $1\frac{1}{2}$ g $3\frac{1}{2}$ h $\frac{1}{4}$
 4 a 3000 g b 500 g c 2500 g d 1250 g
 5 a g b kg c g d kg
 6 a 3.5 kg b 2 kg c 5.5 kg d 5 kg e 7.5 kg
 7 a 2.4 kg = 2400 g b 5.5 kg = 5500 g
 c 0.6 kg = 600 g d 0.375 kg = 375 g
 e 0.1 kg = 100 g f 0.05 kg = 50 g

- 8 a 2000 g = 2 kg b 5000 g = 5 kg
c 1500 g = 1.5 kg d 500 g = 0.5 kg
e 250 g = 0.25 kg f 750 g = 0.75 kg
- 9 a 5 t = 5000 kg b 9.8 t = 9800 kg
c 10.2 t = 10200 kg d 0.5 t = 500 kg
e 0.8 t = 800 kg f 0.36 t = 360 kg
- 10 a 5000 kg = 5 t b 4300 kg = 4.3 t
c 7060 kg = 7.06 t d 800 kg = 0.8 t
e 200 kg = 0.2 t f 120 kg = 0.12 t
- 11 A 12 B

REVIEW EXERCISE 9A

- 1 a km b kg c mL d mm^2 or cm^2
2 a 5 cm 7 mm b i 2000 mm ii 2 m
3 a 10 cm b 5 cm^2 4 3 ha
5 a 8 b 5 c 40 d 10 e 4
6 a 3000 b 1 c $\frac{1}{4}$ 7 8
8 a less b less c more
9 1.5 kg = 1500 g b 500 m = 0.5 km
10 6 cm (or 0.06 m)

REVIEW EXERCISE 9B

- 1 a kg b m^2 c L d mL
2 a 1500 b 10 cm 7 mm 3 both the same
4 a i 2 cm ii  1 cm
b i 8 cm ii 10 cm
5 $\frac{1}{2}$ ha 6 15 m^3
7 a 630 cm = 6.3 m b 0.5 L = 500 mL
8 1.27 kg (or 1270 g) 9 A and C 10 1 L

EXERCISE 10A

- 1 a 15 past 12 b 25 past 2 c 15 to 4 d 10 to 8
e 5 past 5 f 20 to 11 g 20 past 7 h 25 to 11
i 15 to 5 j 10 past 8 k 10 to 7 l 20 to 10
m 5 past 4 n 5 to 12 o 25 past 6 p 20 past 9
- 2 a 12 past 7 b 22 past 8 c 27 past 2 d 7 past 9
- 3 a 12 to 11 b 2 to 3 c 22 to 12 d 7 to 8
- 4 a 15 past 11 b 15 to 9 c 10 past 12 d 30 past 7
- 5 a i 14 past 2 in the morning ii 2:14 am
b i 24 past 3 in the morning ii 3:24 am
c i 24 to 6 in the morning ii 5:36 am
d i 9 to 5 in the morning ii 4:51 am
e i 28 to 8 in the morning ii 7:32 am
f i 7 past 11 in the morning ii 11:07 am
g i 3 to 9 in the morning ii 8:57 am
h i 28 past 1 in the morning ii 1:28 am
- 6 a i 5 to 12 at night ii 11:55 pm
b i 15 past 1 in the afternoon ii 1:15 pm
c i 21 to 5 in the afternoon ii 4:39 pm
d i 3 past 6 in the afternoon ii 6:03 pm
e i 13 past 4 in the afternoon ii 4:13 pm
f i 8 to 6 in the afternoon ii 5:52 pm
g i 17 to 11 at night ii 10:43 pm
h i 29 past 2 in the afternoon ii 2:29 pm

- 7 a 7 past 7 in the morning
b 23 past 6 in the afternoon
c 22 to 12 in the evening
d 2 past 12 in the early morning
e 19 to 3 in the morning
f 28 to 6 in the afternoon
g 24 to 11 in the morning
h 4 to 1 in the morning
i 19 past 4 in the afternoon
j 11 past 1 in the afternoon
- 8 a 8:00 am b 9:00 pm c 6:10 am d 7:30 pm
e 12:35 am f 11:45 am g 12:15 pm h 12:05 am
- 9 a 4:24 am b 6:27 pm c 1:02 pm
d 9:38 pm e 1:32 pm f 12:15 am
- 10 a 3 hours b $3\frac{1}{2}$ hours c 14 hours
d 7 hours e $6\frac{1}{2}$ hours f 6 h 40 min
g 7 h 46 min h 33 h 40 min i 13 h 32 min

EXERCISE 10B

- 1 a minutes b seconds c hours and minutes
d hours and mins e hours f sec. g sec.
2 a 120 min b 180 min c 480 min d 90 min
e 137 min f 177 min g 181 min h 332 min
3 a 1 h b 2 h c 4 h d 9 h
4 a 1 h 12 min b 2 h 4 min c 3 h 37 min
d 4 h 46 min e 10 h 7 min
5 a $60 \text{ min} \div 2 = 30 \text{ min}$ b $60 \text{ min} \div 4 = 15 \text{ min}$
c $3 \times \frac{1}{4} \text{ hr} = 45 \text{ min}$

EXERCISE 10C

- 1 a 12 b

<i>J</i>	<i>F</i>	<i>M</i>	<i>A</i>	<i>M</i>	<i>J</i>
31	28 or 29	31	30	31	30
<i>J</i>	<i>A</i>	<i>S</i>	<i>O</i>	<i>N</i>	<i>D</i>
31	31	30	31	30	31
- c No, as February has 28 days.
- d i Saturday ii Sunday
iii January, July and October
iv Sunday - May, Monday - August
Tuesday - February, March, November
Wednesday - June
Thursday - September, December
Friday - April, July
Saturday - January, October
- 2 a 26 days b Sunday c Wednesday
d 4th December 2005 e Tuesday January 17th
f 12th January 2006 g 20th December 2005

h 6 weeks i

February 2005						
<i>S</i>	<i>M</i>	<i>T</i>	<i>W</i>	<i>T</i>	<i>F</i>	<i>S</i>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

February 18 is a Saturday.

- 3 a 92 days b i Wednesday ii Wednesday

- c i December, January, February
 ii March, April, May
 iii September, October, November
- 4 a 1997 b 6 years old c 8 years old
 d about 10 months

EXERCISE 10D

- 1 a 30 mins b i 10 min ii 15 min iii 20 min
 c i 10:10 am ii 10:22 am d 2 buses e 10:38 am

f

TIMETABLE	
Town Hall	2:20 pm
General Post Office	2:23 pm
Garden Square	2:25 pm
Bus Depot	2:28 pm
Railway Station	2:30 pm
Museum	2:32 pm
Art Gallery	2:34 pm
University	2:39 pm
Shopping Mall	2:43 pm
Cathedral	2:45 pm
Theatre Complex	2:47 pm
Town Hall	2:50 pm

g

TIMETABLE	
Town Hall	10:00 am
Theatre Complex	10:03 am
Cathedral	10:05 am
Shopping Mall	10:07 am
University	10:11 am
Art Gallery	10:16 am
Museum	10:18 am
Railway Station	10:20 am
Bus Depot	10:22 am
Garden Square	10:25 am
General Post Office	10:27 am
Town Hall	10:30 am

- 2 a 45 minutes or $\frac{3}{4}$ hour
 b 2 hours 30 minutes or $2\frac{1}{2}$ hours
 c i Cartoons for Kids ii Quiz Kids, 40 minutes
- 3 a i 8 h 35 min ii 4 h 45 min iii 14 hours
 b i 40 min ii 40 min iii 30 min
 c i 3:50 pm ii 6:40 pm
- 4 a i 1 h 10 min ii 45 min iii 1 h
 b The 1:15 train does not stop at all stations. The Sunday train spends less time at Timbertop Station. c i 5 min ii 8 min
 d i Saturday afternoon (30 min)
 ii weekday 7:25 am or 5:55 pm trains (27 min)
 e Train does not stop (Mon - Fri pm)
 Train does not run (Sunday morning)
- 5 a 12:10 pm b 1:15 pm c 2:30 pm d 3:35 pm
- 6 a 0415 h b 1205 h c 1625 h d 2215 h
 e 0825 h f 0100 h g 2340 h h 2030 h

EXERCISE 10E

- 1 2 hours 14 minutes 2 1:32 pm 3 1:01 pm
 4 3 hours 45 minutes 5 Tuesday 6 150 minutes
 7 2015 8 29 days

EXERCISE 10F

- 1 a 20°C b 35°C c 41°C d 11°C e 18°C f 3°C
 2 a 38.4°C b 39.3°C c 40.1°C
 d 37.9°C e 38.7°C f 36.2°C
 3 a B b F c C d G e A f D g E
 4 a 0°C = 32°F b 100°C = 212°F
 c 50°C ÷ 122°F d 38°C ÷ 100°F

REVIEW EXERCISE 10A

- 1 a 3:00 am b 4:10 pm c 12:30 am d 6:25 pm
 2 a i 5 past 12 ii 25 to 5 b i 12:05 ii 4:35
 3 a 145 min b 6 h c 6 h 38 min
 4 a 5 b October 19th c October 3rd
 5 a 35 minutes b 12 minutes c 1:25 pm
 6 a 43°C b 12°C

REVIEW EXERCISE 10B

- 1 a i 15 to 10 ii 20 past 2 b i 9:45 ii 2:20
 2 a i 11:30 am ii 8:35 pm
 b i 15 to 10 in the morning
 ii 5 past 2 in the afternoon
 c i 5 h 20 min ii 16 h 10 min
 3 a 195 min b 4 h c 4 h 17 min
 4 a started at 2 pm and finished at 2:30 pm
 b i Car racing ii Top Dog
 5 a C b B c D d A

EXERCISE 11A

- 2 a R for red, B for blue, Bk for black, G for green, P for pink, O for orange
 b Sh for Shortland Street, J for Judge Judy, Sp for SportsOne, B for Blues Clues, D for Dexters Laboratory
 c M for maths, R for reading, Sp for spelling, Sc for science, P for physical education
 d F for Ford, H for Holden, N for Nissan, T for Toyota, Ha for Honda
 e D for Dogs, C for Cats, Ra for Rabbits, Ro for Roosters, L for Lambs, G for Guinea Pigs
- 3 a 15 students b 21 students c 32 students
 d 68 students

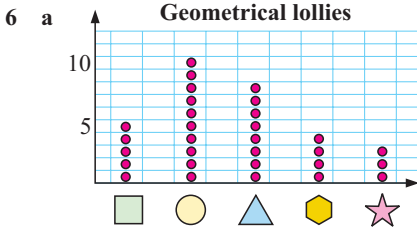
4

Result	Tally	Total
1	|||| |	7
2	||||	5
3	||||	4
4	|||| |	8
5	|||| |	6
6	||||	5

5 a

Bird Type	Tally	Total
magpie, M	||||	8
sparrow, S	|||| ||| ||| ||| |||	25
kookaburra, K	||||	4
wren, W	||||	4
galah, G	|||| |||	9

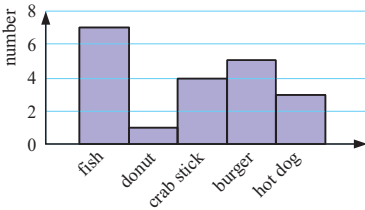
b 50 birds



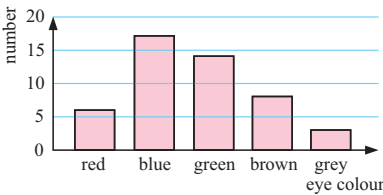
b i \square 5, \circ 10, \triangle 8, \hexagon 4, \star 3
 c i $\frac{10}{30}$ or $\frac{1}{3}$ ii $\frac{4}{30}$ or $\frac{2}{15}$ iii $\frac{2}{3}$

EXERCISE 11B

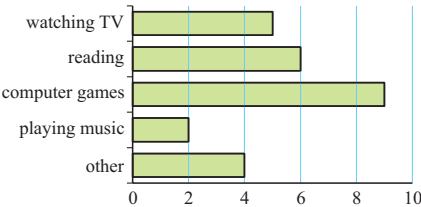
1 Fish and chip shop orders



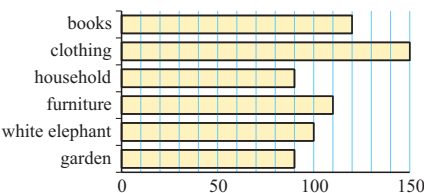
2 Eye colours of dragon flies



3 Rainy Day Pastime



4 Trash and treasure



5 a i swimming ii 7 b 5 c 20

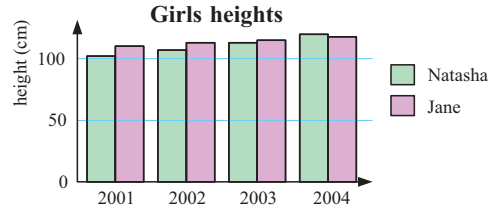
6 a 4 b bus c 21 d less

7 a 5 b 27 c 110

d The fair may have closed at midday. They must have 'run out' of pancakes.

EXERCISE 11C

1



Natasha was shorter than Jane in 2001, but she was taller than Jane by 2004.

2 a Hobart b Adelaide and Melbourne c Perth d Melbourne

3 a Drivers. There were a lot more vehicles on the road in 2002 than in 1950.

b Motorcyclists. There were a lot more motorcyclists on the roads in 1950 than in 2002, and they did not have to wear crash helmets.

c Passengers are less likely to be killed in an accident if they are wearing seatbelts. The number of seatbelts in the car limits the number of passengers. Before seatbelts it was not uncommon to have 8 people in a car.

d The number of driver deaths will continue to rise as there will be more vehicles on the roads and the roads will be more crowded.

EXERCISE 11E

1 a sports and adventure b $\frac{1}{4}$

c cartoons and sports and adventure

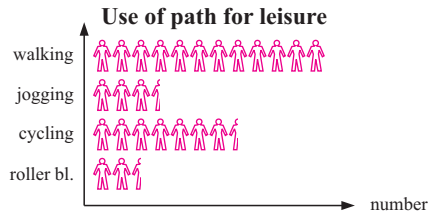
d nature and children's

2 a Because all things shown are required in an emergency b $\frac{1}{4}$ c Volunteer Marine Rescue

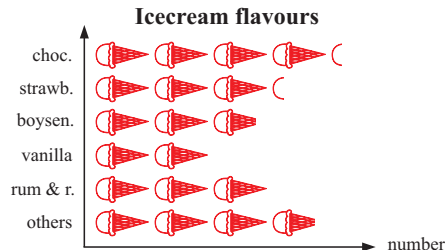
d Metropolitan Fire Service

EXERCISE 11F

1



2



- 3 a 1 b trucks 5 + vans 7 = 12 delivery vehicles
c no
4 a 15 b Friday c 31

EXERCISE 11G

- 1 a i Wednesday ii 26°C b 23°C
c i 20°C ii Sunday d Wednesday e 6°C
2 a 35 kg b 65 kg c i 1 week ii 4 weeks
d growth is faster then
e The calf's weight would not continue to increase.
It would reach its adult weight then its weight
would stay the same.
3 a A b C c B 4 a C b B c A

EXERCISE 11J

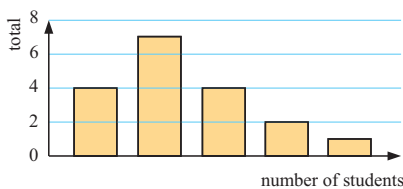
- 1 a meat and eggs b fish, fresh fruit, tomatoes
c 64 kg d 56 kg
2 a i 75.9 cents ii 89.8 cents iii 113.1 cents
b Coober Pedy. Cost of sending it from the
refinery to Coober Pedy
c they increase
d Adelaide in May, Victor Harbor in May
3 a i 131 km ii 2 hours 20 minutes
b i 1 hour 50 min ii 108 km
c i 78 km ii Taupo and Rotorua
d i Auckland (280 km), Palmerston North
(263 km)
ii Auckland (131 km) Taupo (149 km)

REVIEW EXERCISE 11A

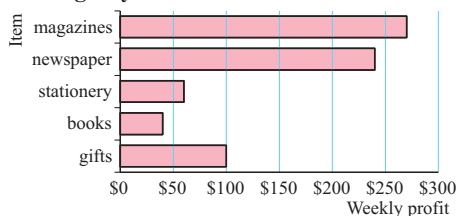
1 a

No. of students	Tally	Total
1	||||	4
2	|||||	7
3	||||	4
4	||	2
5	|	1

b Column graph of student data



2 Newsagency sales



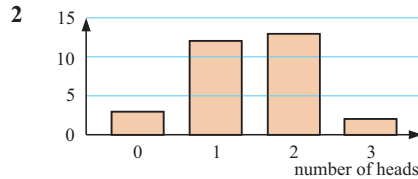
- 3 a apples b $\frac{1}{4}$ c apples and oranges
d plums and peaches e 5
4 a violin, 8 b 5 c 24

REVIEW EXERCISE 11B

1 a

Type	Tally	Total
car, C	|||| |||	17
truck, T	||||	5
van, V	|||| |	6
bus, B	||	2

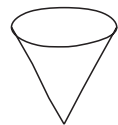
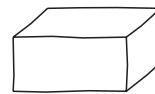
b 30



- 3 a i 30 ii 15 b i April ii August
c 70 houses
4 a 26°C at 2 pm b 19°C at 6 am
c approximately 8:45 am

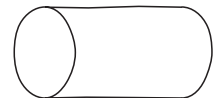
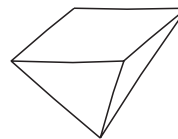
EXERCISE 12A

- 1 a cylinder b cube c cone d sphere
e rectangular prism f pyramid
g triangular prism h triangular pyramid
2 a i at least one flat surface ii the sphere
b curved surface
c cube - containers pyramid - house roof
cone - icecream container cylinder - piping
sphere - tennis ball
triangular prism - chocolate bar
rectangular prism - refrigerator
triangular pyramid - tetrapak for drinks
3 a rectangular prism b cone



c pyramid

d cylinder

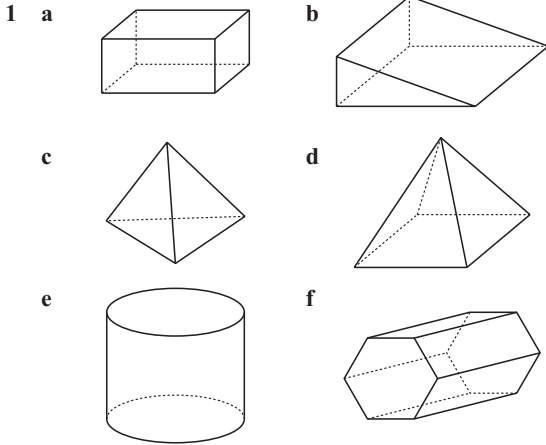


- 4 a 6 b 12 c 8 d a square
5 a 5 b 9 c 6 d 2 triangles, 3 rectangles

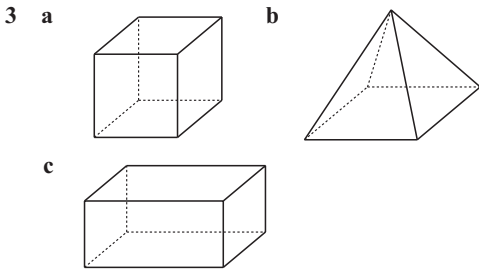
6

Solid	a	b	c
vertices	8	4	12
edges	12	6	18
faces	6	4	8

EXERCISE 12B

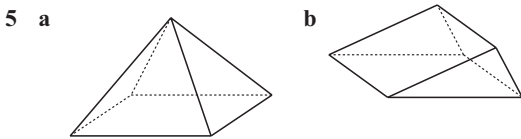
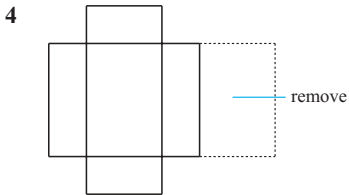


- 2 a rectangular prism b triangular prism
 c triangular-based pyramid (tetrahedron)
 d square-based pyramid e cylinder
 f hexagonal prism



EXERCISE 12C

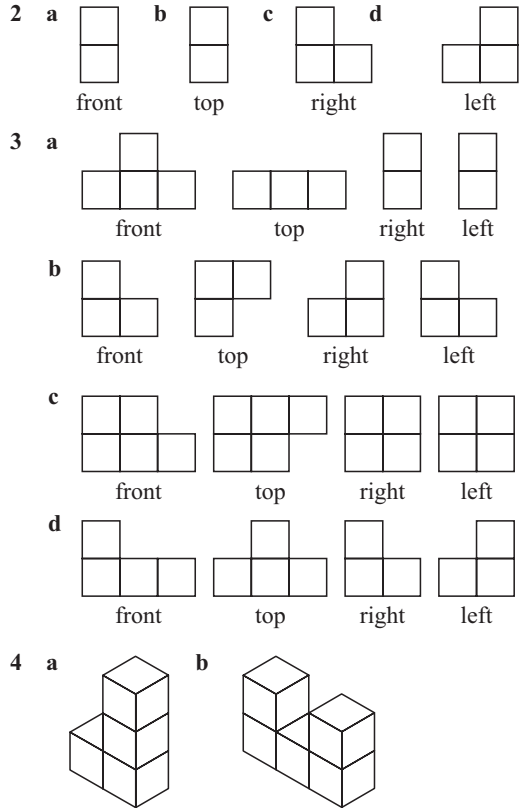
- 1 a B and A b C and A
 c C and B or B and D d D and C
 2 a P and R b Q and S c Q and S



- c a is a rectangular-based pyramid
 b, c are triangular prisms

- 6 a B(3) b A(4) c D(1) d C(2)
 7 a Yes b No c Yes d Yes e No f No

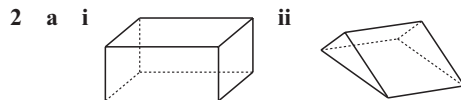
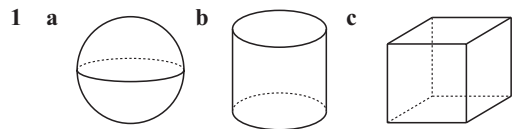
EXERCISE 12D



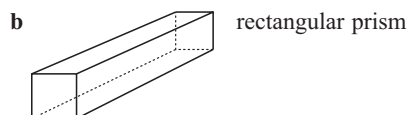
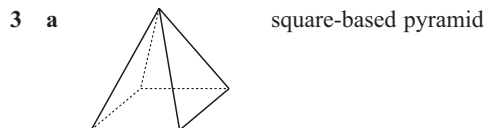
EXERCISE 12F

- 1 a D b B c E d A e C
 2 a 6 b 12 c 20 3 twenty

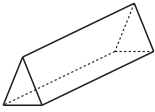
REVIEW EXERCISE 12



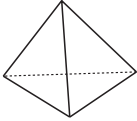
Name	i	ii
Number of vertices	8	6
Number of edges	12	9
Number of faces	6	5



c triangular prism



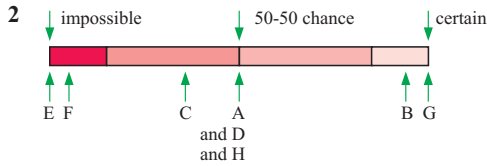
d triangular-based pyramid



4 a sphere b cone d pentagonal pyramid

EXERCISE 13A

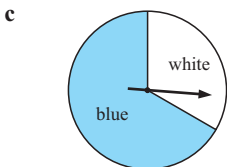
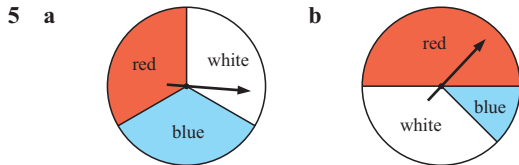
1 a never b unlikely c very unlikely
 d a 50-50 chance e very likely f certain
 g a 50-50 chance h unlikely i likely



3 a certain b unlikely c impossible
 d a 50-50 chance e impossible
 4 a 4 blue cards b 4 white cards
 c 2 blue and 2 white d 3 blue and 1 white
 5 a 3 blue cards b any 3 of the blue or grey ones
 c 3 grey cards d one of each colour

EXERCISE 13B

1 a 28 students b netball c 7 out of 28
 d 7 in 28 e 5 in 28 f Hockey, 1 in 28
 2 a 30 students b chips c 6 out of 30
 d 7 in 30 e 4 in 30 f vegetables, 1 in 30
 3 a a blue b i 15 ii 10 iii 5
 4 a i red ii green b blue or yellow
 c i 20 ii 20 iii 10 iv 30



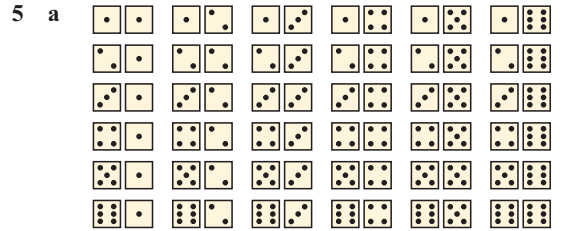
6 a Use 5 of each colour.
 b Use for example, 7 red, 5 blue and 3 white.
 c Use for example, 13 blue and 2 white.

EXERCISE 13C

1 $\left. \begin{matrix} 1H, 2H, 3H, 4H, 5H, 6H \\ 1T, 2T, 3T, 4T, 5T, 6T \end{matrix} \right\} 12 \text{ possible results}$
 2 a 2H, 4H and 6H b 2T, 3T and 5T
 3 HH, HT, TH, TT

4 a The 4 results shown in question 3 could occur with the same chance. So, we expect equal numbers of HH or TT (no heads)

b HT and TH both appear as 'one head'. There are two of these to the one HH so we expect twice as many.



b 36 c i 1 ii 2 iii 6 iv 1

6 CB, CG, HB, HG C = cap, H = hat, B = blue, G = grey

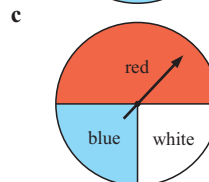
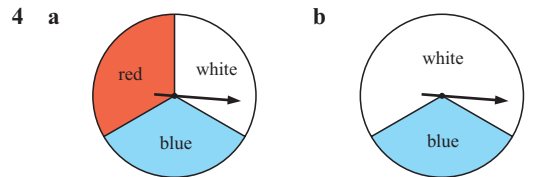
7 J_cWB, J_cWS, J_cJ_aB, J_cJ_aS, TWB, TWS, TJ_aB, TJ_aS

EXERCISE 13D

1 a 10 b heads or tails c true
 d 1 out of the 2 possible outcomes are tails. The likelihood of a tail is 1 in 2. The probability is $\frac{1}{2}$.
 2 a 30 b 1, 2, 3, 4, 5, 6 (or odd numbers or even numbers) c false
 d 3 out of the 6 possible outcomes are even numbers. The likelihood of an even number is 3 in 6 (or 1 in 2). The probability is $\frac{1}{2}$ or 50%.
 3 a 1 b A, E, I, O or U c 5 in 5 d 1 in 5 or 20%
 4 a 12 b blue, blue, blue or red
 c i 1 out of the 4 possible outcomes is red
 ii The likelihood of getting 'a red marble' is 1 in 4.
 iii the probability of a blue marble is $\frac{3}{4}$ or 75%
 d 3, but she may not get 3

REVIEW EXERCISE 13A

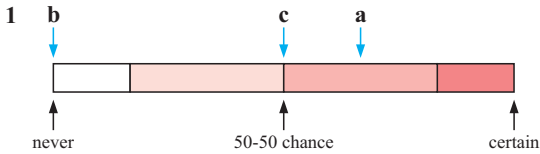
1 a certain b very unlikely c a 50-50 chance
 2 a $\begin{matrix} 1, 1 & 1, 2 & 1, 3 & 1, 4 \\ 2, 1 & 2, 2 & 2, 3 & 2, 4 \\ 3, 1 & 3, 2 & 3, 3 & 3, 4 \\ 4, 1 & 4, 2 & 4, 3 & 4, 4 \end{matrix}$
 b 16 c i 1 ii 2 iii 3 iv 1 3 500



5 a 1 chance in 3 b 7 chances in 12

6 $\frac{3}{9}$ or $\frac{1}{3}$

REVIEW EXERCISE 13B

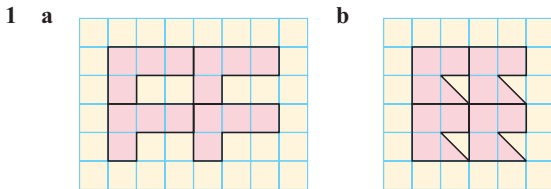


- 2 a have two of each colour
 b have 4 reds, and 2 whites (for example)
 c have 1 red, 1 blue and 4 whites
- 3 a HHH, HHT, HTH, THH, TTH, THT, HTT, TTT
 b 8 c i 1 ii 3 iii 3 iv 1
- 4 $\frac{1}{8}$

EXERCISE 14A

- 1 a rotation b reflection
 2 a translation b reflection
 3 a i rotation ii translation iii reflection

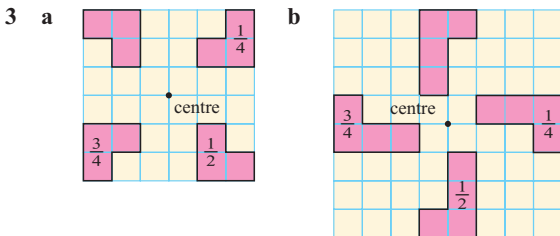
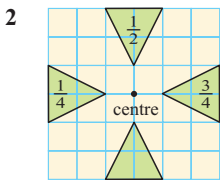
EXERCISE 14B



- 2 a 3 left 2 down b 1 left 4 down c 5 left
 d 2 right 2 down e 3 right 2 up
 f 2 right 2 down
- 3 a 3 right 1 down b 2 right 2 up
 c 5 right 1 up d 3 right 1 down
 e 2 left 2 down f 8 left
- 4 a 2 left 3 up b 6 right 2 up c 4 right 5 up
- 5 a 3 left 6 down b 3 left 3 up c 6 left 3 down

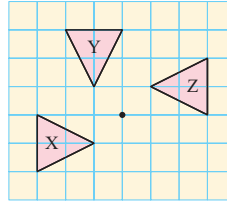
EXERCISE 14C

1 a 2 b 6 c 4



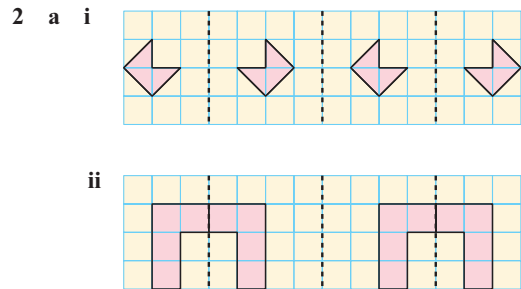
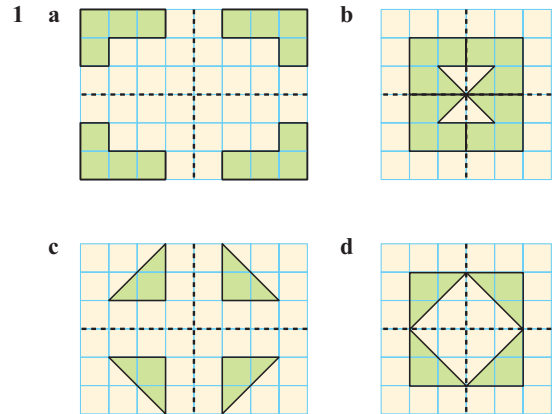
5 a half turn b $\frac{1}{4}$ turn c $\frac{3}{4}$ turn

6 a/b c half turn
 d half turn

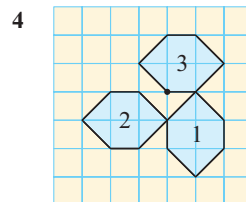
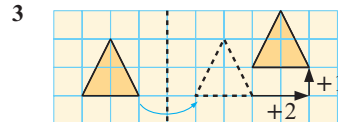


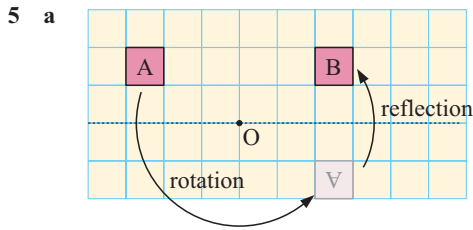
- 7 a 0 b 1 c 0 d 3 e 2
- 8 a half turn b full turn c full turn
 d full turn e half turn

EXERCISE 14D



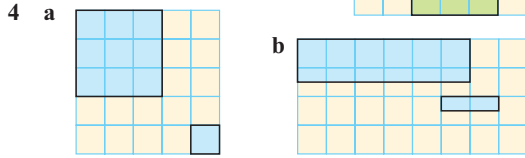
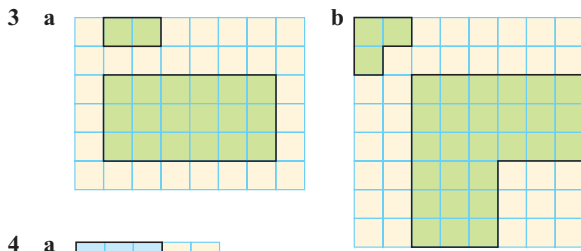
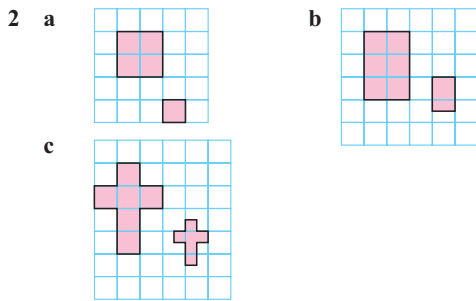
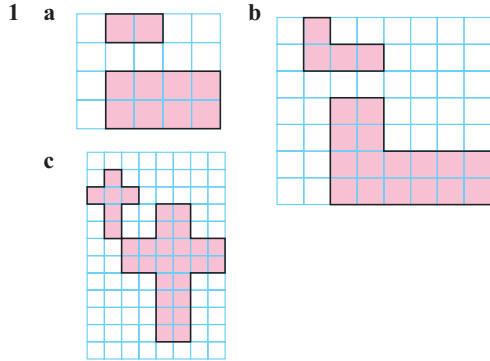
b i image ii original iii original



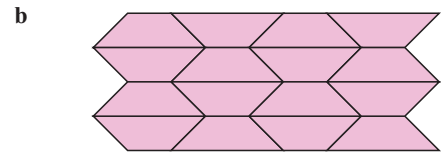
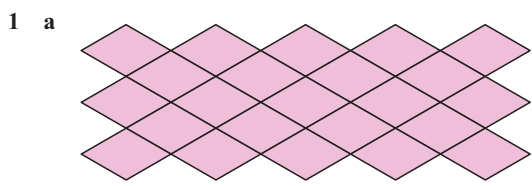


b translation 5 right *or* reflection in a vertical line through O

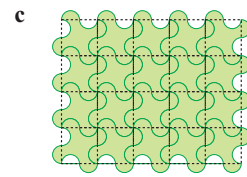
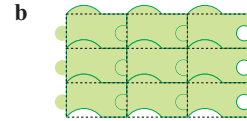
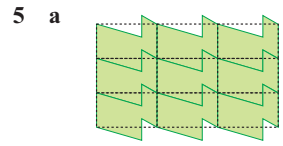
EXERCISE 14E



EXERCISE 14F

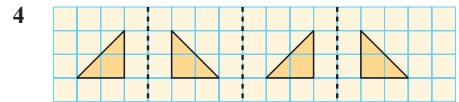
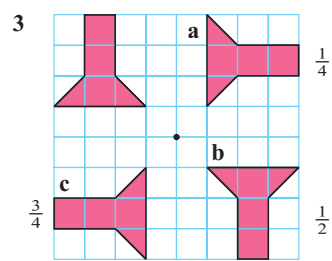
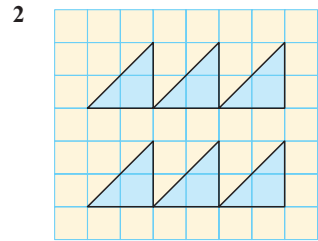


4 a no b no c yes d yes



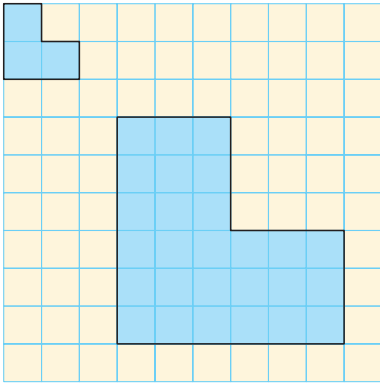
REVIEW EXERCISE 14

1 half

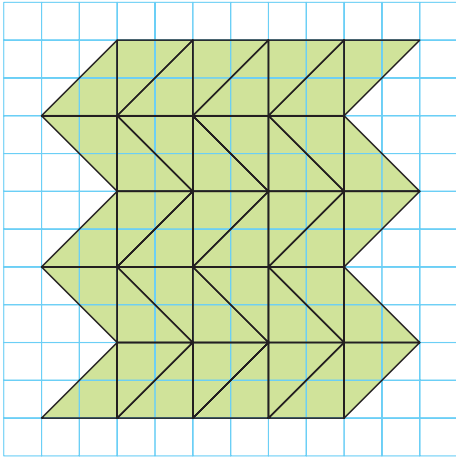


5 a i 4 right, 1 down ii 2 left, 2 down
b 2 right 3 down

6



7



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FACTS TO REMEMBER

MEASUREMENT

Length

- 1 centimetre = 10 millimetres
- 1 metre = 100 centimetres
- 1 metre = 1000 millimetres
- 1 kilometre = 1000 metres

Area

- 1 square centimetre = 1 cm by 1 cm
- 1 square metre = 1 m by 1 m
- 1 hectare = 100 m by 100 m
= 100 000 square metres

Capacity

- 1 litre = 1000 millilitres
- 1 kilolitre = 1000 litres
- 1 millilitre = 1 cubic centimetre

Time

- 1 minute = 60 seconds
- 1 hour = 60 minutes
- 1 day = 24 hours
- 1 week = 7 days
- 1 fortnight = 14 days
- 1 year = 52 weeks
- 1 year = 365 days
- 1 leap year = 366 days
- 1 decade = 10 years
- 1 century = 100 years
- 1 millenium = 1000 years

SEASONS AND MONTHS

		<i>days</i>			
Summer	{	January	31	}	
		February	28 or 29		
		March	31		
	}	April	30		Autumn
		May	31		
		June	30		
	}	July	31		Winter
		August	31		
		September	30		
		October	31		
		November	30		
		December	31			Spring

Thirty days has September, April, June and November.
All the rest have thirty-one, except February, which has twenty-eight and twenty-nine in a leap year.

ABBREVIATIONS

Length

- mm millimetres
- cm centimetres
- m metres
- km kilometres

Area

- m² square metres
- cm² square centimetres
- ha hectares

Capacity

- L litres
- mL millilitres
- cc cubic centimetres

Mass

- g grams
- kg kilograms
- t tonnes

Time

- s seconds
- min minutes
- h hours
- a.m. or am ante meridiem
- p.m. or pm post meridiem

FRACTIONS, DECIMALS AND PERCENTAGES

<i>Fractions</i>	<i>Decimals</i>	<i>Percentages</i>
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{10}$	0.1	10%
$\frac{2}{10}$ or $\frac{1}{5}$	0.2	20%
$\frac{3}{10}$	0.3	30%
$\frac{4}{10}$ or $\frac{2}{5}$	0.4	40%
$\frac{5}{10}$ or $\frac{1}{2}$	0.5	50%
$\frac{6}{10}$ or $\frac{3}{5}$	0.6	60%
$\frac{7}{10}$	0.7	70%
$\frac{8}{10}$ or $\frac{4}{5}$	0.8	80%
$\frac{9}{10}$	0.9	90%
1	1.0	100%
2	2.0	200%

MULTIPLICATION AND DIVISION TABLES

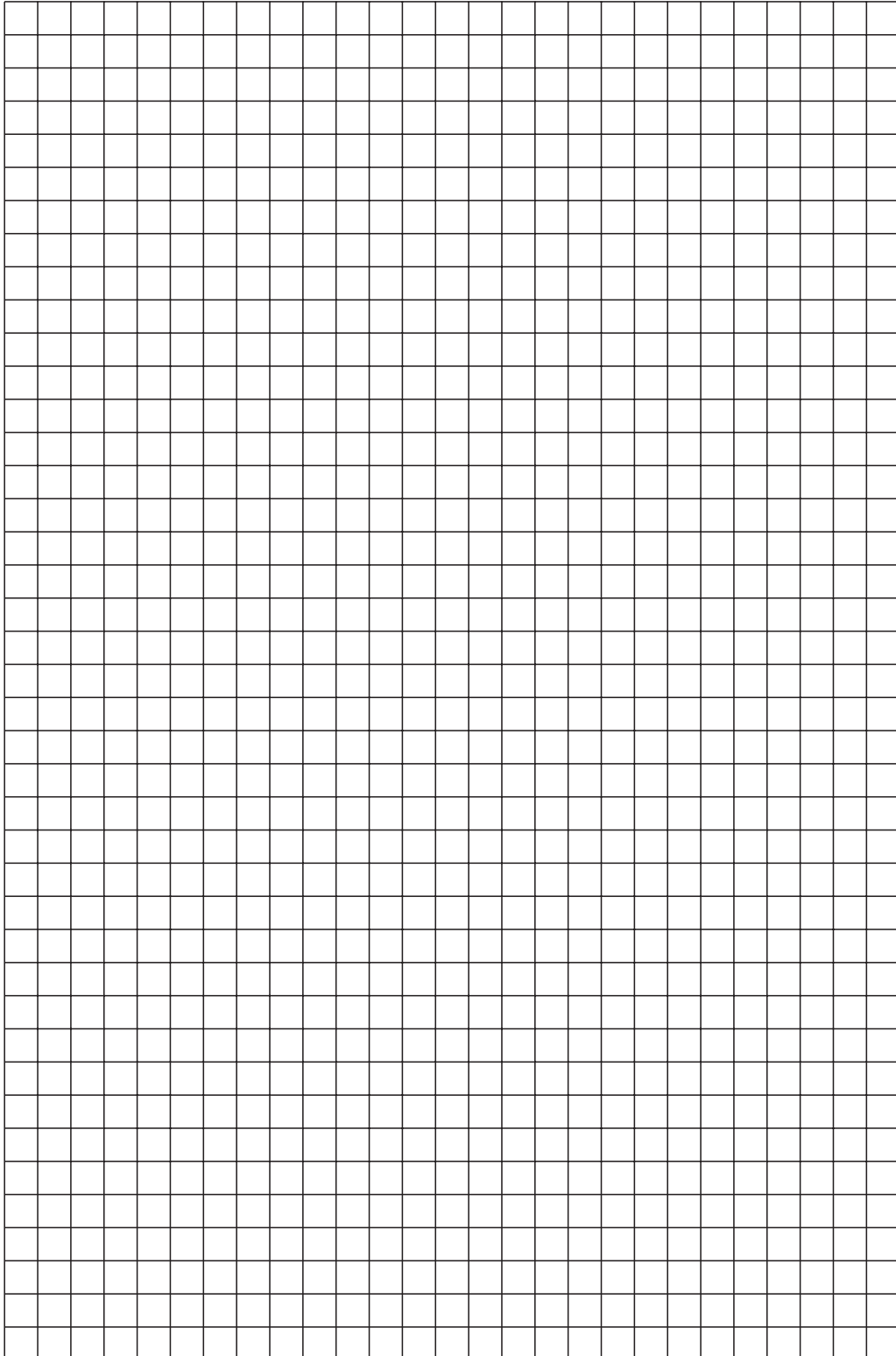
MULTIPLICATION TABLES

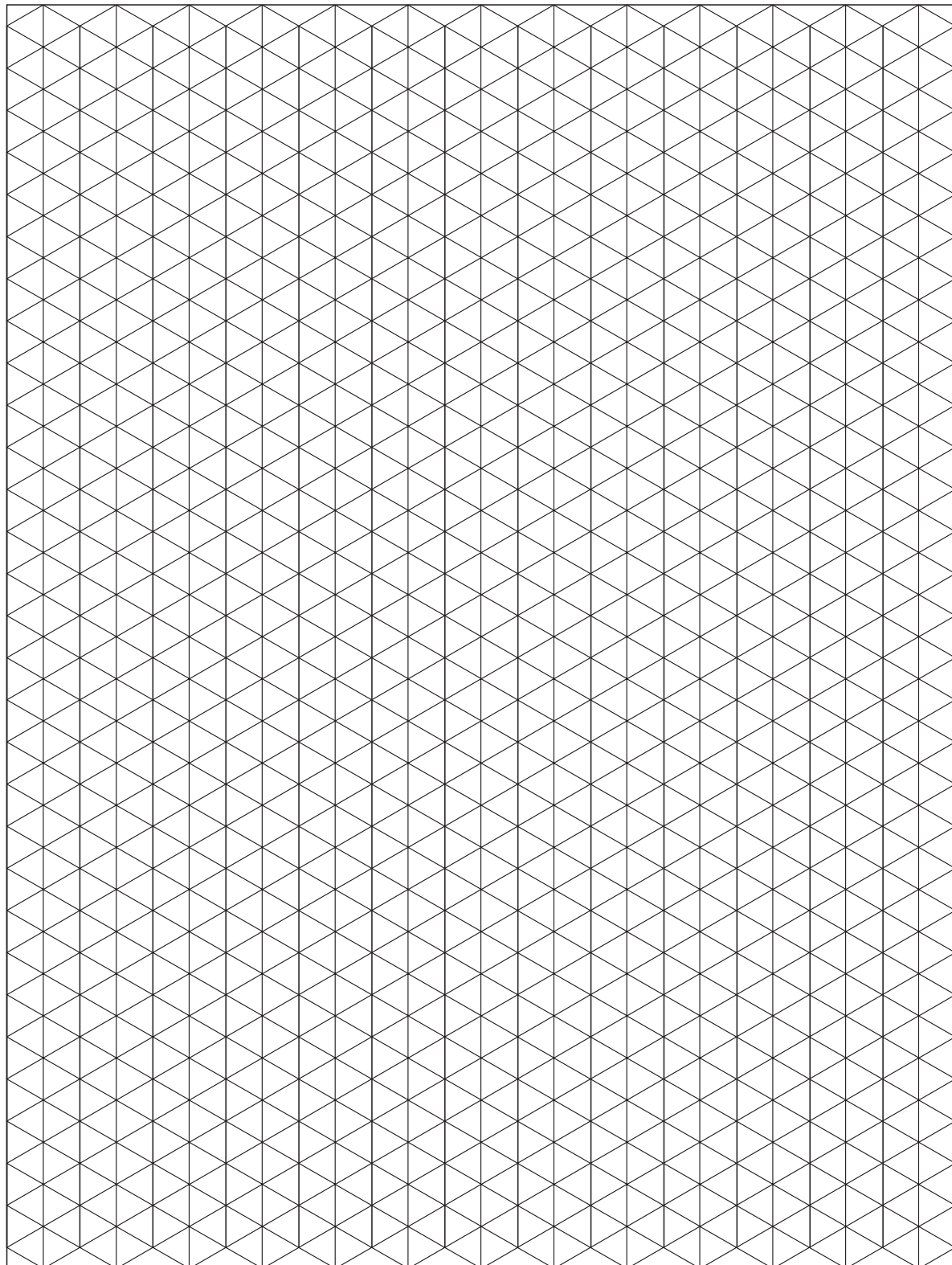
×2	×3	×4
$1 \times 2 = 2$	$1 \times 3 = 3$	$1 \times 4 = 4$
$2 \times 2 = 4$	$2 \times 3 = 6$	$2 \times 4 = 8$
$3 \times 2 = 6$	$3 \times 3 = 9$	$3 \times 4 = 12$
$4 \times 2 = 8$	$4 \times 3 = 12$	$4 \times 4 = 16$
$5 \times 2 = 10$	$5 \times 3 = 15$	$5 \times 4 = 20$
$6 \times 2 = 12$	$6 \times 3 = 18$	$6 \times 4 = 24$
$7 \times 2 = 14$	$7 \times 3 = 21$	$7 \times 4 = 28$
$8 \times 2 = 16$	$8 \times 3 = 24$	$8 \times 4 = 32$
$9 \times 2 = 18$	$9 \times 3 = 27$	$9 \times 4 = 36$
$10 \times 2 = 20$	$10 \times 3 = 30$	$10 \times 4 = 40$
$11 \times 2 = 22$	$11 \times 3 = 33$	$11 \times 4 = 44$
$12 \times 2 = 24$	$12 \times 3 = 36$	$12 \times 4 = 48$
×5	×6	×7
$1 \times 5 = 5$	$1 \times 6 = 6$	$1 \times 7 = 7$
$2 \times 5 = 10$	$2 \times 6 = 12$	$2 \times 7 = 14$
$3 \times 5 = 15$	$3 \times 6 = 18$	$3 \times 7 = 21$
$4 \times 5 = 20$	$4 \times 6 = 24$	$4 \times 7 = 28$
$5 \times 5 = 25$	$5 \times 6 = 30$	$5 \times 7 = 35$
$6 \times 5 = 30$	$6 \times 6 = 36$	$6 \times 7 = 42$
$7 \times 5 = 35$	$7 \times 6 = 42$	$7 \times 7 = 49$
$8 \times 5 = 40$	$8 \times 6 = 48$	$8 \times 7 = 56$
$9 \times 5 = 45$	$9 \times 6 = 54$	$9 \times 7 = 63$
$10 \times 5 = 50$	$10 \times 6 = 60$	$10 \times 7 = 70$
$11 \times 5 = 55$	$11 \times 6 = 66$	$11 \times 7 = 77$
$12 \times 5 = 60$	$12 \times 6 = 72$	$12 \times 7 = 84$
×8	×9	×10
$1 \times 8 = 8$	$1 \times 9 = 9$	$1 \times 10 = 10$
$2 \times 8 = 16$	$2 \times 9 = 18$	$2 \times 10 = 20$
$3 \times 8 = 24$	$3 \times 9 = 27$	$3 \times 10 = 30$
$4 \times 8 = 32$	$4 \times 9 = 36$	$4 \times 10 = 40$
$5 \times 8 = 40$	$5 \times 9 = 45$	$5 \times 10 = 50$
$6 \times 8 = 48$	$6 \times 9 = 54$	$6 \times 10 = 60$
$7 \times 8 = 56$	$7 \times 9 = 63$	$7 \times 10 = 70$
$8 \times 8 = 64$	$8 \times 9 = 72$	$8 \times 10 = 80$
$9 \times 8 = 72$	$9 \times 9 = 81$	$9 \times 10 = 90$
$10 \times 8 = 80$	$10 \times 9 = 90$	$10 \times 10 = 100$
$11 \times 8 = 88$	$11 \times 9 = 99$	$11 \times 10 = 110$
$12 \times 8 = 96$	$12 \times 9 = 108$	$12 \times 10 = 120$
×11	×12	
$1 \times 11 = 11$	$1 \times 12 = 12$	
$2 \times 11 = 22$	$2 \times 12 = 24$	
$3 \times 11 = 33$	$3 \times 12 = 36$	
$4 \times 11 = 44$	$4 \times 12 = 48$	
$5 \times 11 = 55$	$5 \times 12 = 60$	
$6 \times 11 = 66$	$6 \times 12 = 72$	
$7 \times 11 = 77$	$7 \times 12 = 84$	
$8 \times 11 = 88$	$8 \times 12 = 96$	
$9 \times 11 = 99$	$9 \times 12 = 108$	
$10 \times 11 = 110$	$10 \times 12 = 120$	
$11 \times 11 = 121$	$11 \times 12 = 132$	
$12 \times 11 = 132$	$12 \times 12 = 144$	

DIVISION TABLES

÷2	÷3	÷4
$2 \div 2 = 1$	$3 \div 3 = 1$	$4 \div 4 = 1$
$4 \div 2 = 2$	$6 \div 3 = 2$	$8 \div 4 = 2$
$6 \div 2 = 3$	$9 \div 3 = 3$	$12 \div 4 = 3$
$8 \div 2 = 4$	$12 \div 3 = 4$	$16 \div 4 = 4$
$10 \div 2 = 5$	$15 \div 3 = 5$	$20 \div 4 = 5$
$12 \div 2 = 6$	$18 \div 3 = 6$	$24 \div 4 = 6$
$14 \div 2 = 7$	$21 \div 3 = 7$	$28 \div 4 = 7$
$16 \div 2 = 8$	$24 \div 3 = 8$	$32 \div 4 = 8$
$18 \div 2 = 9$	$27 \div 3 = 9$	$36 \div 4 = 9$
$20 \div 2 = 10$	$30 \div 3 = 10$	$40 \div 4 = 10$
$22 \div 2 = 11$	$33 \div 3 = 11$	$44 \div 4 = 11$
$24 \div 2 = 12$	$36 \div 3 = 12$	$48 \div 4 = 12$
÷5	÷6	÷7
$5 \div 5 = 1$	$6 \div 6 = 1$	$7 \div 7 = 1$
$10 \div 5 = 2$	$12 \div 6 = 2$	$14 \div 7 = 2$
$15 \div 5 = 3$	$18 \div 6 = 3$	$21 \div 7 = 3$
$20 \div 5 = 4$	$24 \div 6 = 4$	$28 \div 7 = 4$
$25 \div 5 = 5$	$30 \div 6 = 5$	$35 \div 7 = 5$
$30 \div 5 = 6$	$36 \div 6 = 6$	$42 \div 7 = 6$
$35 \div 5 = 7$	$42 \div 6 = 7$	$49 \div 7 = 7$
$40 \div 5 = 8$	$48 \div 6 = 8$	$56 \div 7 = 8$
$45 \div 5 = 9$	$54 \div 6 = 9$	$63 \div 7 = 9$
$50 \div 5 = 10$	$60 \div 6 = 10$	$70 \div 7 = 10$
$55 \div 5 = 11$	$66 \div 6 = 11$	$77 \div 7 = 11$
$60 \div 5 = 12$	$72 \div 6 = 12$	$84 \div 7 = 12$
÷8	÷9	÷10
$8 \div 8 = 1$	$9 \div 9 = 1$	$10 \div 10 = 1$
$16 \div 8 = 2$	$18 \div 9 = 2$	$20 \div 10 = 2$
$24 \div 8 = 3$	$27 \div 9 = 3$	$30 \div 10 = 3$
$32 \div 8 = 4$	$36 \div 9 = 4$	$40 \div 10 = 4$
$40 \div 8 = 5$	$45 \div 9 = 5$	$50 \div 10 = 5$
$48 \div 8 = 6$	$54 \div 9 = 6$	$60 \div 10 = 6$
$56 \div 8 = 7$	$63 \div 9 = 7$	$70 \div 10 = 7$
$64 \div 8 = 8$	$72 \div 9 = 8$	$80 \div 10 = 8$
$72 \div 8 = 9$	$81 \div 9 = 9$	$90 \div 10 = 9$
$80 \div 8 = 10$	$90 \div 9 = 10$	$100 \div 10 = 10$
$88 \div 8 = 11$	$99 \div 9 = 11$	$110 \div 10 = 11$
$96 \div 8 = 12$	$108 \div 9 = 12$	$120 \div 10 = 12$
÷11	÷12	
$11 \div 11 = 1$	$12 \div 12 = 1$	
$22 \div 11 = 2$	$24 \div 12 = 2$	
$33 \div 11 = 3$	$36 \div 12 = 3$	
$44 \div 11 = 4$	$48 \div 12 = 4$	
$55 \div 11 = 5$	$60 \div 12 = 5$	
$66 \div 11 = 6$	$72 \div 12 = 6$	
$77 \div 11 = 7$	$84 \div 12 = 7$	
$88 \div 11 = 8$	$96 \div 12 = 8$	
$99 \div 11 = 9$	$108 \div 12 = 9$	
$110 \div 11 = 10$	$120 \div 12 = 10$	
$121 \div 11 = 11$	$132 \div 12 = 11$	
$132 \div 11 = 12$	$144 \div 12 = 12$	

SQUARE GRID PAPER



ISOMETRIC PAPER

SQUARE DOT PAPER

