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1 Number and Place Value

Engage

How many chickpeas would fill the classroom?

How many chickpeas would fit in one box?

How big is the classroom?

It is millions.

That is impossible – there are too many to count!

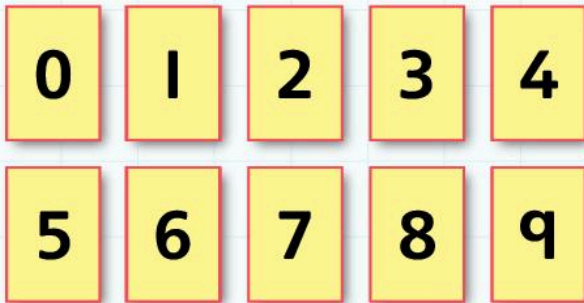
1A Place value

Discover

Place value game

	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Units
Largest number							
Smallest number							
Number nearest to 5 million							
Number nearest to 8 million							

- Use a set of 0–9 digit cards.



- Choose a card.
- Write the digit in a column in the grid. (You cannot change this at a later stage.)
- Replace the card.
- Choose a card again.
- Write this digit in a column in the grid.
- Repeat until all the spaces are full.
- Now complete the following in words:

The largest number was

The largest possible number with these digits is

The smallest number was

The smallest possible number with these digits is

The number nearest to 5 million was

The number nearest to 5 million possible with these digits is

The number nearest to 8 million was

The number nearest to 8 million possible with these digits is

- Repeat the place value game:

	Hundreds	Tens	Units	Decimal point	Tenths	Hundredths
Largest number				•		
Smallest number				•		
Number nearest to 10				•		
Number nearest to 100				•		

- Now complete the following in words:

The largest number was

The largest possible number with these digits is

The smallest number was

The smallest possible number with these digits is

The number nearest to 10 was

The number nearest to 10 possible with these digits is

The number nearest to 100 was

The number nearest to 100 possible with these digits is

Dividing by 10, 100 and 1000



Use a calculator for this activity.

- Put any three-digit number into your calculator.
- Write the number in the place value grid below.
- Divide the number by 10.
- Write the answer in the place value grid.
- Divide the number by 100.
- Write the answer in the place value grid.
- Repeat this for two other three-digit numbers.

Hundreds	Tens	Units	Decimal point	Tenths	Hundredths	Thousandths
			•			
			•			
			•			
			•			
			•			
			•			
			•			
			•			
			•			
			•			
			•			
			•			

- Now complete these phrases:
When you divide by 10 the digits move _____ places to the _____
When you divide by 100 _____
When you divide by 1000 _____

1B Number properties

Discover

Prime and composite numbers

A **factor** of a number is a number that divides exactly into that number.

For example $2 \times 3 = 6$ so 2 and 3 are factors of 6.

A **prime number** is a number that has only two factors: itself and 1. You can use 'the sieve of Eratosthenes' to find all the prime numbers up to 100. Eratosthenes was an Ancient Greek mathematician.

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	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

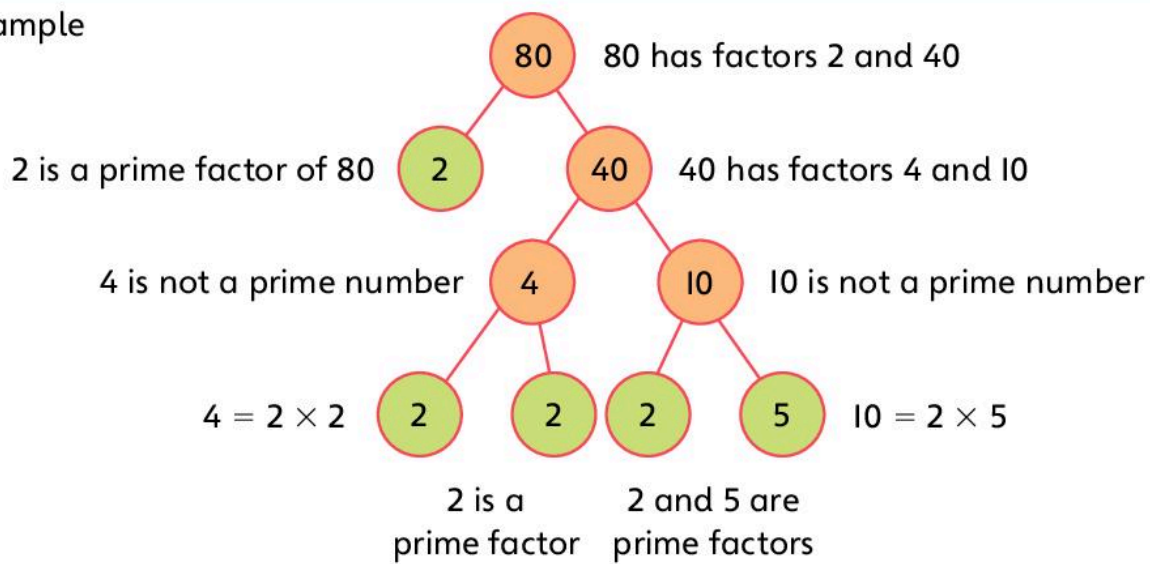
- Use this 100 square to make a sieve of Eratosthenes:
 - 1 is not a prime number. It only has one factor. Circle the number 1.
 - The number 2 is a prime number. Shade the number 2.
 - The number 2 is a factor of the multiples of 2. The multiples of 2 are not prime numbers. Cross out all the multiples of 2.
 - The number 3 is a prime number. Shade the number 3.
 - The number 3 is a factor of the multiples of 3. The multiples of 3 are not prime numbers. Cross out all the multiples of 3.
 - The number 5 is a prime number. Shade the number 5.
 - The number 5 is a factor of the multiples of 5. The multiples of 5 are not prime numbers. Cross out all the multiples of 5.
 - Repeat with the other prime numbers. Each time start with the next prime number.
 - Now list all the prime numbers up to 100:
Prime numbers: 2, 3, 5, 7, _____

A **composite number** is a number which has more than 2 factors.

You can divide all composite numbers into **prime factors**.

You can use a factor tree to find the prime factors of any number.

Example



So $80 = 2 \times 2 \times 2 \times 2 \times 5$

2, 2, 2, 2 and 5 are the prime factors of 80.

- Now find the prime factors of these numbers:

150

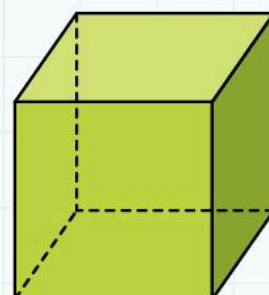
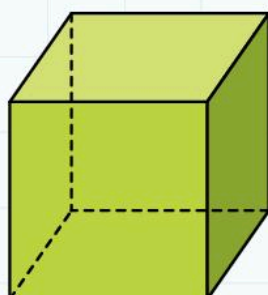
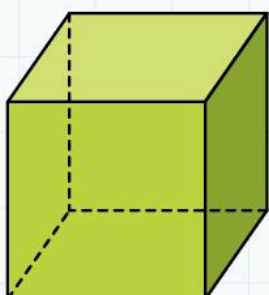
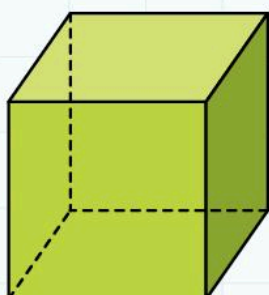
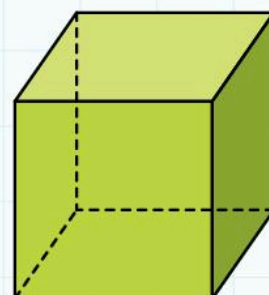
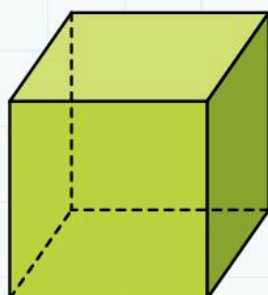
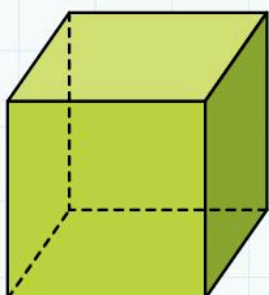
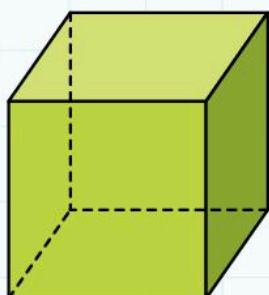
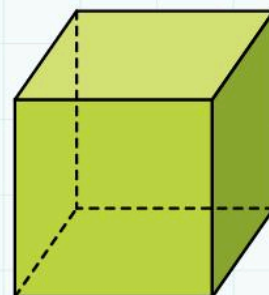
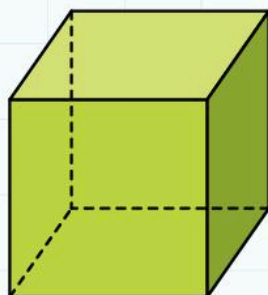
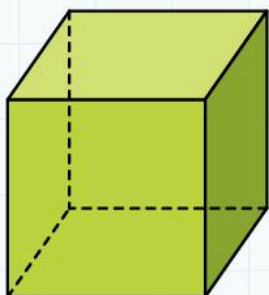
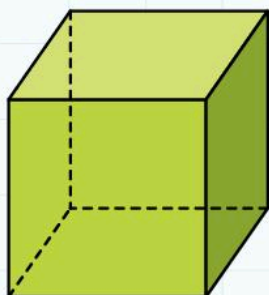
36

75

1B Number properties

Explore

Finding factors of two-digit numbers



This shows that you can write 12 as 3×4 .

We say that 4 and 3 are factors of 12.

They divide exactly into 12.

How many ways can you arrange 12 cubes?

- Find all the different ways. Then complete this sentence:

The factors of 12 are _____

Repeat this for 18, 24, 36 and 49 cubes.

- Write the factors:

The factors of 18 are _____

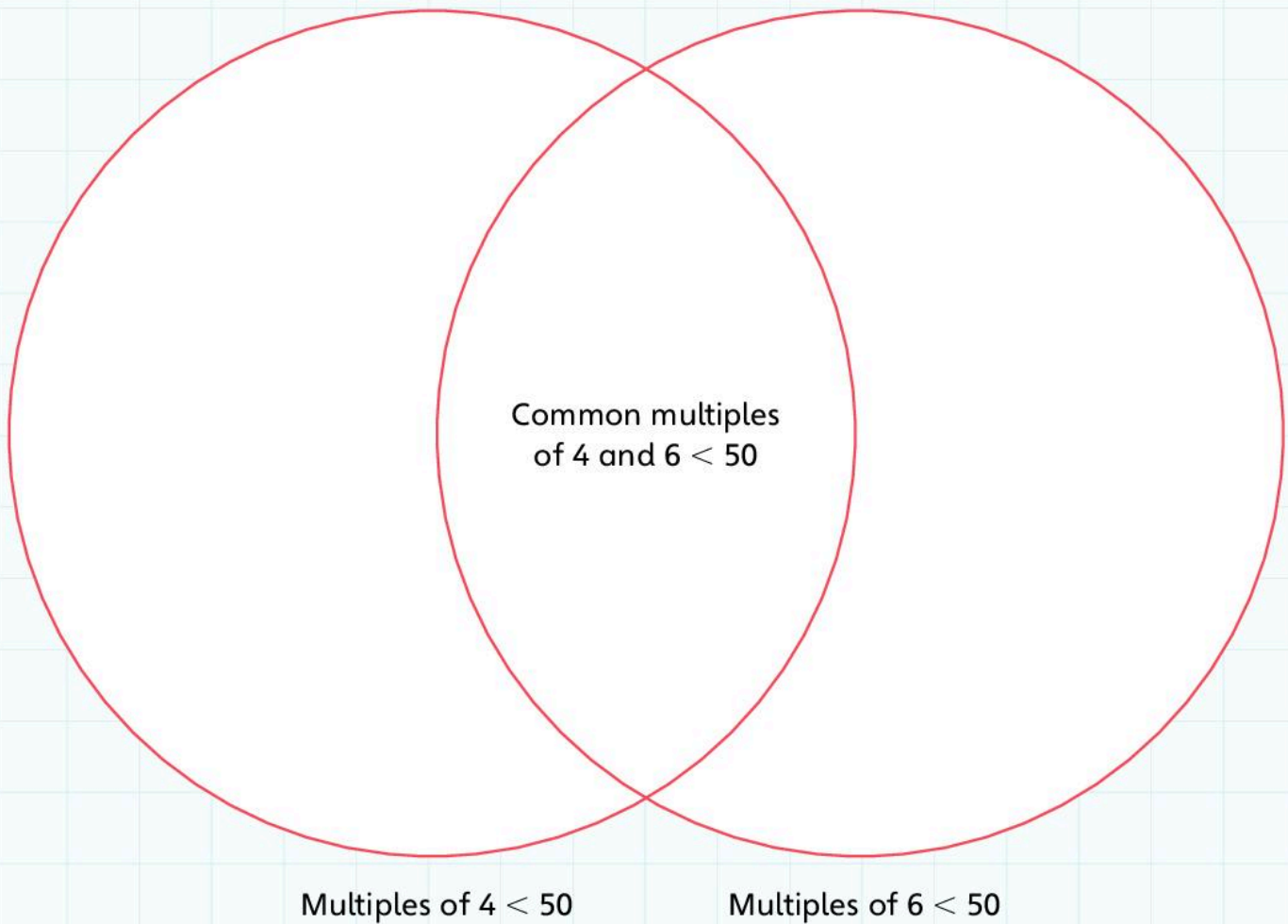
The factors of 24 are _____

The factors of 36 are _____

The factors of 49 are _____

Common multiples

- Complete this Venn diagram:



The numbers in both multiplication tables are the **common multiples** of 4 and 6.

- Write the common multiples less than 50 of these numbers:

3 and 7 _____

2 and 10 _____

5 and 12 _____

6 and 9 _____

2, 3 and 5 _____

1C Estimation and rounding

Discover

- Use a set of 0–9 digit cards.
- Select four cards.
- Use these four digits to make 15 different four-digit numbers.
- Order the numbers smallest to largest.
- Write the numbers in the table.

For example:

I pick 3, 5, 7, 9.

I make 5379, 9357, 7539, and so on.

Number	Number rounded to nearest 10	Number rounded to nearest 100	Number rounded to nearest 1000
5379	5380	5400	5000
7359	7360	7400	7000
9357	9360	9400	9000

Number	Number rounded to nearest 10	Number rounded to nearest 100	Number rounded to nearest 1000

1C Estimation and rounding

Explore

- Use a set of 0–9 digit cards.
- Select four cards.
- Use these digits to make as many different four-digit numbers as you can.
- Write them here:

My four digits are _____

All the possible numbers are _____

I know I have found all the possibilities because _____

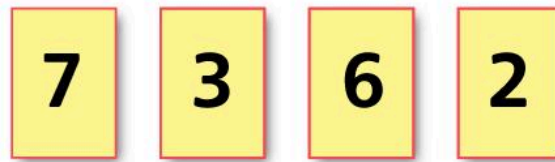
- Round all the numbers to the nearest 10.
- Use your numbers to make correct statements:

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<input type="text"/>	<	<input type="text"/>	<	<input type="text"/>
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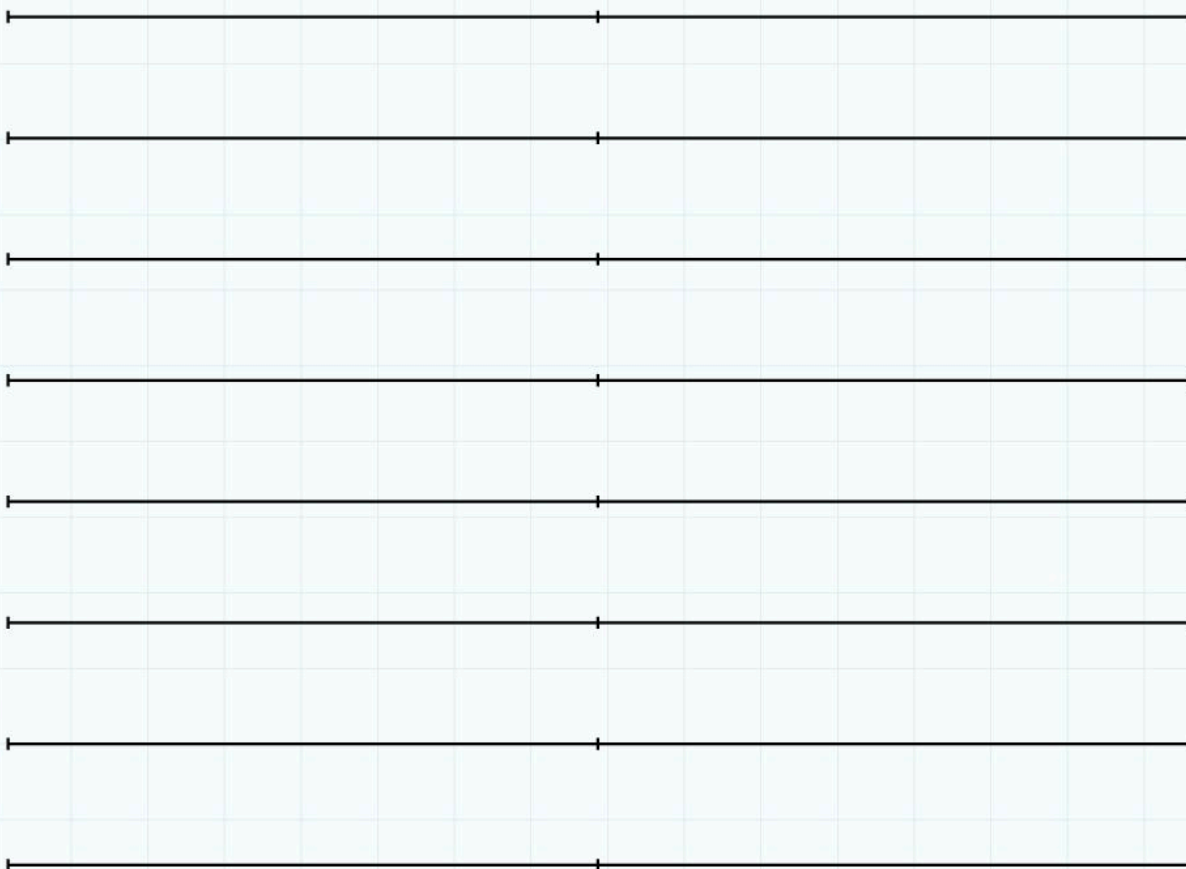
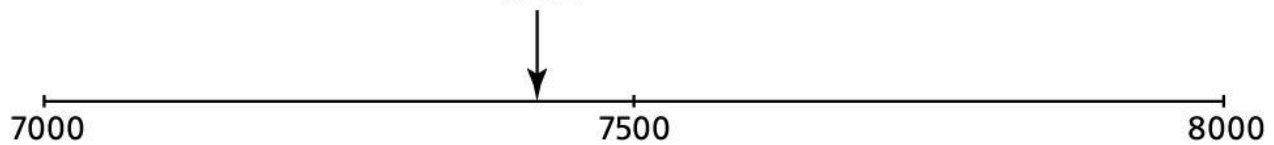
Placing numbers on empty number lines

- Use 0–9 digit cards.
- Pick four cards to make a four-digit number.
- Label the ends and the middle of the empty number lines.
- Write the number in the correct place.
- Repeat this for each empty number line.

For example:



7362



Eight horizontal number lines are provided for practice. Each line has a tick mark at its midpoint, but no numerical labels are present.

1D Number sequences

Discover

This is a famous **sequence**. It is called the Fibonacci sequence.

1, 1, 2, 3, 5, 8, 13, 21,

How do you make the next number in the sequence?

- Write your answers in the spaces.

The next three numbers in the sequence are _____

The rule for generating the sequence is _____

A Fibonacci type sequence has 4 and 18 as the first two **terms**. What is the 7th term?

- Find as many Fibonacci type sequences as you can that contain the term 75.

Examples

5, 35, 40, 75 and 23, 26, 49, 75

Here is the start of a sequence:

Position	1	2	3	4	5	6	7
Number	5	9	13	17	21	25	29

The rule for generating the sequence is:

You generate this sequence by adding 4 to the previous number.

- Complete these tables.
- Write the rule for generating the sequence in each table.

Position	1	2	3	4	5	6	7
Number	$\frac{1}{4}$	1	$1\frac{3}{4}$				

You generate this sequence by _____

Position	1	2	3	4	5	6	7
Number	55	25	-5				

You generate this sequence by _____

Position	1	2	3	4	5	6	7
Number	0.8	1.6	2.4				

You generate this sequence by _____

- Make your own sequences in these tables. Give them to a partner to solve.

Position	1	2	3	4	5	6	7
Number							

You generate this sequence by _____

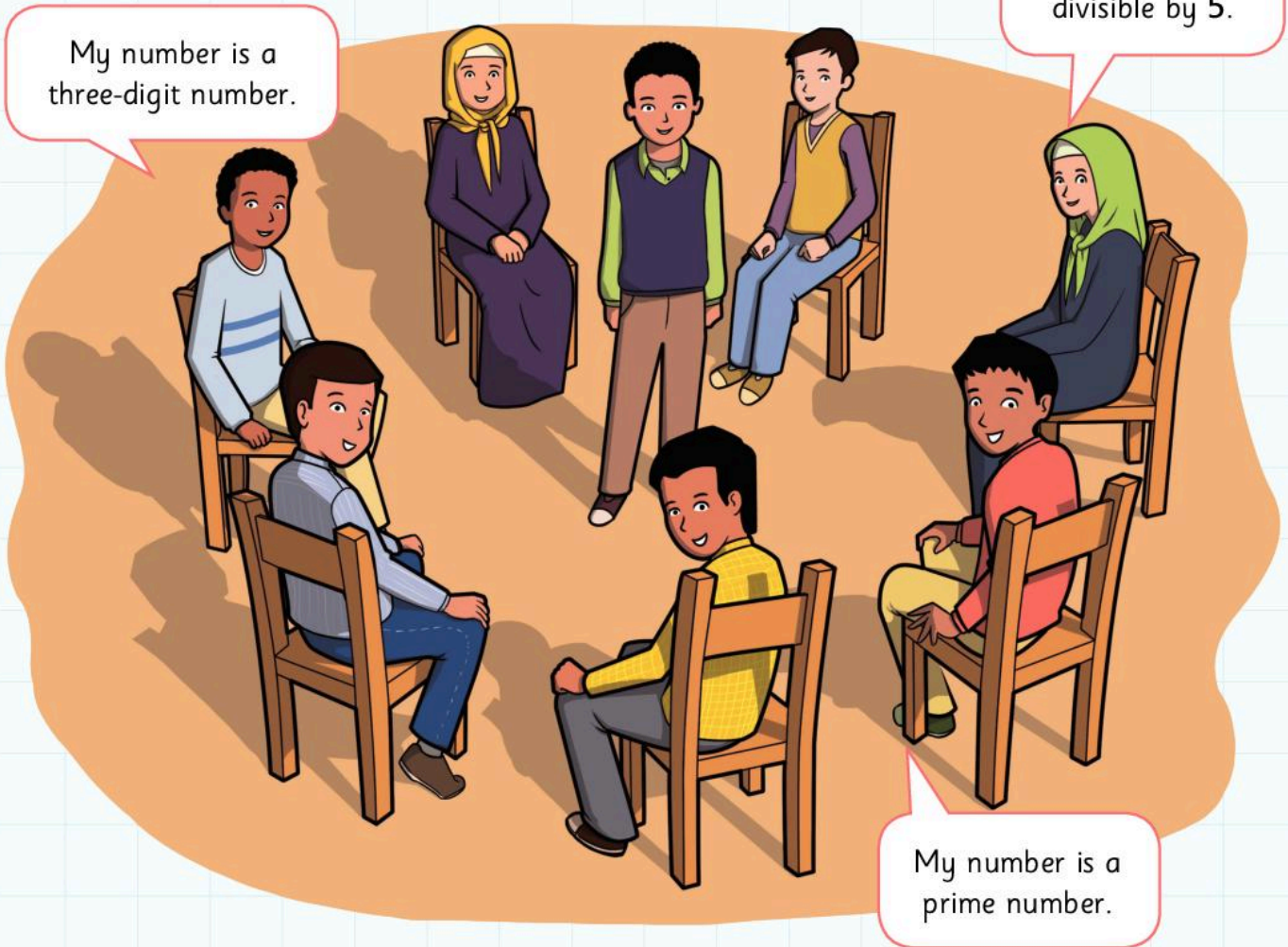
Position	1	2	3	4	5	6	7
Number							

You generate this sequence by _____

1D Number sequences

Explore

Odd and even numbers



- Play 'Crossing the Circle' and 'Making Groups' as a whole class.
- Then complete these sentences:
The sum of two even numbers is _____

- The sum of two odd numbers is _____

- The difference between two even numbers is _____

The difference between two odd numbers is _____

The product of two even numbers is _____

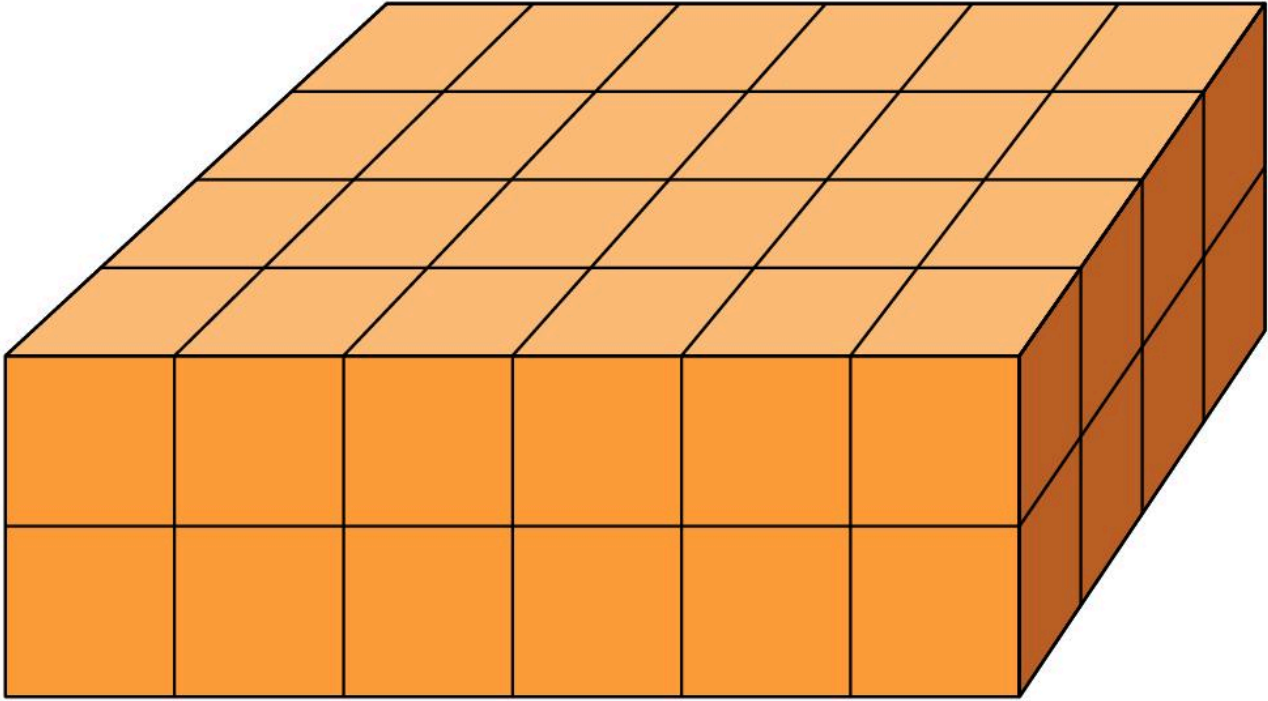
The product of two odd numbers is _____

- Write two more general statements about even and odd numbers:

1 Number and place value

Connect

This is a cuboid made with 48 cubes:



How many different cuboids can you make with 48 cubes?

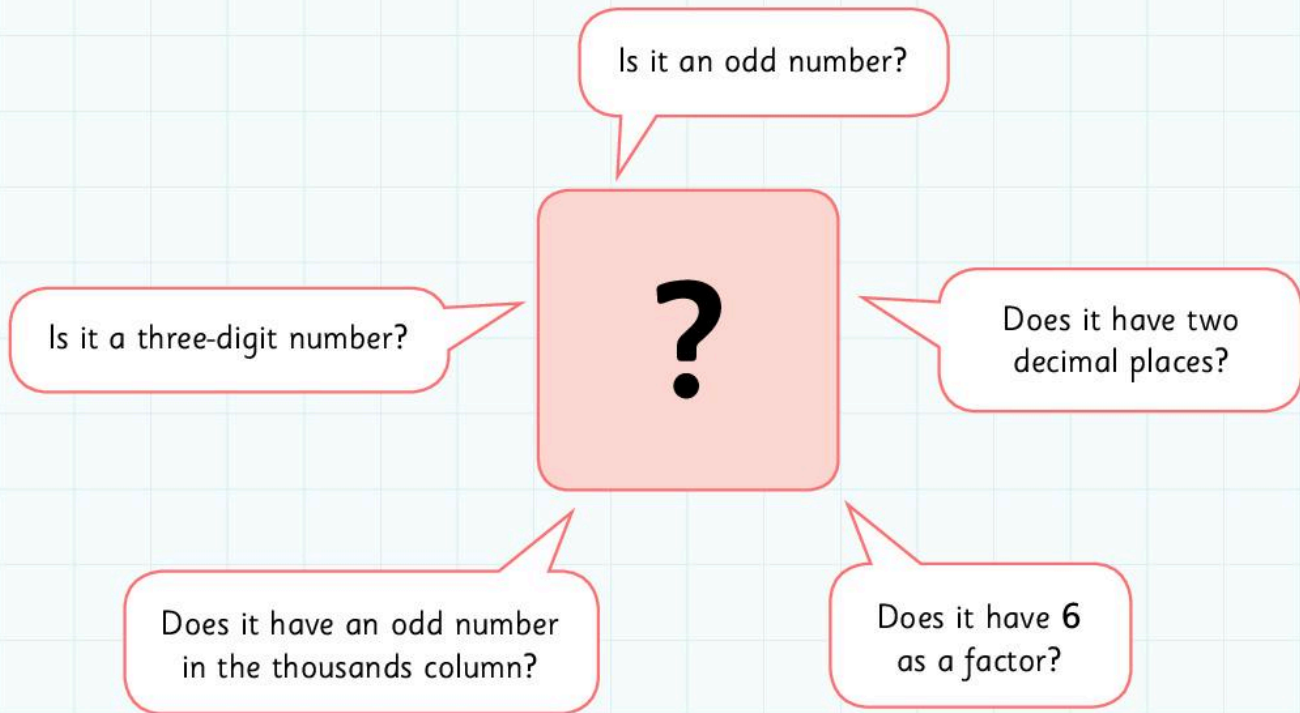
Choose another starting number to let you make a lot of different cuboids.
Why did you choose this number?

Which starting numbers will only let you make a single cuboid?

1 Number and place value

Review

Guess my number



- Pick a two-digit number.
- Write your number in the box.
- Write ten facts about the number.
- Pick any three-digit number.
- Write your number in the box.
- Write ten facts about the number.

2 Fractions and Decimals

Engage



2A Equivalent fractions

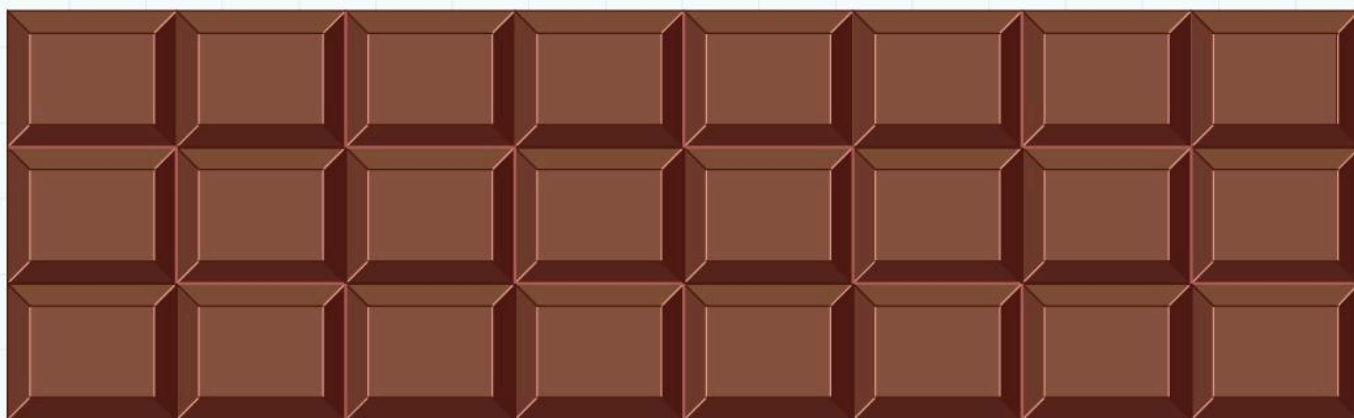
Discover

How many ways can I make a **quarter**?

How many different ways can we share this chocolate between four of us?

I think we get six pieces each.

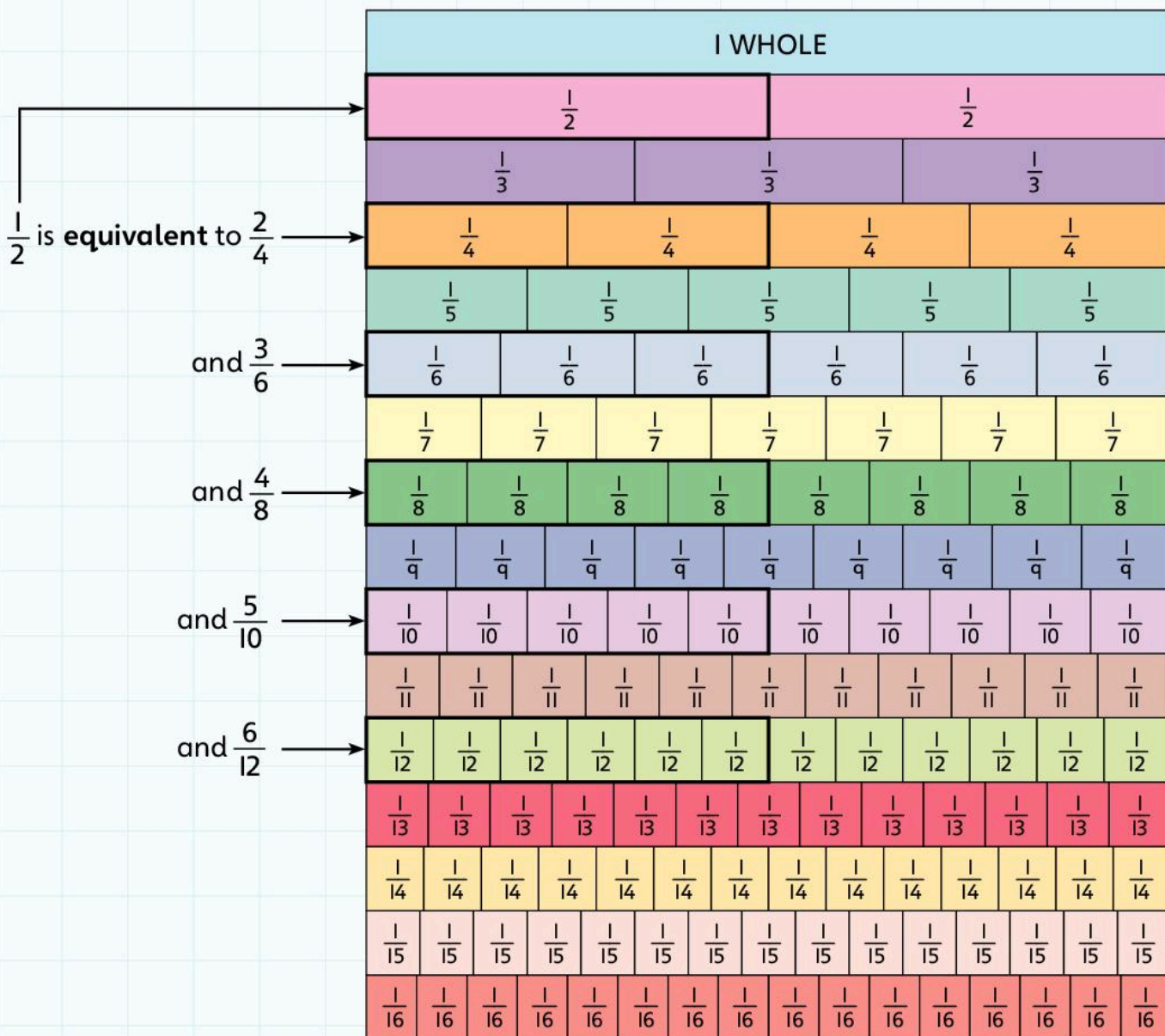
Yes – but there are lots of different ways of doing it.



Do we always get a quarter each?

You could have a row of six pieces or two rows of three pieces.

- Draw three different ways to divide the chocolate bar into quarters.



- Use the fraction wall to write five **equivalent fractions** for these:

$\frac{1}{3}$ is equivalent to _____

$\frac{1}{4}$ is equivalent to _____

$\frac{1}{5}$ is equivalent to _____

- Complete these sentences:


Fractions are equivalent to each other if

You can find an equivalent fraction by

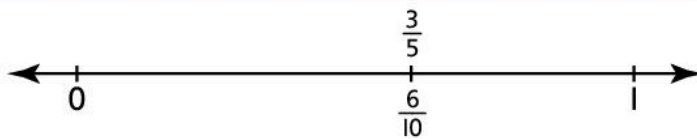
2A Equivalent fractions

Explore

1. Complete the grid. Choose your own fractions for the last three rows.

Fraction in its simplest form	Fraction in words	Equivalent fraction	Equivalent fraction	Diagram
$\frac{3}{5}$	Three-fifths	$\frac{6}{10}$	$\frac{9}{15}$	
			$\frac{50}{100}$	
	Four-fifths			
				
	One-quarter			
$\frac{3}{4}$		$\frac{9}{12}$		
			$\frac{4}{12}$	

The fraction $\frac{3}{5}$ is equivalent to $\frac{6}{10}$.
 $\frac{3}{5}$ is in its **simplest form**.



2. Find pairs of equivalent fractions in this list:

$$\frac{1}{4}, \frac{3}{12}, \frac{4}{10}, \frac{9}{12}, \frac{5}{6}, \frac{2}{5}, \frac{1}{2}, \frac{3}{4}, \frac{10}{12}, \frac{6}{12}$$

- For each pair mark the correct position on the number line.
- Write the fraction in its simplest form above the number line.
- Write the equivalent fraction below the number line.

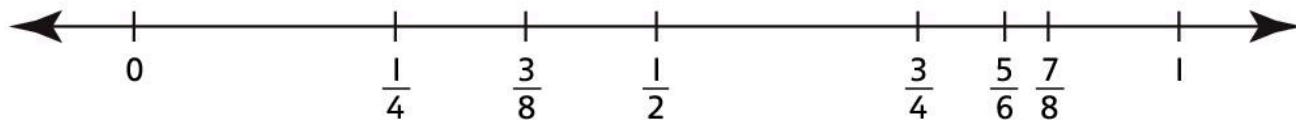


$$\frac{1}{2}, \frac{3}{8}, \frac{5}{6}, \frac{1}{4}, \frac{7}{8}, \frac{3}{4}$$

To order this set of fractions, use equivalent fractions.

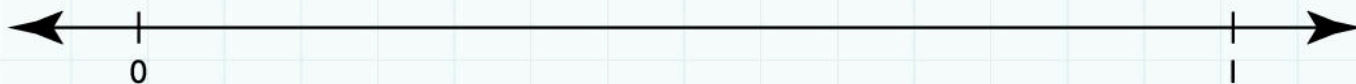
For example: $\frac{3}{4} = \frac{6}{8}$ so $\frac{3}{4} < \frac{7}{8}$

The correct order, starting with the smallest, is:

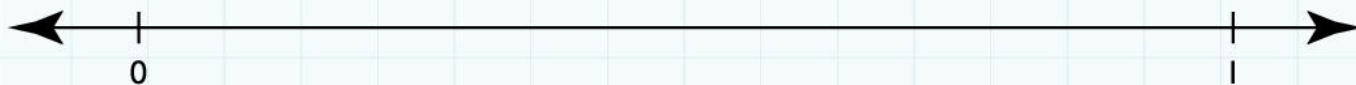


3. Order these sets of fractions. Start with the smallest.

$$\frac{3}{4}, \frac{10}{12}, \frac{5}{12}, \frac{1}{2}, \frac{1}{4}, \frac{2}{3}$$



$$\frac{4}{5}, \frac{3}{10}, \frac{1}{2}, \frac{9}{10}, \frac{2}{5}$$



2B Fractions and decimals

Discover

- Complete the tables below by changing the **fractions** to **decimals**.
Then write a sentence about what you notice.

Fraction	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$	$\frac{5}{4}$
Decimal equivalent					

Fraction	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{5}{5}$
Decimal equivalent					

Fraction	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
Decimal equivalent								

Fraction	$\frac{1}{12}$	$\frac{2}{12}$	$\frac{3}{12}$	$\frac{4}{12}$	$\frac{5}{12}$	$\frac{6}{12}$	$\frac{7}{12}$	$\frac{8}{12}$	$\frac{9}{12}$	$\frac{10}{12}$	$\frac{11}{12}$	$\frac{12}{12}$
Decimal equivalent												

I notice that _____

- Try this with other families of fractions and their decimal equivalents.

2B Fractions and decimals

Explore

- Write five fractions between 0 and 1 in the table.
 - Write down their decimal equivalents.

Fraction						
Decimal equivalent						

- Complete this table to show fractions and their decimal equivalents:

0.3	$\frac{3}{10}$	three-tenths
0.30	$\frac{30}{100}$	_____hundredths
0.300		_____thousandths
0.7		_____tenths
0.70	$\frac{70}{100}$	
	$\frac{700}{1000}$	
	$\frac{9}{10}$	
		ninety-hundredths
0.900		

What do you notice about these fractions and their decimal equivalents?

3. Here are the results for the Men's 100 m final in the Olympics in 2012.

- In the blank table, write the results in order. Start with the fastest time.



Athlete	Time (seconds)
Ryan Bailey	9.88
Yohan Blake	9.75
Usain Bolt	9.63
Justin Gatlin	9.79
Tyson Gay	9.80
Churandy Muranda	9.94
Asafa Powell	11.99
Richard Thompson	9.98

Athlete	Time (seconds)

4. Here are the results for the women's high jump final.

- In the blank table below, write the results in order. Start with the highest jump.

Athlete	Height of jump (metres)
Burcu Ayhan	1.87
Brigetta Barrett	2.03
Ruth Beita	1.89
Anna Chicherova	2.05
Irina Gordeeva	1.93
Emma Green	1.95
Tia Hellebaut	1.99
Chaunte Lowe	1.97
Melanie Melfort	1.91
Airine Palsyte	1.90
Svetlana Radzivil	1.94
Svetlana Shkolina	2.02

2C Mixed numbers and improper fractions

Discover



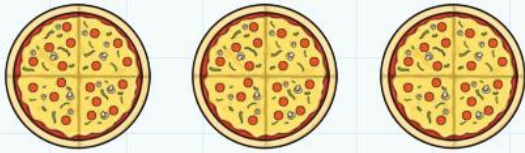
There are ten students in your class. They come into the classroom one at a time and stand behind one of the three chairs. They cannot change their position. Students behind each chair share the chocolate on that chair.

Where should they stand to share out the chocolate as fairly as possible?

- Draw or write your solution here:

2C Mixed numbers and fractions

Explore



1. a) You have **three** pizzas to share with a friend. How much pizza do you **get each**?

- b) **Two** more friends arrive. How much pizza do you **get each** now?

2. a) The next day your dad buys five small cakes. He divides the cakes into thirds. You take it in turns to eat some cake. The table below shows how much cake everyone eats. Complete the table to see how much is left for you.



	Number of cakes eaten	Number of cakes left
	None	5
Dad	$1\frac{1}{3}$	$3\frac{2}{3}$
Mum	$\frac{2}{3}$	
Big brother	$1\frac{2}{3}$	
Big sister	$\frac{2}{3}$	
You		

- b) Write your own story and complete the table below:

	Amount of cake eaten	Amount of cake left
	None	
Dad		
Mum		
Big brother		
Big sister		
You		

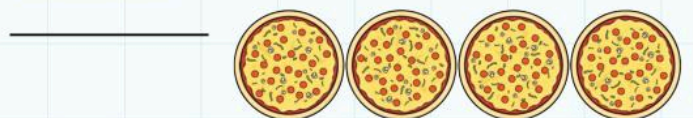
3. a) **Three** people are eating chapatis. They eat $\frac{3}{4}$ of a chapati each.

How many chapatis do they eat **in total**?



- b) **Five** people are eating pizza. They eat $\frac{1}{2}$ of a pizza each.

How many pizzas do they eat **in total**?



c) Two people are eating small cakes.
They eat $1\frac{1}{2}$ each.

How many cakes do they eat in total?



d) Seven people are eating cookies.
They eat $\frac{1}{3}$ of a cookie each.

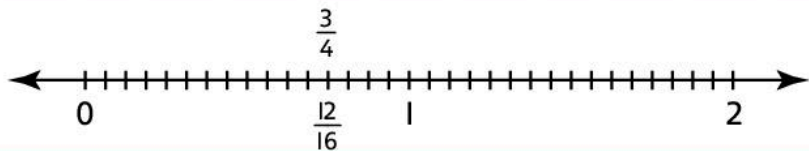
How many cookies do they eat in total?



4. Draw a picture to show each of these fractions:

A fraction between $1\frac{1}{2}$ and 3	A fraction smaller than 5
A fraction larger than $\frac{3}{4}$	A fraction smaller than $1\frac{3}{4}$

5. $\frac{3}{4}$ is equivalent to $\frac{12}{16}$.



- Find pairs of equivalent fractions in this list.
- Write one fraction from each pair above the line in its correct place.
- Write the other fraction below the line in its correct place.

$\frac{10}{16}, \frac{5}{8}, \frac{7}{6}, 1\frac{2}{3}, \frac{20}{12}, 1\frac{1}{2}, 1\frac{1}{6}, \frac{15}{10}$



2D Ratio and proportion

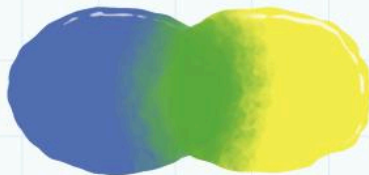
Discover

1. You can buy green paint from two companies.

Paint A is made up from blue and yellow paint in the ratio 1 : 4.

Paint B is made up from blue and yellow paint in the ratio 1 : 7.

You can mix blue and yellow to make different shades of green.



Paint A and Paint B are in the same size tins.



Paint A



Paint B

You are making different shades of green. You don't want to use too much paint!

How many tins of paints A and B do you need to make green paint with these ratios of blue to yellow?

1 : 5 _____

1 : 6 _____

2. You want to paint another room orange.

Orange paint is made up from yellow and red paint.



Paint C



Paint D

Paint C is made up from red and yellow in the ratio 1 : 4.

Paint D is made up from red and yellow in the ratio 1 : 9.

What is the minimum number of tins of paints C and D you need to make orange made up from red and yellow in the following ratios?

1 : 5 _____

1 : 6 _____

1 : 7 _____

1 : 8 _____

3. Make up a similar question for your partner to solve:

You want to paint another room _____.

_____ paint is made up from _____ and _____ paint.

Paint E is made up from _____ and _____ in the ratio ____ : ____.

Paint F is made up from _____ and _____ in the ratio ____ : ____.

What is the minimum number of tins of paints E and F you need to make _____ made up from _____ and _____ in the following ratios?

____ : ____ _____

____ : ____ _____

____ : ____ _____

2D Ratio and proportion

Explore

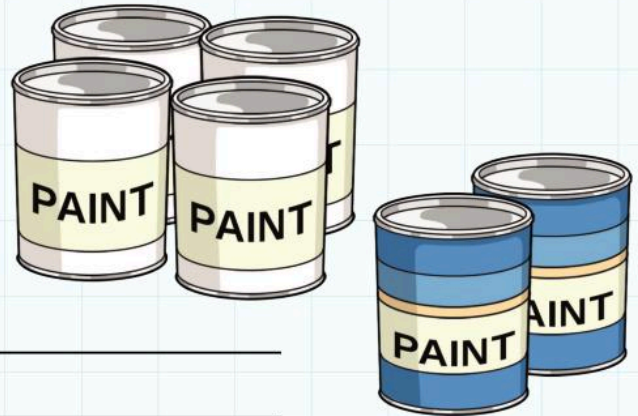
1. I use this paint to paint my bedroom walls.

To make the colour I want I use one tin of blue paint for every two tins of white paint.

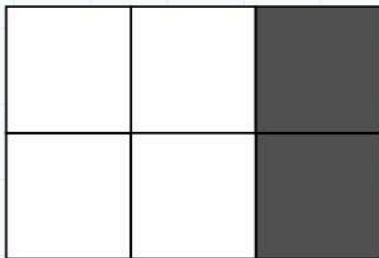
I need twelve tins of paint to cover all the walls.

How many tins of blue paint do I need? _____

How many tins of white paint do I need? _____



2. I am tiling a floor using the following pattern of tiles:



The pattern uses one black tile for every two white tiles.

My room is six tiles wide and twelve tiles long.

a) How many black tiles do I need?

b) How many white tiles do I need?

c) I buy 39 tiles in the correct ratio. How many white tiles do I buy?

3. To make a fruit drink for three people, I mix fruit juice and water in the ratio 1 part fruit juice to 3 parts water. This makes 200 millilitres of fruit drink.



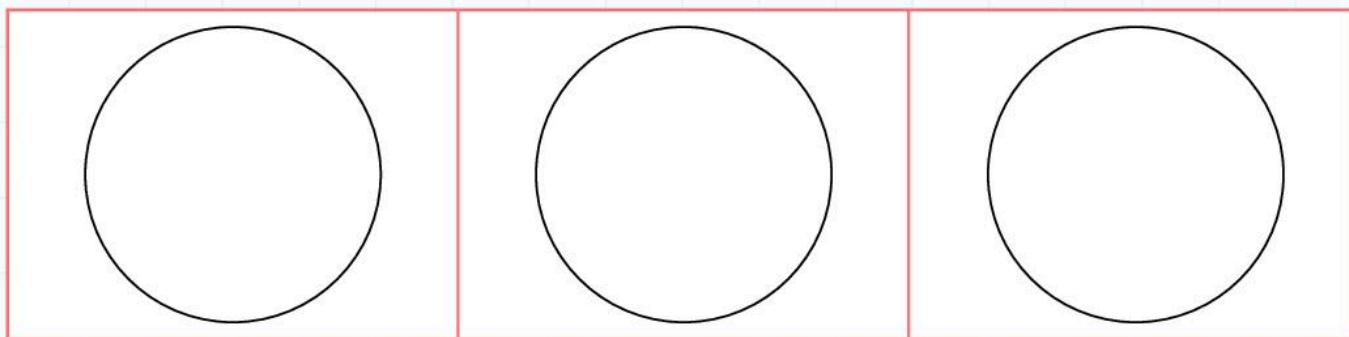
a) How much fruit juice do I need for six people?

b) How much water do I use for 150 millilitres of fruit juice?

2E Percentages

Discover

- Here are three circles.
 - Shade in 25% of the first circle.
 - Shade in 50% of the second circle.
 - Shade in 75% of the third circle.



- The total number of marks in a test is 80.

The table shows some possible marks out of 80.

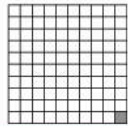
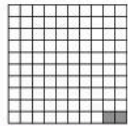
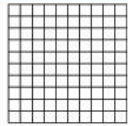
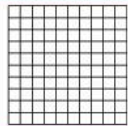
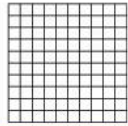
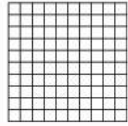
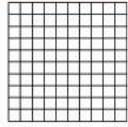
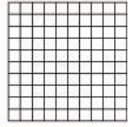
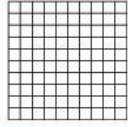
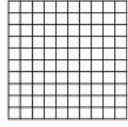
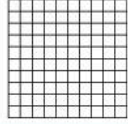
- Complete the table to show the equivalent percentage scores:

Marks	Percentage
80	100%
70	
60	
55	
45	
40	
20	
10	
8	10%
4	
2	
1	
0	0%

2E Percentages

Explore

- Complete this table:

Fraction	Decimal fraction	Percentage	Percentage as an area
$\frac{1}{10}$	0.1	10%	
$\frac{1}{5}$			
$\frac{1}{4}$			
$\frac{3}{10}$			
$\frac{2}{5}$			
$\frac{1}{2}$			
$\frac{3}{5}$			
$\frac{7}{10}$			
$\frac{3}{4}$			
$\frac{4}{5}$			
I whole			

2 Fractions and decimals

Connect

You are a shopkeeper. You sell the following items:

Item	Usual selling price	Cost price
T-shirt	6 dollars	2 dollars
Shorts	8 dollars	3 dollars
Jeans	14 dollars	10 dollars
Sandals	5 dollars	2 dollars



You reduce the price of these items in a sale. You reduce:

- one item by 10%
- one item by 15%
- one item by a quarter
- one item by a half.

Last year you sold these items in the following proportions:

Item	Percentage sales
T-shirts	40
Shorts	30
Jeans	20
Sandals	10

Which items do you reduce by which percentage?

- Write a presentation to explain your decision to your class:

I reduce _____ by _____ %
because _____

I reduce _____ by _____ %
because _____

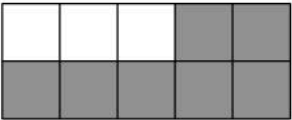
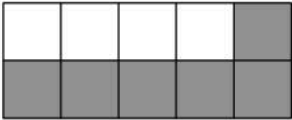
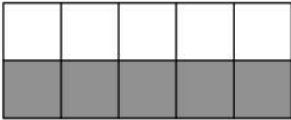

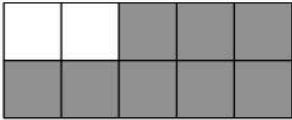
I reduce _____ by _____ %
because _____

I reduce _____ by _____ %
because _____

2 Fractions and decimals

Review

- Write or draw fractions or percentages in the empty squares.
- Cut the cards out.
- Use the cards to play the memory game with your partner.

0.8	$\frac{1}{2}$	60%	
	75%		$\frac{7}{10}$
			
50%	$\frac{4}{5}$	0.75	
	80%		0.7
$\frac{3}{5}$		0.5	
$\frac{3}{4}$		70%	

3 Mental Calculation

Engage

How do you work out $90 \div 15$ in your head?

How do you work out $48 + 53$ in your head?

How do you work out $99 + 15$ in your head?

How do you work out $148 - 6$ in your head?

How do you work out 21×18 in your head?

How do you work out $37 - 9$ in your head?

How do you work out 6×15 in your head?

How do you work out $87 - 10$ in your head?

3A Mental strategies for addition and subtraction

Discover

1. I am thinking of two whole numbers that add up to 20.

What could they be?

2. I am thinking of two numbers. Each number has **one decimal place**.

The two numbers add up to 2.

What could they be?

3. I am thinking of two numbers. Each number has one decimal place.

The two numbers add up to 1.

What could they be?

4. I am thinking of two numbers. Each number has two decimal places.

The two numbers add up to 1.

Write down ten possibilities for the two numbers.

Can you explain your strategy?

To work out a pair of numbers with **two decimal places** that add up to 1:

I _____

I know that this is correct because

Adding two-digit and three-digit numbers

5. This table gives the numbers of students in each class in a school.

Find two different ways to work out the total number of students in the school.

Class	Number of students
Kindergarten	42
Grade 1	28
Grade 2	35
Grade 3	33
Grade 4	35
Grade 5	33
Grade 6	27

6. This table shows how many people got on and off a bus at each stop.



Stop	Number getting on bus	Number getting off bus
Bus Station	38	0
Cinema	9	5
School	15	3
Temple	11	12
Shopping Mall	26	14
Riverside	7	9
Sports Stadium	3	24

Read the information out to your partner.

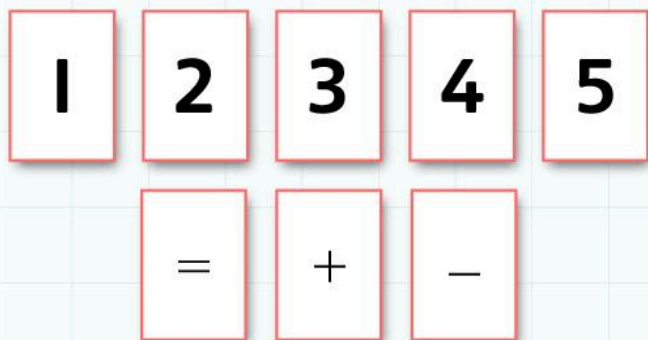
Ask your partner to write down how many people are on the bus when it leaves the Sports Stadium.

Ask your partner to tell you their answer.

Did you get the same answer?

3A Mental strategies for addition and subtraction

Explore



Use the digits 1, 2, 3, 4 and 5 once and only once.

- Make a **sum** with two numbers.
For example: $123 + 45 = 168$
- Make a sum with three numbers.
For example: $12 + 34 + 5 = 51$
- Make a subtraction with two numbers.
For example: $312 - 54 = 258$

1. Use the digits 1, 2, 3, 4 and 5 once and only once. Find:

- the largest sum with two numbers

- the largest sum with three numbers

- the smallest sum with two numbers

- the smallest sum with three numbers

- the largest difference between two numbers

- the smallest difference between two numbers

- the largest answer you can get using all the cards _____
- the smallest answer you can get using all the cards _____

2. The answer is 112.
What is the calculation?

Write down ten different calculations involving **two-digit and three-digit numbers** and **addition** and **subtraction**:

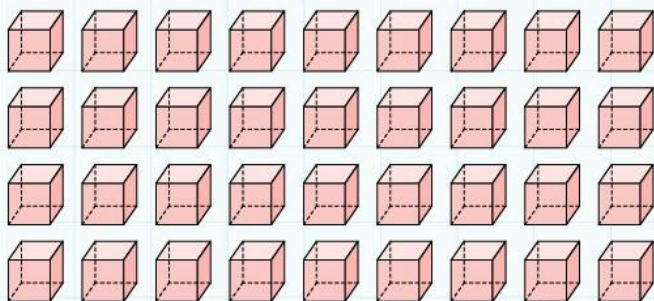
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112
- _____ = 112

3. Can you find a quick way to add together all the numbers from 1 to 100?

3B Mental strategies for multiplication and division

Discover

1. Here is 36 as an **array**:



How many different ways can you draw 36 as an array?

- Sketch them here:

2. Repeat question 1 for the numbers 24, 28, 32 and 40:

3. Complete these calculations:

$15 \times 9 =$	$15 \times 11 =$
$16 \times 9 =$	$16 \times 11 =$
$17 \times 9 =$	$17 \times 11 =$
$18 \times 9 =$	$18 \times 11 =$
$19 \times 9 =$	$19 \times 11 =$
$20 \times 9 =$	$20 \times 11 =$
$21 \times 9 =$	$21 \times 11 =$

What do you notice about the answers? Complete these sentences:

- a) A quick way to multiply any number by 9 is to _____ and then _____
b) A quick way to multiply any number by 11 is to _____ and then _____

4. Work in groups to find rules for **divisibility** for each of the times tables.

Then write down the rules in this table.

Multiplication table	Rule
A number divides by 2 if	
A number divides by 3 if	
A number divides by 4 if	
A number divides by 5 if	
A number divides by 6 if	
A number divides by 7 if	
A number divides by 8 if	
A number divides by 9 if	
A number divides by 10 if	

3B Mental strategies for multiplication and division

Explore

- Complete these tables
- First do the calculations in your head.
- Then check your results with a calculator.
- Then complete the sentences.

1. Multiplying pairs of **multiples of 10**

×	10	30	50	60	90
10					
20					
30					
40					
70					

To multiply multiples of ten I _____

2. Multiplying **near multiples of 10**

×	10	30	50	60
19				
21				
39				
41				
51				
69				
91				

To multiply near multiples of ten I _____

3. Multiplying by **numbers with one decimal place**

×	18	25	40	80
0.2				
0.4				
0.8				
0.6				
0.5				
0.9				
0.7				

To multiply by numbers with one decimal place I _____

3C Using known facts to derive new ones

Discover

1. Complete this multiplication table:

\times	0.25	0.5	2	5	10	20	50	70	90	100
3										
6										
9										
10										
30										
60										
70										

- Talk to a partner about how you completed the table:

First I _____ and then I _____

2. Make a multiplication table for your partner to complete.

- Use numbers that link to help your partner complete the table:

\times										

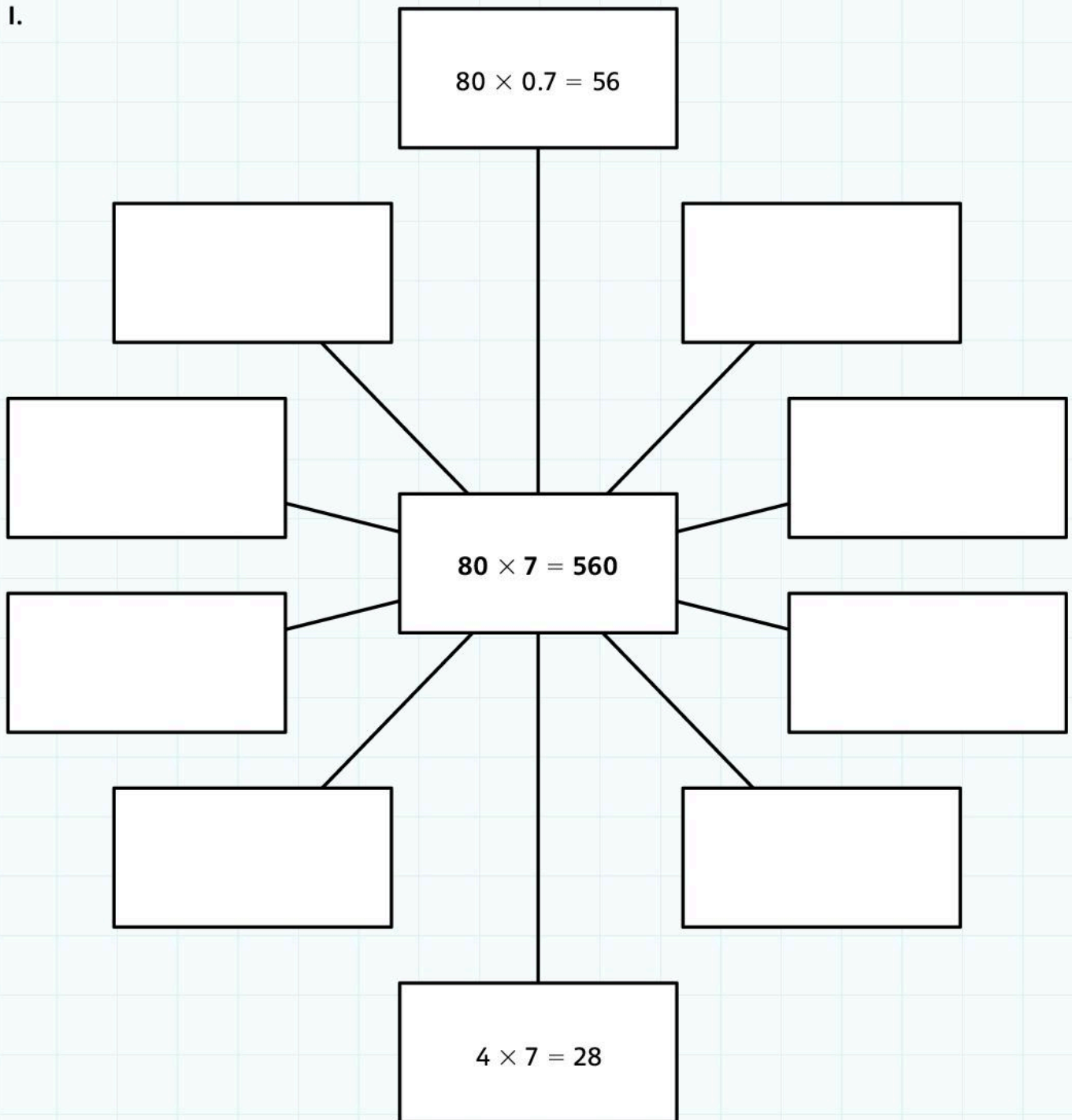
3. Use the 17 times table to complete the following table:

17 times table	Reason
$1 \times 17 =$	
$2 \times 17 =$	
$3 \times 17 = 51$	$3 \times 10 = 30$ and $3 \times 7 = 21$ and $30 + 21 = 51$
$4 \times 17 =$	
$5 \times 17 =$	
$6 \times 17 =$	
$7 \times 17 =$	
$8 \times 17 =$	
$9 \times 17 =$	
$10 \times 17 =$	

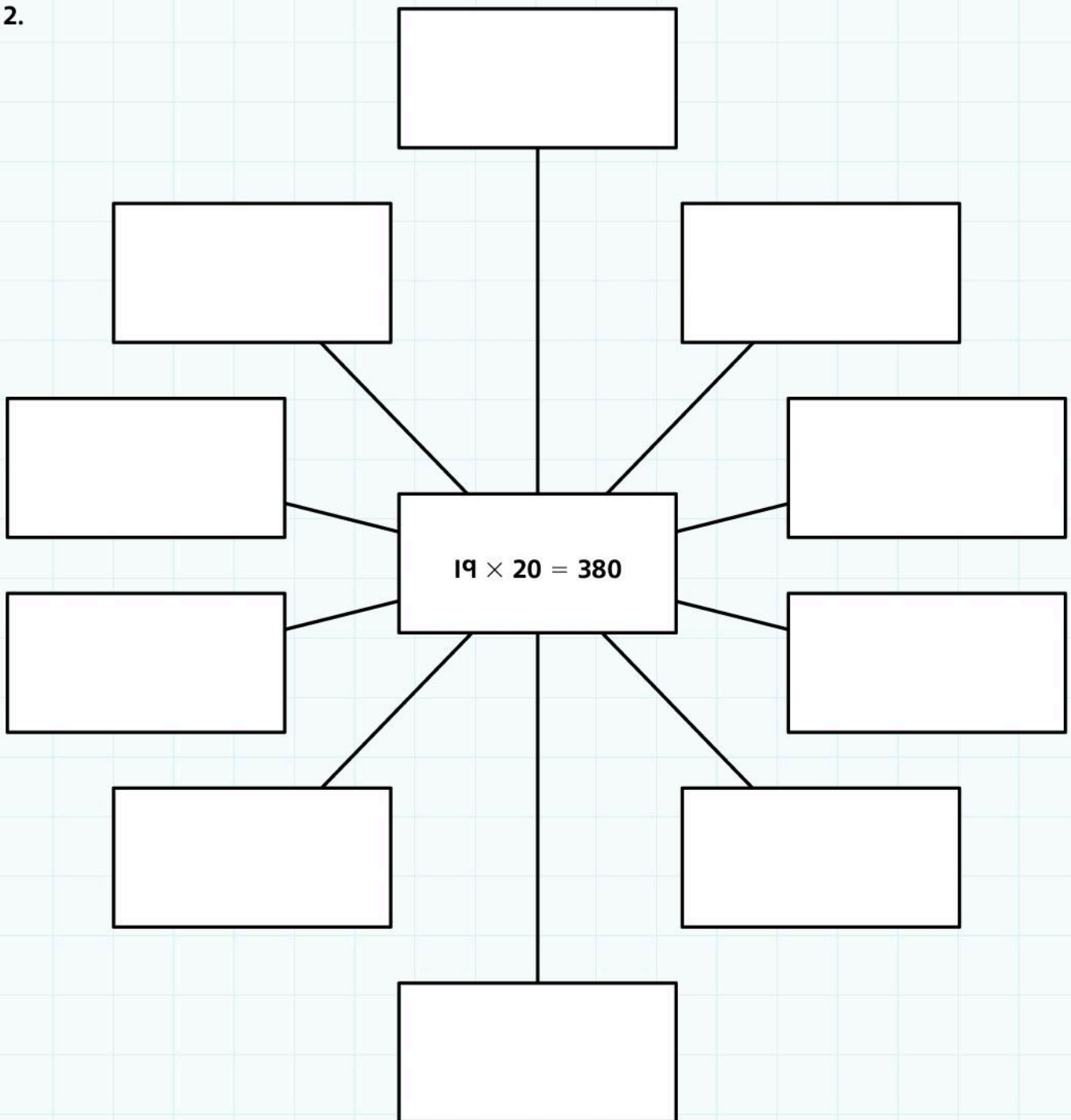
3C Using known facts to derive new ones

Explore

I.



2.



3D Doubling and halving

Discover

1. Roll a dice twice to make a two-digit number.

- Write the number in the table.
- Then **double** the number and write the answer in the table.

Was it 'easy' or 'hard'? Tick the column and explain why.

Two examples are shown.

Digits	Number	Double	Easy	Hard	Reason
2, 1	21	42	✓		This is easy because I double 20 then add 2.
5, 6	56	112		✓	Because it goes over 100. I double 50 and double 6, then add the answers together.

2. Roll a dice three times to make a three-digit number.

- Write the number in the table.
- **Halve** the number and write the answer in the table.

Was it 'easy' or 'hard'? Tick the column and explain why.

Two examples are shown.

Digits	Number	Half of the number	Easy	Hard	Reason
1, 6, 2	162	81	✓		This is easy because half of 160 is 80 and half of 2 is 1. Then I add them.

5, 5, 6	556	278		✓	Because it is a bigger number. I know that half of 500 is 250, and half of 50 is 25, and half of 6 is 3. Then I add them.

3. Complete this table.

- Explain how you calculated the answers.

Question	Answer	Strategy
Double 2.44		
Double 7.5		
Halve 2.44		
Double 3.2		
Halve 3.2		
Halve 6.88		
Double 14.8		
Halve 25.6		
Halve 2.44		
Double 35.9		

3D Doubling and halving

Explore

I. These are the prices of clothes in a shop:

Shorts 18 dollars

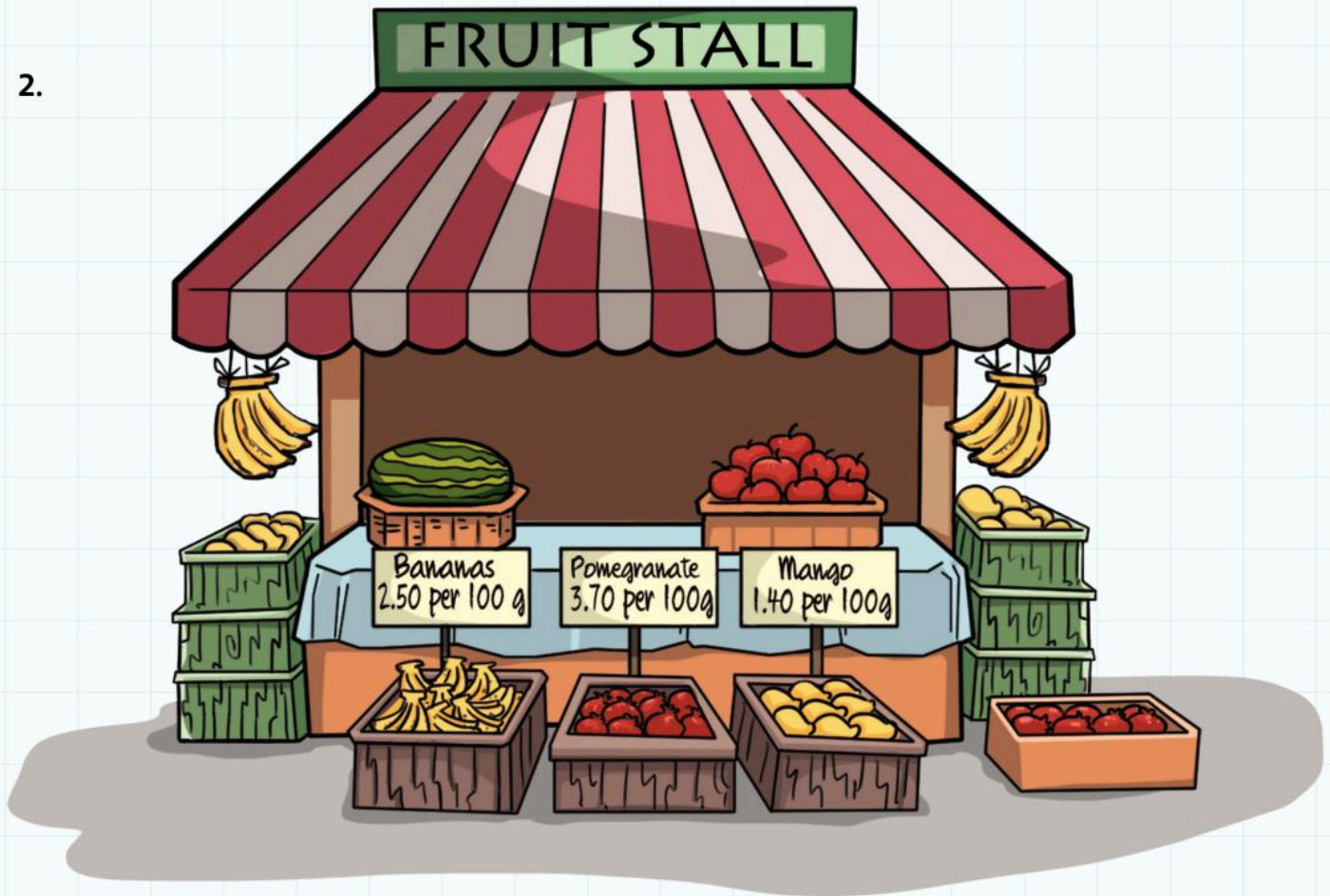
T-shirt 15 dollars

Sandals 24 dollars



- You buy two T-shirts and two pairs of shorts. How much does this cost?
- Your friend buys one pair of sandals and four T-shirts. What do they spend?
- All items are half price in a sale. What is the total cost of one pair of shorts, one T-shirt and one pair of sandals?
- Write two more questions for your friends. Include doubling or halving.

2.



• Complete the prices on these shopping lists:

a)

SHOPPING LIST
200 g Banana
50 g Mango
400 g Pomegranate

b)

SHOPPING LIST
50 g Banana
200 g Mango
200 g Pomegranate

c)

SHOPPING LIST
150 g Banana
300 g Mango
150 g Pomegranate

d)

SHOPPING LIST
300 g Banana
175 g Mango
300 g Pomegranate

3. Use the Fish Stew recipe to write two questions that you can solve mentally.

- Include doubling and halving in your questions.
- Make your questions as hard as you can.
- Ask your friends your questions.

Fish Stew (Serves 4)

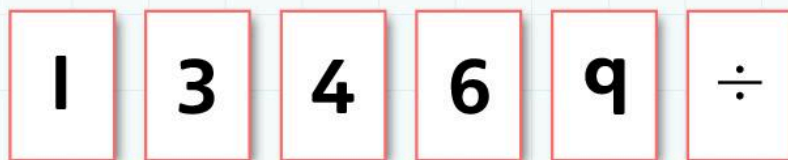
300 g fish
2 cloves of garlic
1 teaspoon cumin
200 g tomatoes
1 pepper
 $\frac{1}{2}$ lemon



3E Mental strategies for division of two-digit numbers by single-digit numbers

Discover

- Use these numbers to make up calculations.



In each calculation, divide a **two-digit number** by a **single-digit number**.

Use a \div sign. You can use each digit more than once.

For example: Division by 3 with a **remainder**: $41 \div 3 = 13 \text{ r } 2$

Division by 3 with no remainder: $96 \div 3 = 32$

- Complete the table:

	Calculation	Answer	Reason
Division by 4 with no remainder			
Division by 4 with a remainder			
Division by 1 with no remainder			
Division by 6 with a remainder			
Division by 9 with a remainder			
Division by 6 with no remainder			
Division by 3 with a remainder			
Division by 3 with no remainder			
Division by 9 with no remainder			

3E Mental strategies for division of two-digit numbers by single-digit numbers

Explore

- Write a 'revision guide' page to explain the strategies for dividing a two-digit number by a single-digit number.
- Include examples with a remainder and without a remainder and an example with a decimal point.

How to divide two-digit numbers by single-digit numbers

3 Mental calculation

Connect

1. Complete this **addition** grid with your digits.
 - Roll a dice nine times and fill the cells one at a time.
 - Then **add** the three numbers.

For example: 24.6

$$\begin{array}{r} 24.6 \\ 31.2 \\ 54.1 \\ \hline 109.9 \end{array}$$

		.	
		.	
		.	

Play with your friends. The winner is the person with the answer nearest to 100.

2. Complete this **subtraction** grid.

Roll a dice and fill the cells one at a time.

For example: $26.5 - 15.2 = 11.3$

Play with your friends. The winner is the person with the answer nearest to 10.

		.		-			.	
--	--	---	--	---	--	--	---	--

3. Complete this **multiplication** grid.

Roll a dice and fill the cells one at a time.

For example: $262 \times 4 = 1048$

Play with your friends. The winner is the person with the answer nearest to 1000.

			×	
--	--	--	---	--

4. Complete this **division** grid.

Roll a dice and fill the cells one at a time.

For example: $66.2 \div 5 = 13.24$

Play with your friends. The winner is the person with the answer nearest to 10.

		.		÷	
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3 Mental calculation

Review

- Make a set of loop cards like the ones below to play with your friends.
You can take them home and play with your family.

I am 0.5 Who is $29 + 13$?	I am 42 Who is $98 - 23$?	I am 75 Who is 6×14 ?	I am 84 Who is $120 \div 6$?
I am 20 Who is $19 + 57$?	I am 76 Who is $136 - 23$?	I am 113 Who is 9×18 ?	I am 162 Who is $100 \div 4$?
I am 25 Who is $2.8 + 17$?	I am 19.8 Who is $5.5 - 2.3$?	I am 3.2 Who is 0.5×7 ?	I am 3.5 Who is $180 \div 4$?
I am 45 Who is $115 + 76$?	I am 191 Who is $89 - 6$?	I am 83 Who is 10×2.7 ?	I am 27 Who is $66 \div 3$?
I am 22 Who is $1.56 + 2.33$?	I am 3.89 Who is $15.5 - 10.5$?	I am 5 Who is 100×1.37 ?	I am 137 Who is $8 \div 16$?

4 Addition and Subtraction

Engage

Each letter stands for a digit.
What does each letter represent?

Oh, so 'E' could represent 7.

One plus two is four –
what does it mean?

$$\begin{array}{r} \text{ONE} \\ + \text{TWO} \\ \hline \text{FOUR} \end{array}$$

Should we try
some examples?

We can't do
this mentally.

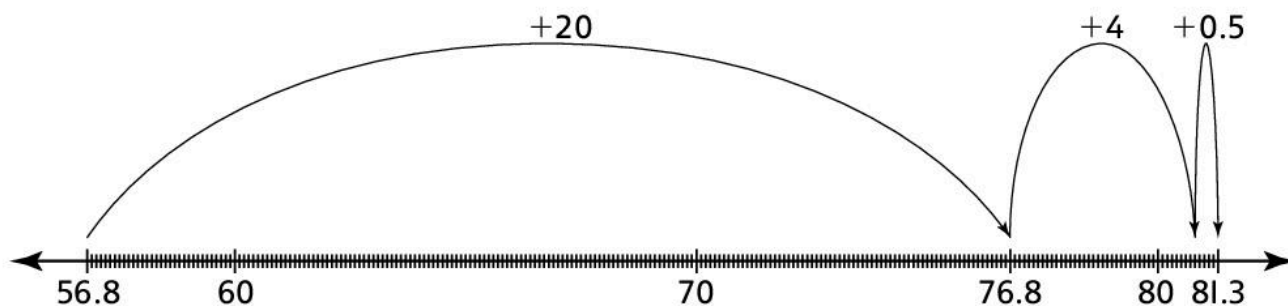
Do you think the
units column adds up
to more than 10?

4A Adding and subtracting three-digit numbers

Discover

- Look at each of these calculations.
Can you work them out mentally or do you need to use a paper and pencil method?
- Explain your answers.

Example: $56.8 + 24.5$



But it is easier to do a column addition:

Line up the decimal places.

$$\begin{array}{r} 56.8 \\ + 24.5 \\ \hline 81.3 \\ \hline \end{array}$$

50 add 20 and the 10 carried is 80.

8 tenths add 5 tenths is one unit and 3 tenths. Write down 3 and carry the 1 unit into the units column.

6 add 4 and the 1 carried is 11. Write down 1 unit and carry one 10.

The answer is 81.3.

1. $152.7 + 14.1$

2. $45 + 17$

3. $983.7 + 419.8$

4. $115.5 - 16.2$

5. $101 - 17$

6. $51.52 + 13.11$

7. $121.78 + 19.44$

8. $452.2 - 134.8$

9. $52.12 + 9.57$

10. $147.9 + 321.6$

4A Adding and subtracting three-digit numbers

Explore

- Use the digits 4, 5, 6, 7, 8, 9 to make two three-digit numbers.
- What is the smallest possible sum?
 - What is the largest possible sum?

- Create sums with the answer as close as possible to each of the numbers in the table.

For example: for 900: $576 + 489 = 1065$

Can you make a sum closer to 900?

900	1200
1300	1400
1500	1600
1700	1800

4. Check these calculations.

If they are correct, 'tick' them.

If there is an error, explain where the student has made a mistake.

$$\begin{array}{r} 985 \\ - 668 \\ \hline 317 \end{array}$$

$$\begin{array}{r} 27.5 \\ + 42.6 \\ \hline 69.11 \end{array}$$

$$\begin{array}{r} 456 \\ + 845 \\ \hline 1291 \end{array}$$

$$\begin{array}{r} 38.9 \\ + 46.5 \\ \hline 85.4 \end{array}$$

$$\begin{array}{r} 876 \\ - 459 \\ \hline 417 \end{array}$$

$$\begin{array}{r} 76.5 \\ - 32.8 \\ \hline 43.7 \end{array}$$

$$\begin{array}{r} 76.5 \\ - 32.8 \\ \hline 44.3 \end{array}$$

$$\begin{array}{r} 576 \\ + 345 \\ \hline 921 \end{array}$$

$$\begin{array}{r} 346 \\ + 504 \\ \hline 840 \end{array}$$

$$\begin{array}{r} 1007 \\ - 9 \\ \hline 998 \end{array}$$

4B Adding and subtracting money

Discover

- Use a set of 0–9 digit cards to create 10 different additions and subtractions in the grids below.
- Then work them out.

They are all money calculations.

For example

$$\begin{array}{r} 53.72 \\ + 14.68 \\ \hline 68.40 \end{array}$$

\$	Tens	Units		Tenths	Hundredths
			•		
+			•		
			•		

\$	Tens	Units		Tenths	Hundredths
			•		
+			•		
			•		

\$	Tens	Units		Tenths	Hundredths
			•		
+			•		
			•		

\$	Tens	Units		Tenths	Hundredths
			•		
-			•		
			•		

\$	Tens	Units		Tenths	Hundredths
			•		
+			•		
			•		

\$	Tens	Units		Tenths	Hundredths
-			•		
			•		
			•		

\$	Tens	Units		Tenths	Hundredths
+			•		
			•		
			•		

\$	Tens	Units		Tenths	Hundredths
-			•		
			•		
			•		

\$	Tens	Units		Tenths	Hundredths
+			•		
			•		
			•		

\$	Tens	Units		Tenths	Hundredths
-			•		
			•		
			•		

Is the method for **adding decimals** the same as the method for **adding whole numbers**?

Explain your answer.

Is the method for **subtracting decimals** the same as the method for **subtracting whole numbers**?

Explain your answer.

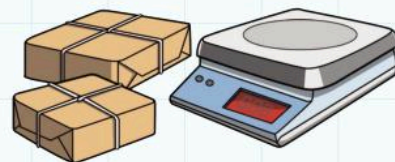
4B Adding and subtracting money

Explore

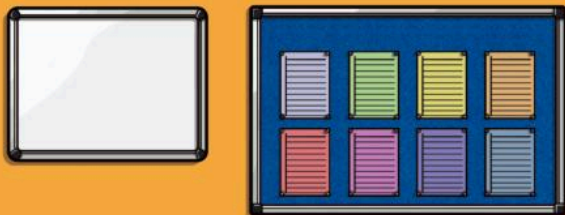
- Read each of these word problems.
- Write down the **operation** you need to do to solve the problem.
- Then solve the problem.

1. You post **two** parcels. **One** parcel weighs **3.56 kg**.
The **other** parcel weighs **4.82 kg**.

- a) What is the **total weight** of the parcels? _____
- b) **How much heavier** is the heavier parcel than the other parcel? _____



2. The classroom wall is **15.7 m** long.
The whiteboard is **2.2 m** long.
The noticeboard is **3.5 m** long.
How much space **is left** on the wall?

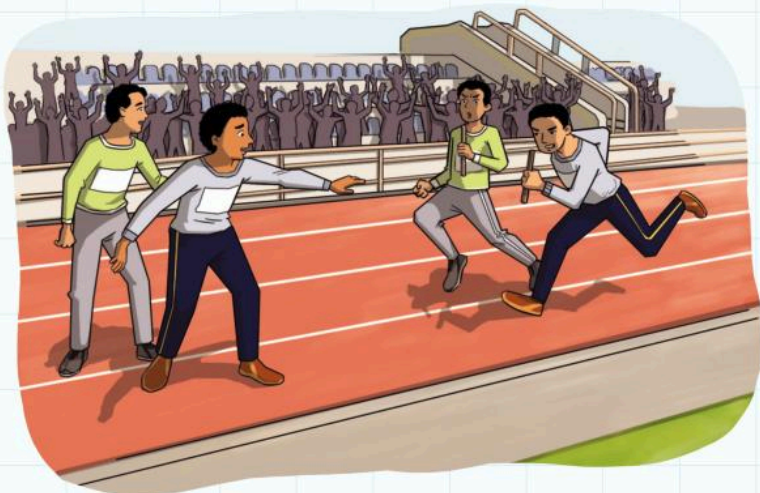


3. You have a 15 gigabyte (GB) Internet download allowance per month.
You use 1.85 GB downloading music and 3.65 GB downloading movies.
How much of your allowance do you have left? _____



4. In a 4×100 m relay race the four runners' times are 13.46 s, 14.15 s, 12.52 s, 11.99 s.

What is the total time for the race?



5. a) You buy a DVD and a game.
How much do you spend in total?

- b) You buy a CD and a DVD.
You pay with a \$50 note.
How much change do you receive?



6. Make up two more questions to ask your friends using the prices from question 5.

4C Using negative numbers

Discover

I. a) Match the following temperatures to the thermometers:

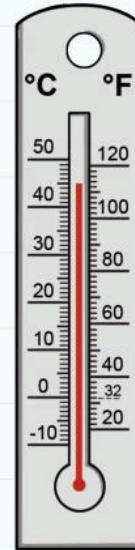
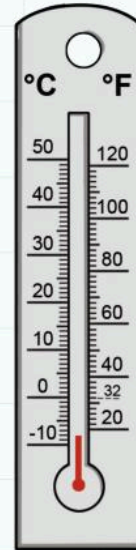
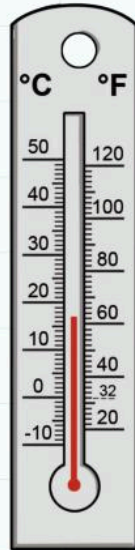
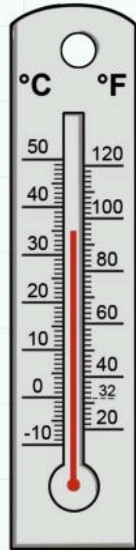
London 17°C

Moscow -4°C

Oslo -8°C

Bangkok 35°C

Dubai 42°C

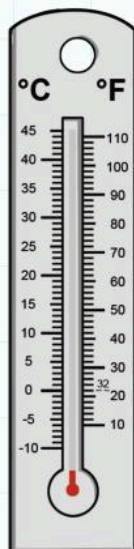
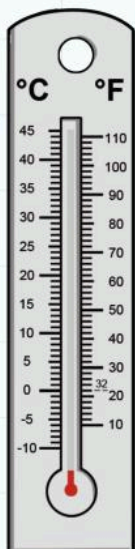


b) Choose six cities around the world.

Use the Internet to find the average temperature for each city in December.

Draw the temperatures on the thermometers below.

Find three positive temperatures and three temperatures below zero.



2. Look at your matched thermometers and cities in question 1a).

a) I fly from Bangkok to London. What is the change in the temperature?

b) Does the temperature rise or fall between Dubai and Bangkok?

By how much? _____

c) Does the temperature rise or fall between London and Moscow?

By how much? _____

d) Does the temperature rise or fall between Moscow and Oslo?

By how much? _____

3. Look at this table of temperatures:

City	Temperature in January
Anchorage	
London	-2
Omykan	-45
Rio	
Sydney	28
Tunis	
Cairo	
Bangkok	

Use the following clues to complete the table.

- Anchorage is 10 degrees colder than Omykan.
- Rio is 38 degrees warmer than London.
- Tunis is 12 degrees colder than Sydney.
- Cairo is 59 degrees warmer than Omykan.
- Bangkok is 4 degrees colder than Rio.

4C Using negative numbers

Explore

- For each of the following statements circle the correct answer.

The statements are either 'Always true', 'Sometimes true' or 'Never true'.

You **add** two **negative** numbers.
You get a **negative** answer.

$$(-3) + (-2)$$

Always / sometimes / never

You **add** a **negative** number and
a **positive** number. You get a
positive answer.

$$(-3) + (+6)$$

Always / sometimes / never

You **subtract** a **positive** number
from a **negative** number. You get
a **negative** answer.

$$(-7) - (+9)$$

Always / sometimes / never

You **subtract** a **negative** number
from a **negative** number. You get
a **negative** answer.

$$(-4) - (-6)$$

Always / sometimes / never

You **subtract** a **positive** number
from a **positive** number. You get
a **negative** answer.

$$(+8) - (+15)$$

Always / sometimes / never

You **subtract** a **negative** number
from a **positive** number. You get
a **positive** answer.

$$(+8) - (-6)$$

Always / sometimes / never


4 Addition and subtraction

Connect

- I. The tables show water supply and demand in the Middle East and North Africa.
Supply is how much water is available.
Demand is how much water is needed.



2010









Demand (km ³)		Supply (km ³)	
Irrigation 	213	Surface water	171
Urban 	28	Ground water	48
Industry 	20		
Total			

2050

Demand (in km ³)		Supply (in km ³)	
Irrigation	251	Surface water	215
Urban	88	Ground water	168
Industry	41		
Total			

- Find the totals. Then write them in the tables.
- What is the difference between supply and demand in 2010? _____
- What is the predicted difference between supply and demand in 2050? _____

2. Premier League Attendances:

Club	Average attendance	To nearest thousand
Manchester United 	75 528	76 000
Arsenal 	60 079	
Newcastle United 	50 515	
Manchester City 	47 017	
Liverpool 	44 731	
Chelsea 	41 435	
Sunderland 	40 601	
Everton 	36 182	

Complete the table. Then calculate:

- the total attendance for these eight clubs _____
- the difference in attendance between Manchester United and Manchester City _____
- the difference in attendance between Liverpool and Everton _____
- the difference in attendance between Newcastle United and Sunderland _____
- the difference in attendance between the Manchester clubs (United and City) and the Liverpool clubs (Liverpool and Everton) _____

4 Addition and subtraction

Review

- Write an example question for each of the following.
- Exchange your questions with a friend.
- Mark your friend's answers and correct any errors.

An addition involving one place of decimals.
Write an addition that you solve using a written method.

An addition involving one place of decimals.
Write an addition that you solve using a mental method.

A subtraction involving one place of decimals.
Write a subtraction that you solve using a written method.

A subtraction involving one place of decimals.
Write a subtraction that you solve using a mental method.

An addition involving two places of decimals.
Write an addition that you solve using a written method.

An addition involving two places of decimals.
Write an addition that you solve using a mental method.

A subtraction involving two places of decimals.
Write a subtraction that you solve using a written method.

A subtraction involving two places of decimals.
Write a subtraction that you solve using a mental method.

5 Multiplication and Division

Engage

There are different ways to work it out.

How can you calculate 286×29 ?

\times	20	9	
200	4000	1800	5800
80	1600	720	2320
6	120	54	174
			8294

286×29			
	200×20	4000	
	80×20	1600	
	6×20	120	
	200×9	1800	
	80×9	720	
	6×9	54	
			8294

Which do you think is easiest?

286	
$\times 29$	
5720	(286×20)
2574	(286×9)
8294	

Which do you think is quickest?

5A Multiplying by a two-digit number

Discover

1. Partition to multiply the following:

a) $346 \times 7 = (\quad \times 7) + (40 \times \quad) + (\quad \times 7) = \underline{\hspace{2cm}}$

b) $\$4.92 \times 3 = (4 \times 3) + (0.9 \times \quad) + (\quad \times 3) = \underline{\hspace{2cm}}$

c) $685 \times 6 = (\quad \times 6) + (80 \times \quad) + (\quad \times 6) = \underline{\hspace{2cm}}$

d) $\$4.56 \times 4 = (\quad \times 4) + (0.5 \times \quad) + (\quad \times 4) = \underline{\hspace{2cm}}$

e) $532 \times 8 = \underline{\hspace{4cm}}$

f) $\$8.26 \times 5 = \underline{\hspace{4cm}}$

2. A friend does not understand this calculation.

- Complete the sentences below to help them:

\times	40	7	
300	12000	2100	14100
60	2400	420	2820
5	200	35	235
			17155

This multiplication shows $365 \times \underline{\hspace{2cm}}$

12 000 in the top left box is the answer to $300 \times \underline{\hspace{2cm}}$

The first column contains 300, 60 and 5 because $\underline{\hspace{4cm}}$

2820 is written across from 60 because $\underline{\hspace{4cm}}$

The answer 17 155 is calculated by $\underline{\hspace{4cm}}$

Show by estimating that the answer is sensible:

3. Complete these empty boxes to calculate 523×47 :

×		7	
500	20000		
		140	940
3		21	

Show by estimating that the answer is sensible:

4. Calculate 426×82 using the grid below:

×			

Show by estimating that the answer is sensible:

5. Your friend does not understand how to carry out column multiplication. Complete the sentences below to explain it to them:

$$\begin{array}{r}
 352 \\
 \times 63 \\
 \hline
 21120 \\
 1056 \\
 \hline
 22176
 \end{array}$$

($352 \times \underline{\hspace{2cm}}$)
 ($352 \times \underline{\hspace{2cm}}$)

21120 is the answer to _____

1056 is the answer to _____

I get 22176 by _____

6. Write a set of instructions to calculate 415×27 using a column method:

You set the multiplication out by _____

First you multiply _____ by _____.

This gives you _____.

Then you multiply _____ by _____.

This gives you _____.

Then you add _____ and _____.

This gives you _____.

You can check the answer by _____

_____.

5A Multiplying by a two-digit number

Explore

4

5

6

7

8

You can use these digits to make a product.

For example:

$$45 \times 768 = ?$$

$$67 \times 548 = ?$$

What is the largest product you can make using the digits 4, 5, 6, 7, 8?

- Use each digit only once.
- Use the column method to do the calculations.

5B Dividing three-digit numbers by two-digit numbers

Discover

1. Your friend does not understand how to calculate $845 \div 13$.

Complete the following sentences to explain the method to them:

$$\begin{array}{r} 65 \\ 13 \overline{)845} \\ \underline{780} \\ 65 \end{array}$$

$$60 \times 13 = 780$$

$$5 \times 13 = 65$$

You write _____ inside the box
and _____ outside _____

because _____.

I tried 60×13 first because _____

_____.

I know $5 \times 13 = 65$ because _____

_____.

The answer is 65 because _____

_____.

You can check the answer by _____

_____.

3. Write a series of instructions to show a friend how to calculate $901 \div 17$:

First you write the division like this _____.

Then you estimate _____.

You write the answer underneath the _____ and _____.

Then you have to _____.

Finally you _____.

You check your answer by _____.

2. Fill in the blanks to calculate $756 \div 14$:

$$\begin{array}{r} \square\square \\ \square\square \overline{)756} \\ \underline{700} \\ 56 \end{array} \quad \square 0 \times \square = 700$$

$$56 \square \times \square = 56$$

Show that the answer is correct using a multiplication:

5B Dividing three-digit numbers by two-digit numbers

Explore

1. The answer to a division problem is 1331.
 - Use the digits 2, 3, 4 and 5 to find the question.
 - Use a written method to show that you are correct:

2. The answer to a division problem is 52.
 - Use the digits 0, 2, 5 and 6 to find the three-digit **dividend** and the single-digit **divisor**.
 - Use a written method to show that you are correct:

3. The answer to a division question is 15.
 - Use the digits 0, 1, 2, 7 and 8 to find the three-digit dividend and the two-digit divisor.
 - Use a written method to show that you are correct:

4. The answer to a division question is 28.

- Use the digits 0, 1, 2, 4 and 5 to find the three-digit dividend and the two-digit divisor.
- Use a written method to show that you are right:

5. Make up a question like question 3 or 4.

Give your question to a friend to solve.

5C Division with remainders

Discover

1. Write down four different division calculations with an answer including remainder 3.

For example:

$$45 \div 7 = 6 \text{ r } 3$$

(Because $7 \times 6 = 42$ so there are 3 left over.)

- a) _____

- b) _____

- c) _____

- d) _____

2. Write down four different division calculations with an answer including remainder $\frac{3}{4}$.

For example:

$$43 \div 4 = 10 \frac{3}{4}$$

(Because $4 \times 10 = 40$ and there are 3 left over.

We are dividing by 4 so that leaves $\frac{3}{4}$.

- a) _____

- b) _____

- c) _____

- d) _____

3. Complete the following sentences to explain how to carry out this calculation:

$$\begin{array}{r} 15.6 \\ 5 \overline{)78.30} \end{array}$$

This calculation shows how to work out

$78 \div$ _____?

I write '1' above the '70' because _____

_____.

The next calculation is $28 \div 5$ because

_____.

The answer is 15.6 because _____

_____.

4. Write down two calculations where you multiply a three-digit number with one decimal place by a single-digit number.

Work out your calculations:

5. Write down the division calculation to match each multiplication you wrote in question 4:

5C Division with remainders

Explore

1. Imran wants to get a good deal at the shop.

- Work out how much each item costs.
- Circle the better deal for each item.

a



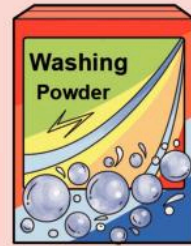
Ice lollies: \$6.75 for a box of 10 or \$4.47 for a box of 6

b



Cakes: \$8.12 for a box of 4 or \$12.84 for a box of 6

c



Washing Powder: \$18.92 for a 2 kg box or \$50.54 for a 7 kg box

d



Juice: \$14.35 for a 5-bottle pack or \$19.39 for a 7-bottle pack

e



Fizzy Drink: \$14.32 for an 8-can pack or \$8.25 for a 5-can pack

2. Use the price of the better-value pack to work out the cost of:

- a) 4 ice lollies

b) 7 cakes

c) 3 kg of washing powder

d) 5 bottles of juice

e) 10 fizzy drinks

5D Using the arithmetical laws for multiplication and division

Discover

I. Is each statement 'sometimes true', 'always true' or 'never true'?

- Circle the correct answer.
- Give examples to show that you are correct:

I can add numbers in any order and I always get the same answer.

sometimes true / always true / never true

I can subtract numbers in any order and I always get the same answer.

sometimes true / always true / never true

I can multiply numbers in any order and I always get the same answer.

sometimes true / always true / never true

I can divide numbers in any order and I always get the same answer.

sometimes true / always true / never true

$a(b + c)$ is always the same as $ab + ac$.

sometimes true / always true / never true

$\frac{a+b}{c}$ is always the same as $\frac{a}{c} + \frac{b}{c}$

sometimes true / always true / never true

2. Work in pairs.

- Research the meanings of the following mathematical terms.
- Complete these sentences:

The **associative** law means _____

For example _____

The **commutative** law means _____

For example _____

The **distributive** law means _____

For example _____

5D Using the arithmetical laws for multiplication and division

Explore

1. Change the order of the numbers to calculate each answer more easily:

For example:

$$12 \times 16 \times 5 = 12 \times 5 \times 16 = 60 \times 16 = 960$$

a) $20 \times 18 \times 5 =$

b) $15 \times 13 \times 10 =$

c) $18 \times 25 \times 4 =$

d) $5 \times 15 \times 2 =$

e) $4 \times 26 \times 5 =$

2. Use the distributive law to make these calculations easier to work out:

For example:

$$46 \times 8 = (40 + 6) \times 8 = (40 \times 8) + (6 \times 8) = 320 + 48 = 368$$

$27 \times 6 =$

$38 \times 5 =$

$58 \times 7 =$

$62 \times 9 =$

3. Find the missing number in each equation:

$$21 + 8 = 40 - \underline{\hspace{2cm}}$$

$$22 + 8 = 40 - \underline{\hspace{2cm}}$$

$$23 + 8 = 40 - \underline{\hspace{2cm}}$$

$$2 \times \underline{\hspace{2cm}} = 12 + 4$$

$$2 \times \underline{\hspace{2cm}} = 12 + 6$$

4. Try these number puzzles. Some are correct and some are not correct.

- Change the puzzles that are not correct so that they work.
- Explain how the correct puzzles work.

a) Think of a number.

Add 3.

Multiply by 2.

Subtract 6.

Divide by 2.

Your answer is your start number.

For example, I think of 7:

$$7 + 3 = 10$$

$$10 \times 2 = 20$$

$$20 - 6 = 14$$

$$14 \div 2 = 7$$

So this works for 7.

Does it work for other numbers?

b) Think of a number.

Add 3.

Multiply by 2.

Subtract 3.

Divide by 2.

Your answer is your start number.

c) Think of a number.

Multiply by 3.

Add 9.

Divide by 3.

Subtract 3.

Your answer is your start number.

d) Make up a number puzzle like the ones above.

Give your puzzle to your friends to try.

5 Multiplication and division

Connect

Your class wants to make smoothies to sell to the school.

The food you need to buy is:

SHOPPING LIST

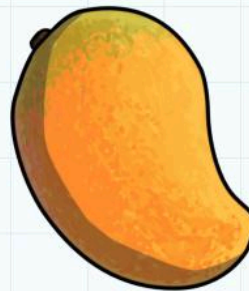
Mango cost:
\$1.70 per kilogram

Guava cost:
\$1.60 per kilogram

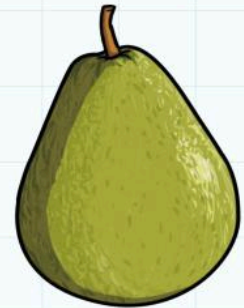
Banana cost:
\$1.20 per kilogram

Yoghurt cost:
\$0.75 a litre

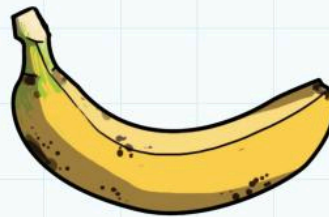
One bottle of smoothie uses:



500 g mango



250 g guava



250 g banana



200 ml yoghurt

1. How much does it cost to make 1 bottle of smoothie?

2. How much does it cost to make 20 bottles of smoothie?

3. How much does it cost to make 50 bottles of smoothie?

4. How much does it cost to make 100 bottles of smoothie?

5. You have \$50. How many bottles of smoothie can you make?

6. You want to make a small profit to buy some new equipment for school.
 - a) How much do you sell 1 bottle for?

 - b) You offer a discount for 25 bottles. How much do you sell 25 bottles for?

5 Multiplication and division

Review

1. Choose two different methods to divide 3824 by 16.
Under each calculation write an explanation of your method:

2. Choose two different methods to multiply 337 by 23.
Under each calculation write an explanation of your method:

3. Write down three different division questions with an answer ending in 0.6:



4. Write down three different division questions with an answer that has remainder 7:



6 Shapes and Geometry

Engage

I can see lots of different shapes.

What is the difference between **2D** and **3D**?

Is a diamond a **regular** shape?

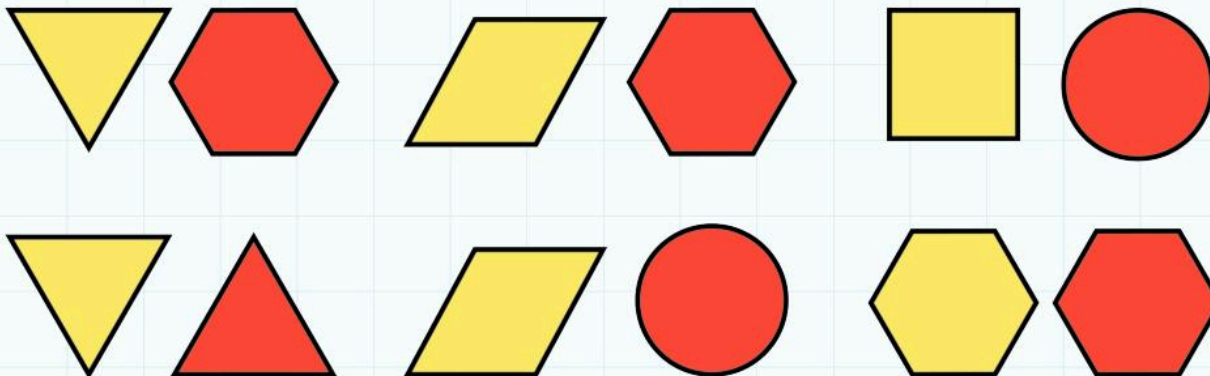
Are those shapes tessellating?

Can a **polygon** have a **curved** line?

6A Classifying polygons

Discover

I. Here are some pairs of shapes:

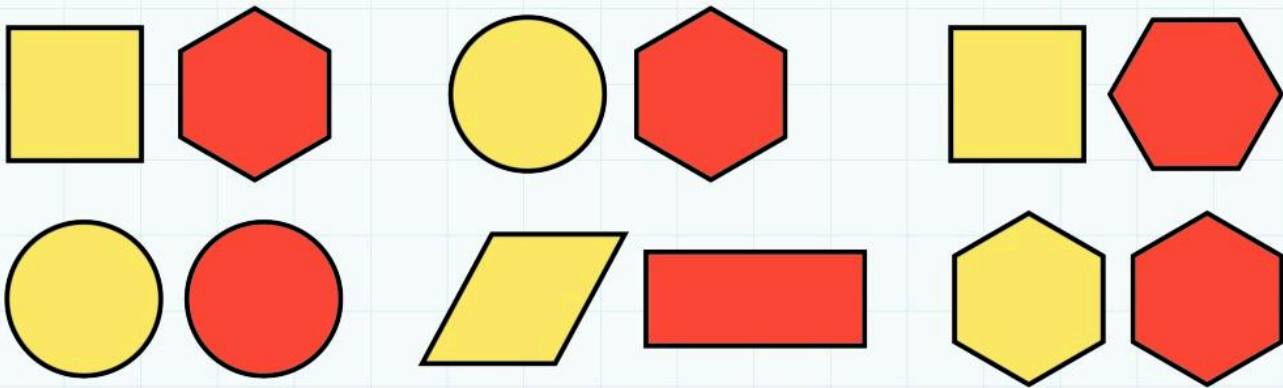


- Copy the shapes onto card and cut them out.
- Use one pair of shapes.
- Move one shape slowly on top of the other shape.
- Stop when the shape is half on top of the other shape.
- What shape is the covered part?
- What shape is the uncovered part?
- Sketch the shapes below and name them:

Repeat for the other pairs of shapes:

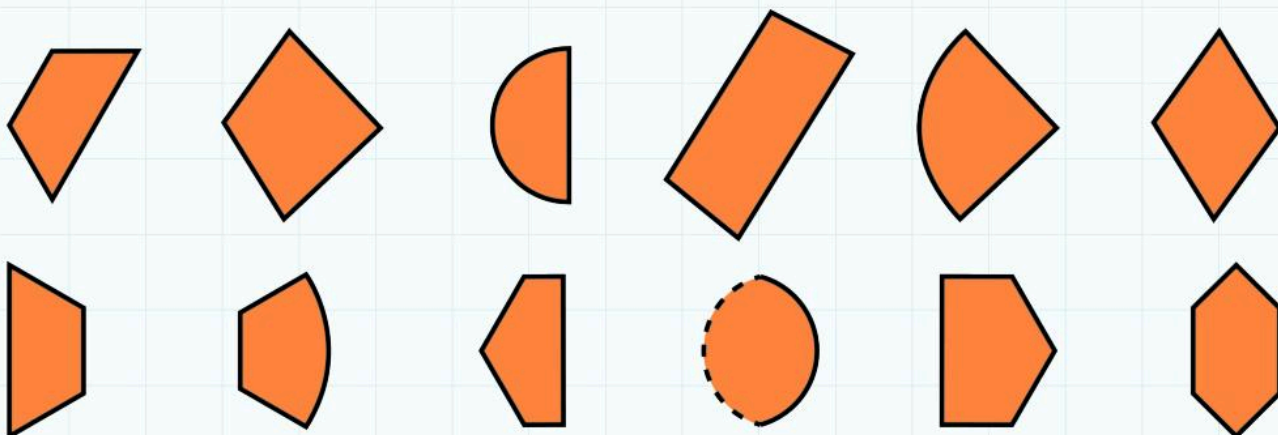
2. Repeat the exercise with these pairs of shapes.

What shapes are the uncovered/covers parts?



A large, empty white rectangular box with rounded corners, intended for students to write their answers to the exercise.

3. Circle and name the overlap shapes that you can find:



6A Classifying polygons

Explore

1. Draw a different **triangle** in each section of this table and write its name. Are there any sections with no possible triangle? Explain why.

	No right angles	One right angle
No sides equal		
Two sides equal		
Three sides equal		

2. Draw a different **polygon** in each section of this table and write its name:

	Regular	Irregular
Triangle		
Quadrilateral		
Pentagon		
Hexagon		

3. Draw a different polygon in each section of this table and write its name.

	No parallel sides	One pair of parallel sides	Two pairs of parallel sides
No equal sides			
One pair of equal sides			
Two pairs of equal sides			

4. Draw the correct shapes in the second column of this table.

- Write at least three properties for each shape:

Name of shape	Drawing	Properties
Circle		• • •
Equilateral triangle		• • •
Isosceles triangle		• • •
Scalene triangle		• • •

Name of shape	Drawing	Properties
Rectangle		• • •
Square		• • •
Kite		• • •
Parallelogram		• • •
Rhombus		• • •
Regular pentagon		• • •
Irregular hexagon		• • •
Regular octagon		• • •

5. Complete these sentences:

- Draw examples of the shapes.

A shape is a polygon if _____.

These shapes are polygons:



A shape is not a polygon if _____.

These shapes are not polygons:



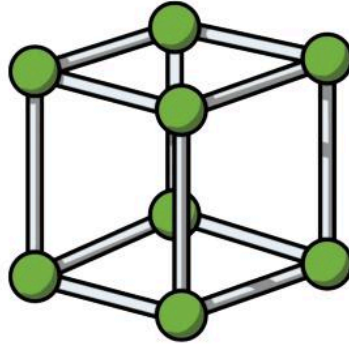
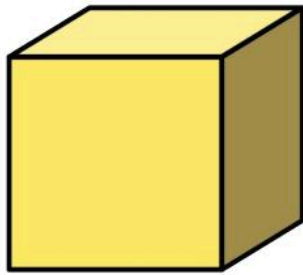
6B Properties of 3D shapes

Discover

You can use clay and straws to make models of 3D shapes.

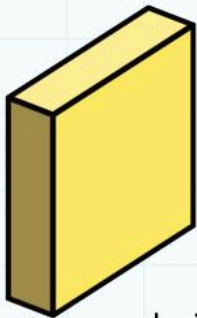
For example:

Here is a **cube** and its model:

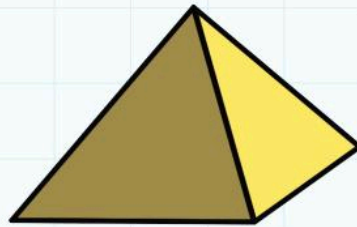


You need 8 balls of clay and 12 straws to make the model of the cube.

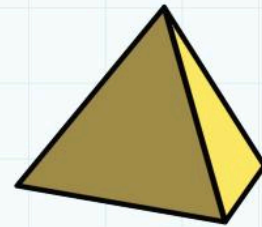
- Make models of these shapes:
How many balls of clay do you need for each shape?
How many straws do you need?



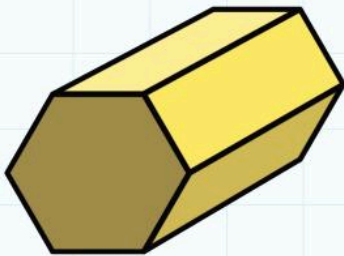
cuboid



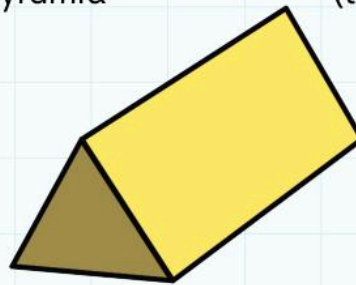
square pyramid



tetrahedron
(triangular pyramid)



hexagonal prism



triangular prism

- Write your answers in the table.
- Make three models of 3D shapes of your own.
- Add your shapes to the table.

Shape	Number of balls of clay	Number of straws
Cuboid		
Triangular prism		
Square-based pyramid		
Tetrahedron		
Hexagonal prism		

6B Properties of 3D shapes

Explore

I. Complete this table to show the properties of each 3D shape:

Can you find an example of each shape in your classroom or the local environment?

	Number of vertices	Number of edges	Number of faces	Example
Cube				
Cuboid				
Pyramid				
Sphere				
Hemisphere				
Cone				
Cylinder				
Prism				
Tetrahedron				
Octahedron				
Dodecahedron				

2. Draw three different cuboids:



3. Draw three different prisms:



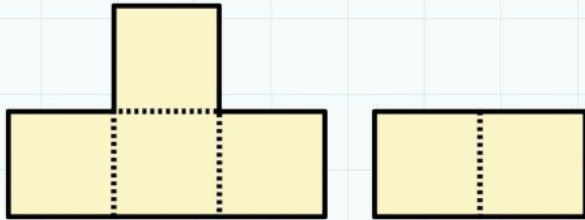
4. Draw three different cylinders:



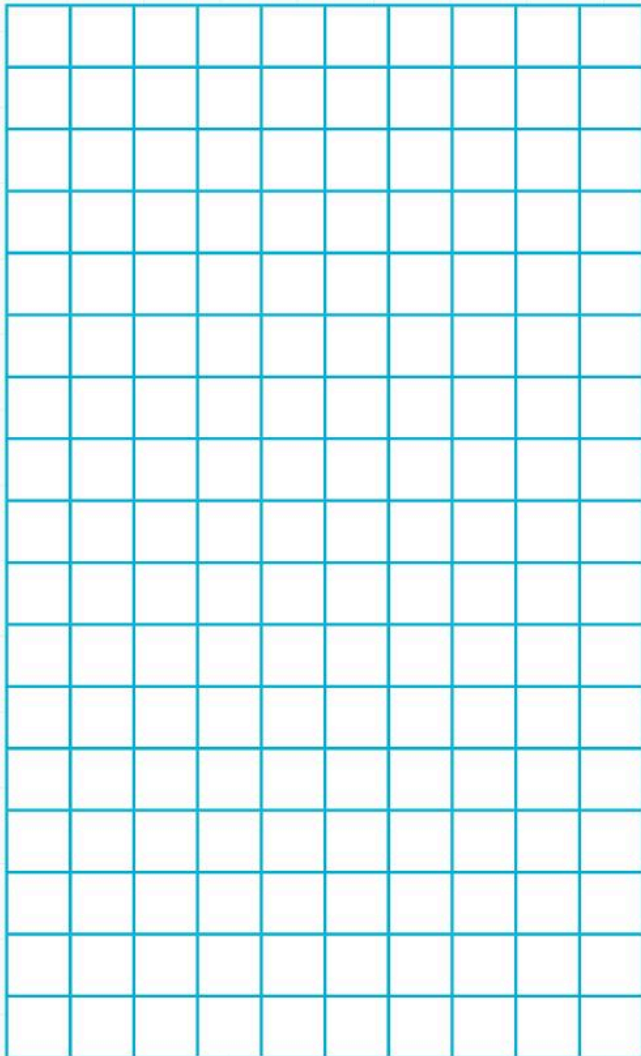
6C Making 2D representations of 3D shapes

Discover

1. This is the **net** of a cube cut into two parts:



- Make a copy of the two parts of the net on squared paper.
- Use the two parts to make the net of a cube.
- Draw three different ways:



2. Open your interesting-shaped box so that you can see the net.

- Draw the net:

3. Make a small-scale model of your box so that the length, width and height of the new box are exactly half the size of those of the original box.

- Sketch this net and write the dimensions:

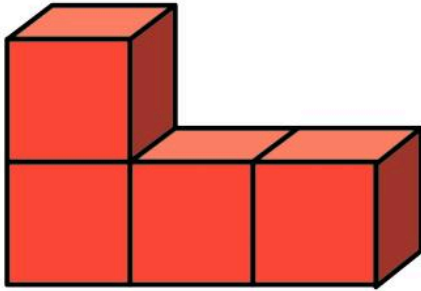
4. What do you notice about the volume of the new box compared with the original box?

6C Making 2D representations of 3D shapes

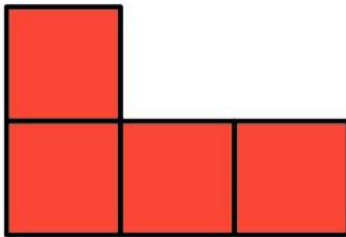
Explore

You can join four cubes together in lots of different ways.

For example:



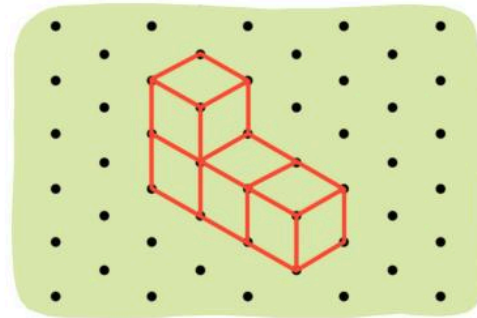
The front elevation is:



The side elevation is:



You can draw this arrangement on isometric paper like this:



The plan view is:

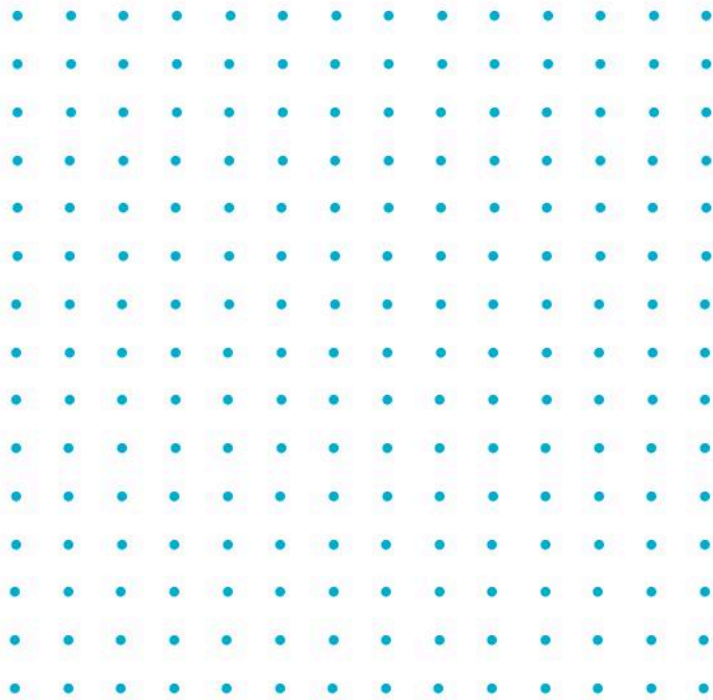


- Use five cubes to make three different models.
- Complete this table:

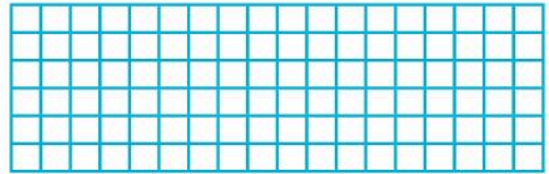
Model 1
• • • • • • • • • • • • • •
• • • • • • • • • • • • • •
• • • • • • • • • • • • • •
• • • • • • • • • • • • • •
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• • • • • • • • • • • • • •
• • • • • • • • • • • • • •

Plan
Front elevation
Side elevation

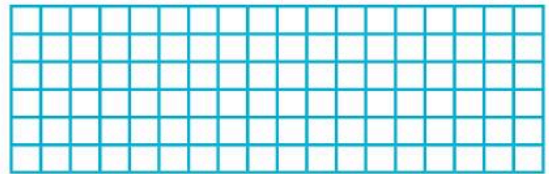
Model 2



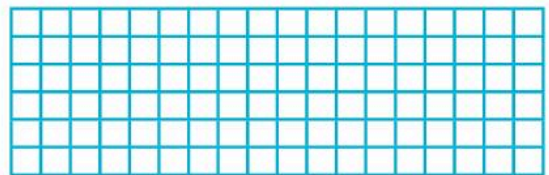
Plan



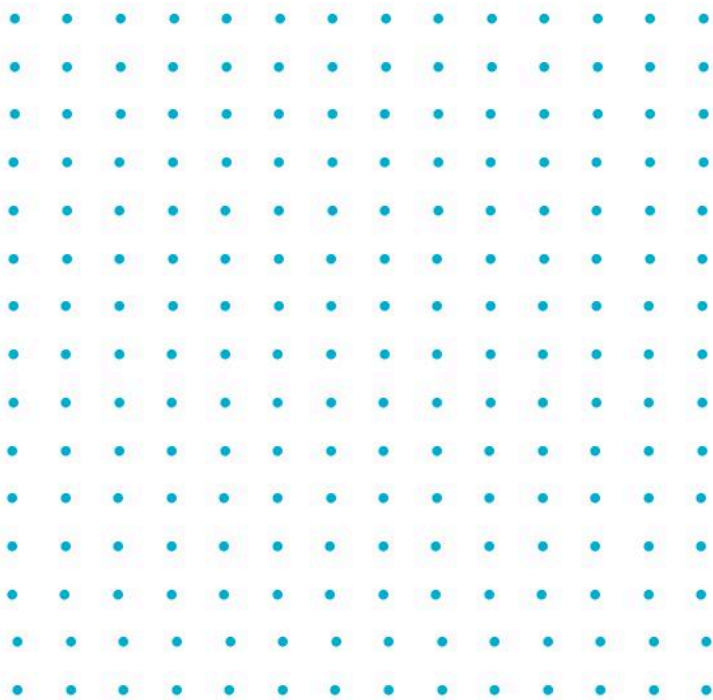
Front elevation



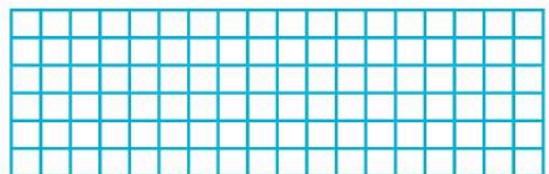
Side elevation



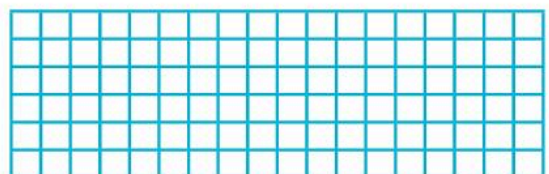
Model 3



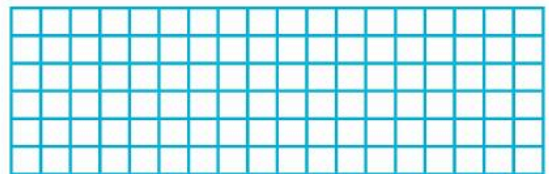
Plan



Front elevation



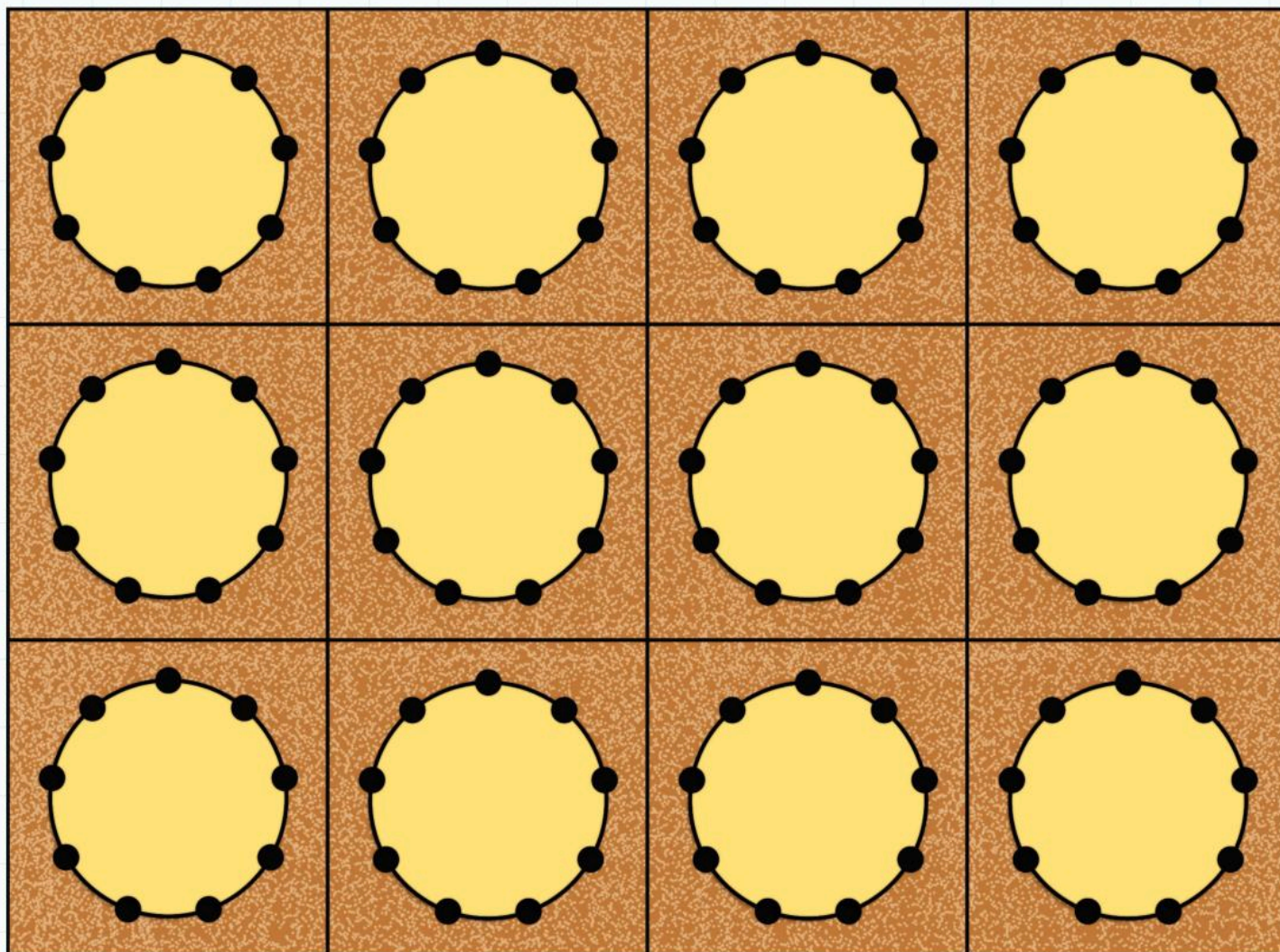
Side elevation



6D Drawing angles, and angles in a triangle

Discover

- Make triangles on your 9-peg circular pinboards.
- Draw your triangles on the pinboards below.
- Label the acute angles 'a'.
- Label the obtuse angles 'o'.
- Label the reflex angles 'r'.



6D Drawing angles, and angles in a triangle

Explore

1. Find three reflex angles, three acute angles and three obtuse angles in your classroom.
 - Measure your angles using your angle measurer and a protractor.
 - List your angles in ascending order in this table:

Type of angle	Location	Angle size

2. Find four different triangles in your classroom.
 - Measure the angles.
 - Use the angles to draw accurate sketches of your triangles:

6 Shapes and geometry

Connect



You want to design a new playground for the local kindergarten.

In your playground include: a balance beam, a climbing frame, swings and a hopscotch game.

Tasks:

1. Design the balance beam.

What is the best 3D shape to use for the balance beam?

Think about how to make the beam stable.

What angles will you use?

2. What shapes will you include in the climbing frame?
3. Design a hopscotch game.

Use at least three different 2D shapes.

4. Make a 3D model of the swings.

Think about how to make the swings stable.

What angles will you use?

5. Draw a sketch of the playground to illustrate your results:

6 Shapes and geometry

Review

- Find at least two 2D and two 3D shapes in your classroom.
- Draw them in the table below.
- Write clues so that your friends can guess what the objects are.

Photo or drawing of object	Clues
	1. 2. 3. 4. 5.
	1. 2. 3. 4. 5.
	1. 2. 3. 4. 5.
	1. 2. 3. 4. 5.
	1. 2. 3. 4. 5.

7 Position and Movement

Engage

Does this pattern have the same shape when it spins round?

There are lots of repeating patterns.

We can draw a cross through the middle of this pattern. This will help people to copy the pattern.



What sort of symmetry does the shape have?

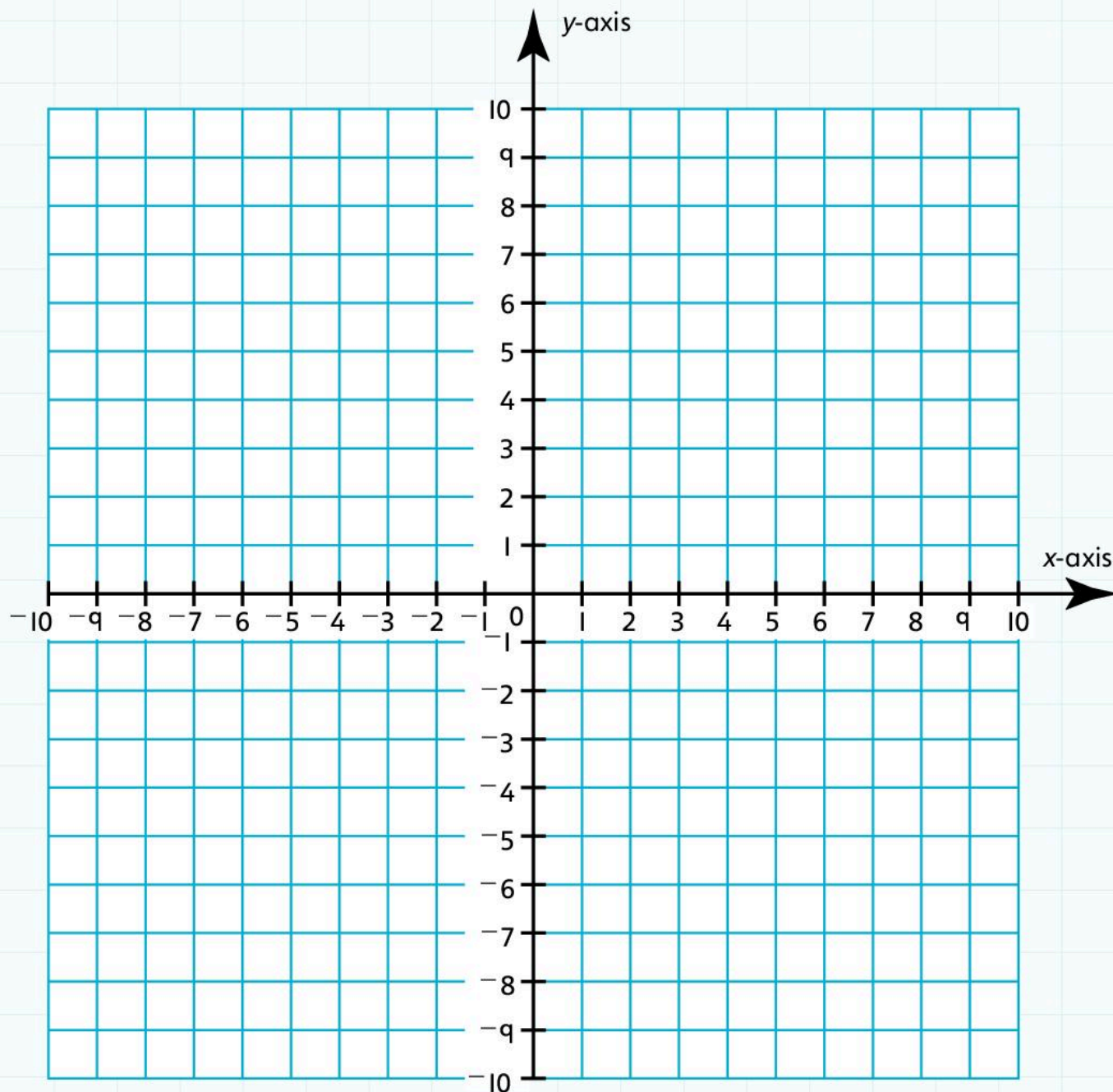
Which coordinate comes first?

What scale should we use?

7A Reading and plotting coordinates

Discover

- Draw a plan of your classroom on the **coordinate** grid below. How can you find the centre of the classroom?
- Place the centre of the classroom at the **origin** (0, 0).



- Write five statements about the position of people or objects in your classroom. In your statements use coordinates in all four **quadrants**.

For example:

Sohm is sitting at $(-3, 2)$.

The teacher's desk is at $(0, 5)$.

1.

2.

3.

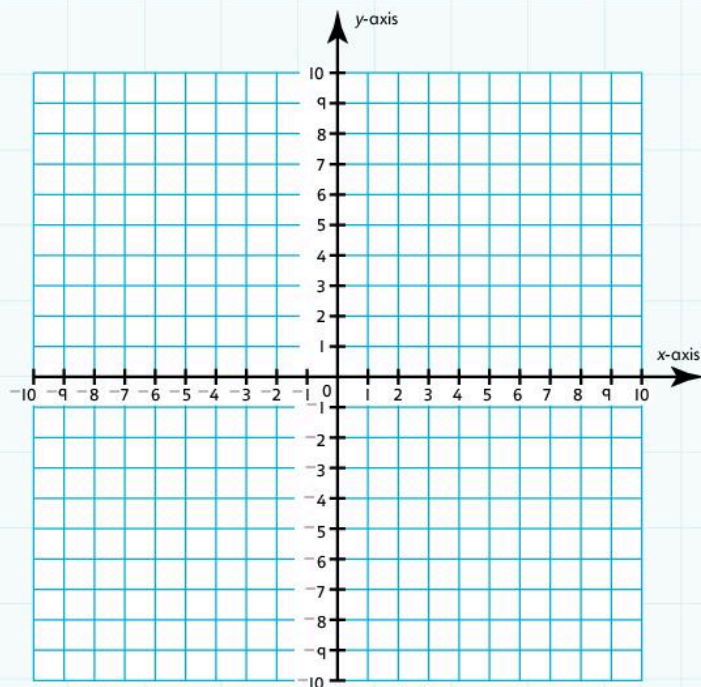
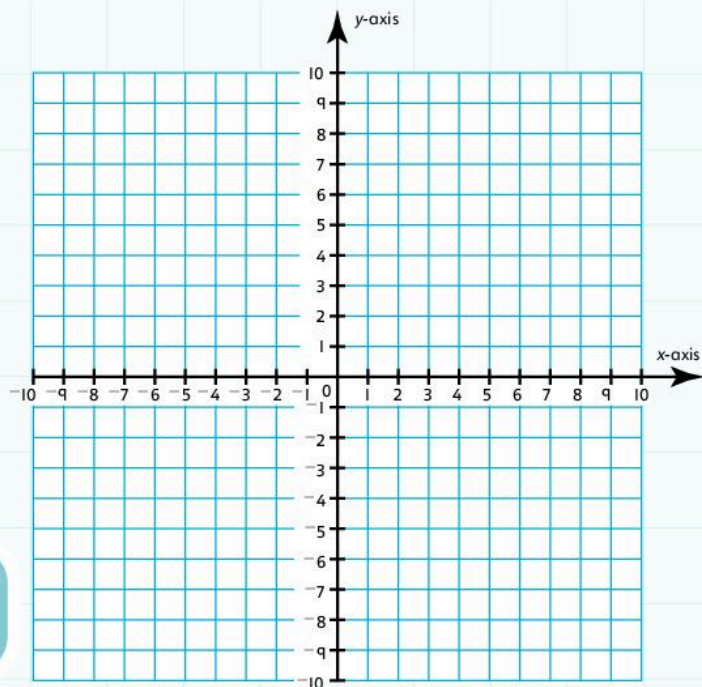
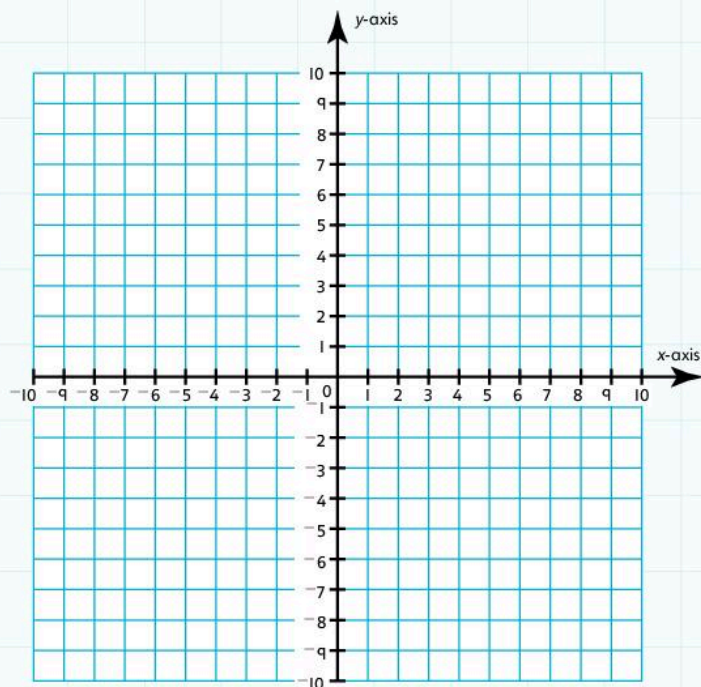
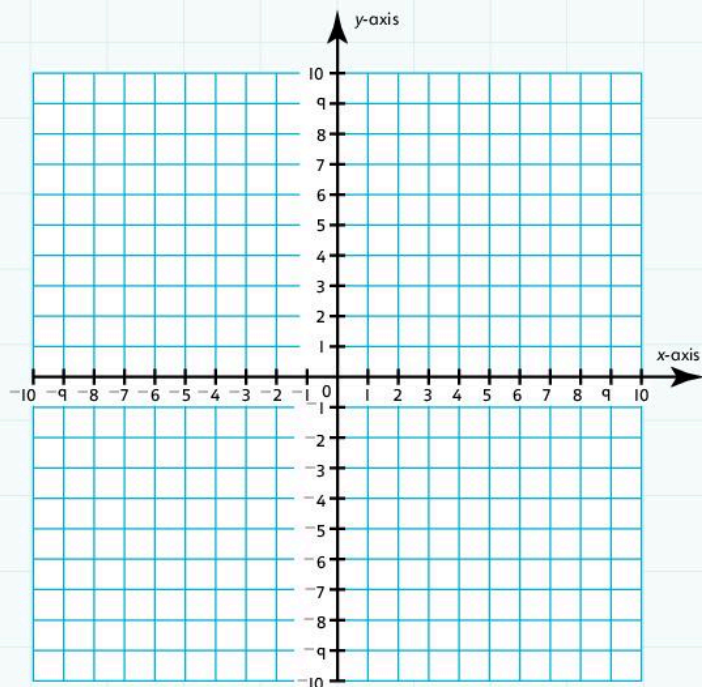
4.

5.

7A Reading and plotting coordinates

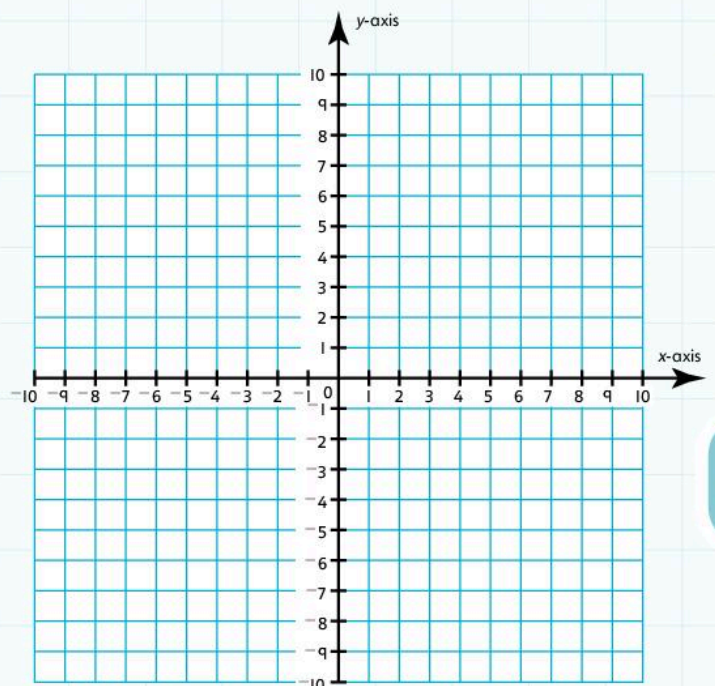
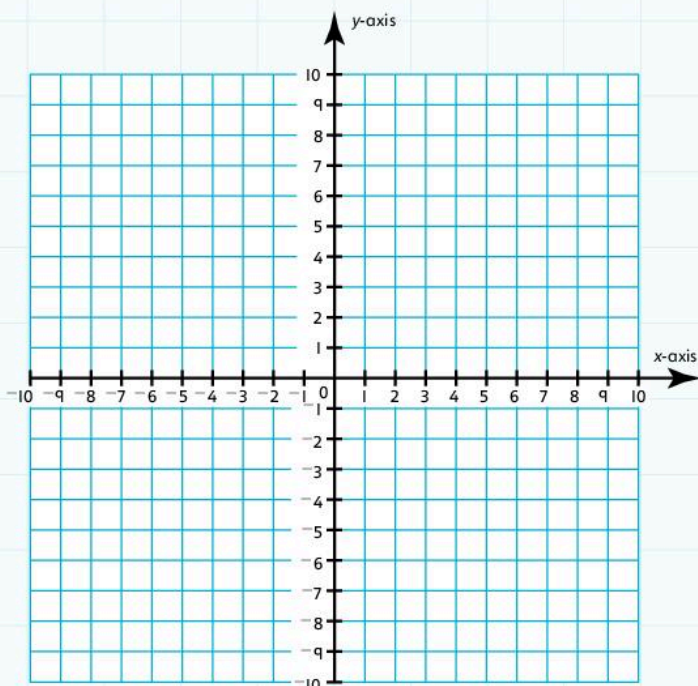
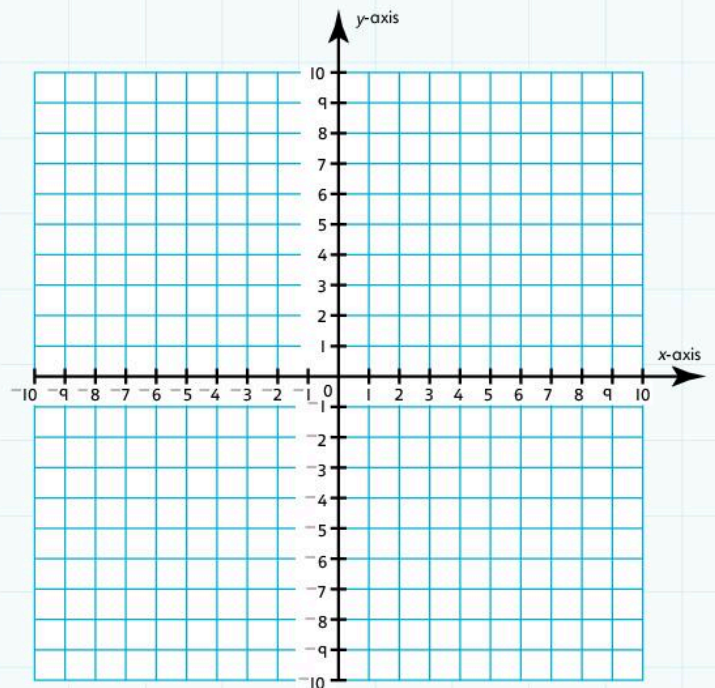
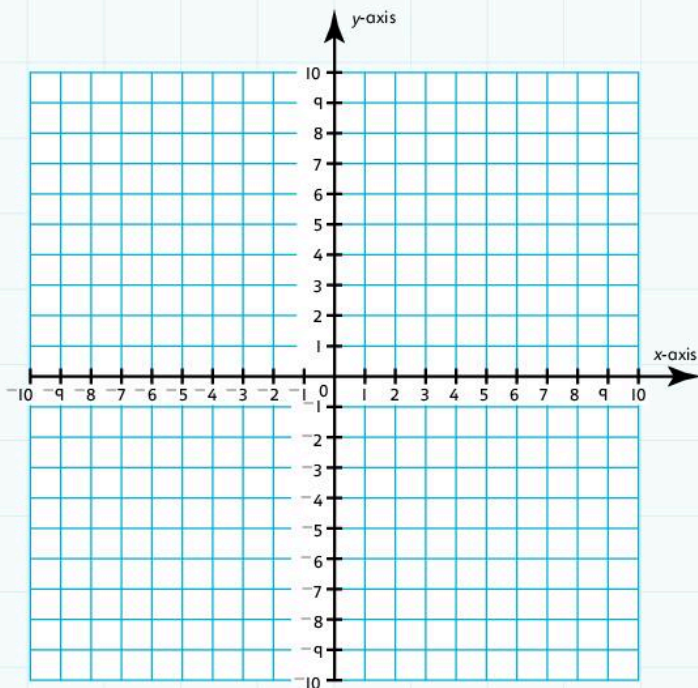
Explore

- I. Draw a different polygon in each grid so that each polygon has a **vertex** in each quadrant.
- Label the **vertices** with their coordinates.



2. Work with a partner.

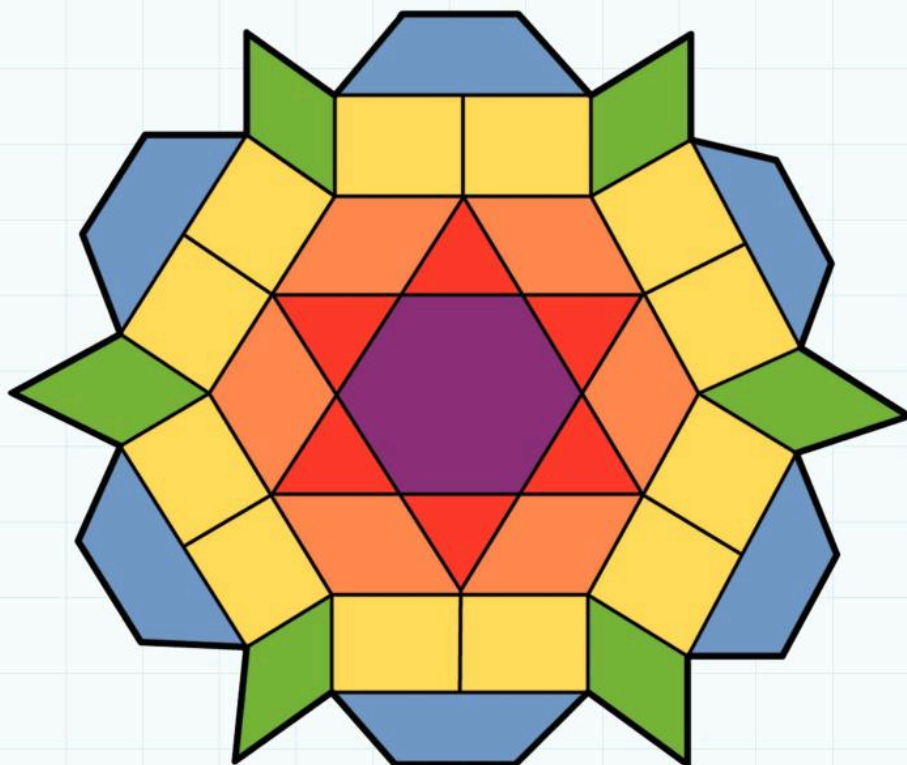
- Give your partner the coordinates for your shapes from question 1.
- Ask your partner to use the coordinates to draw the shapes in their grids.
- Ask your partner to write the name of the shape under each grid.
- Follow your partner's instructions to draw shapes on the grids below.



7B Reflections and rotations

Discover

Look at this piece of art:



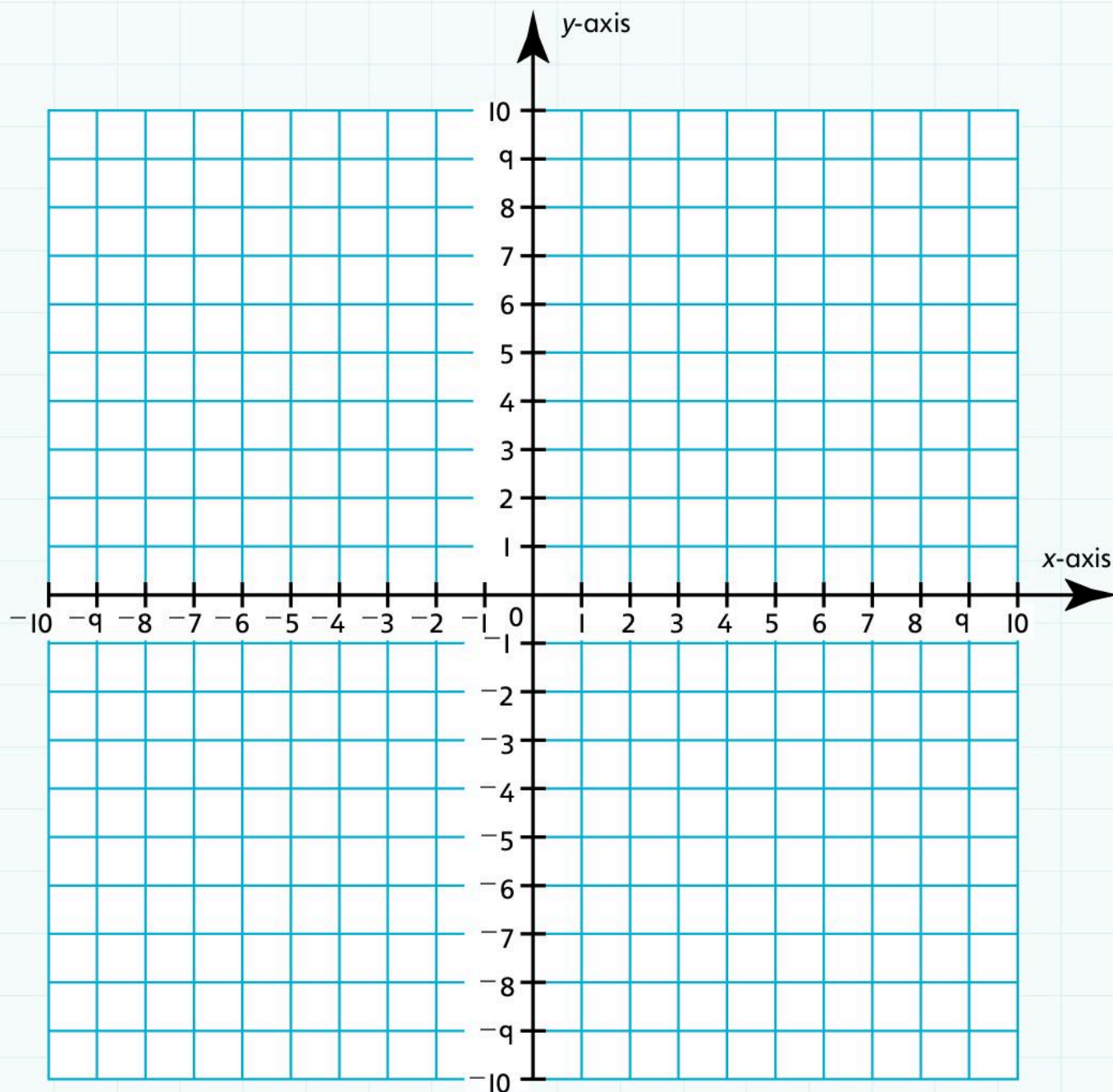
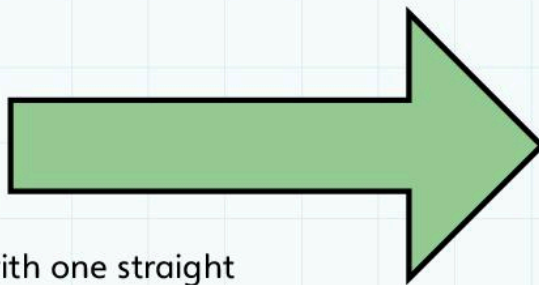
- Write down all the **reflections**, **rotations** or **translations** that you can see:

- Make a piece of art.
Include shapes that are **reflected, translated** and **rotated**.

7B Reflections and rotations

Explore

- Draw a simple shape on a piece of card. For example:
- Cut your shape out.
- Place your shape on the grid, with one straight edge against the y-axis:



- Write down the coordinates of each vertex:

1.	2.	3.
4.	5.	6.
7.	8.	9.

1. Slide the shape across the grid to a new position:
Write down the new coordinates of each vertex:

1.	2.	3.
4.	5.	6.
7.	8.	9.

2. Rotate the original shape clockwise through 90° about one vertex:
Write down the new coordinates:

1.	2.	3.
4.	5.	6.
7.	8.	9.

3. Reflect the original shape about the x-axis:
Write down the new coordinates:

1.	2.	3.
4.	5.	6.
7.	8.	9.

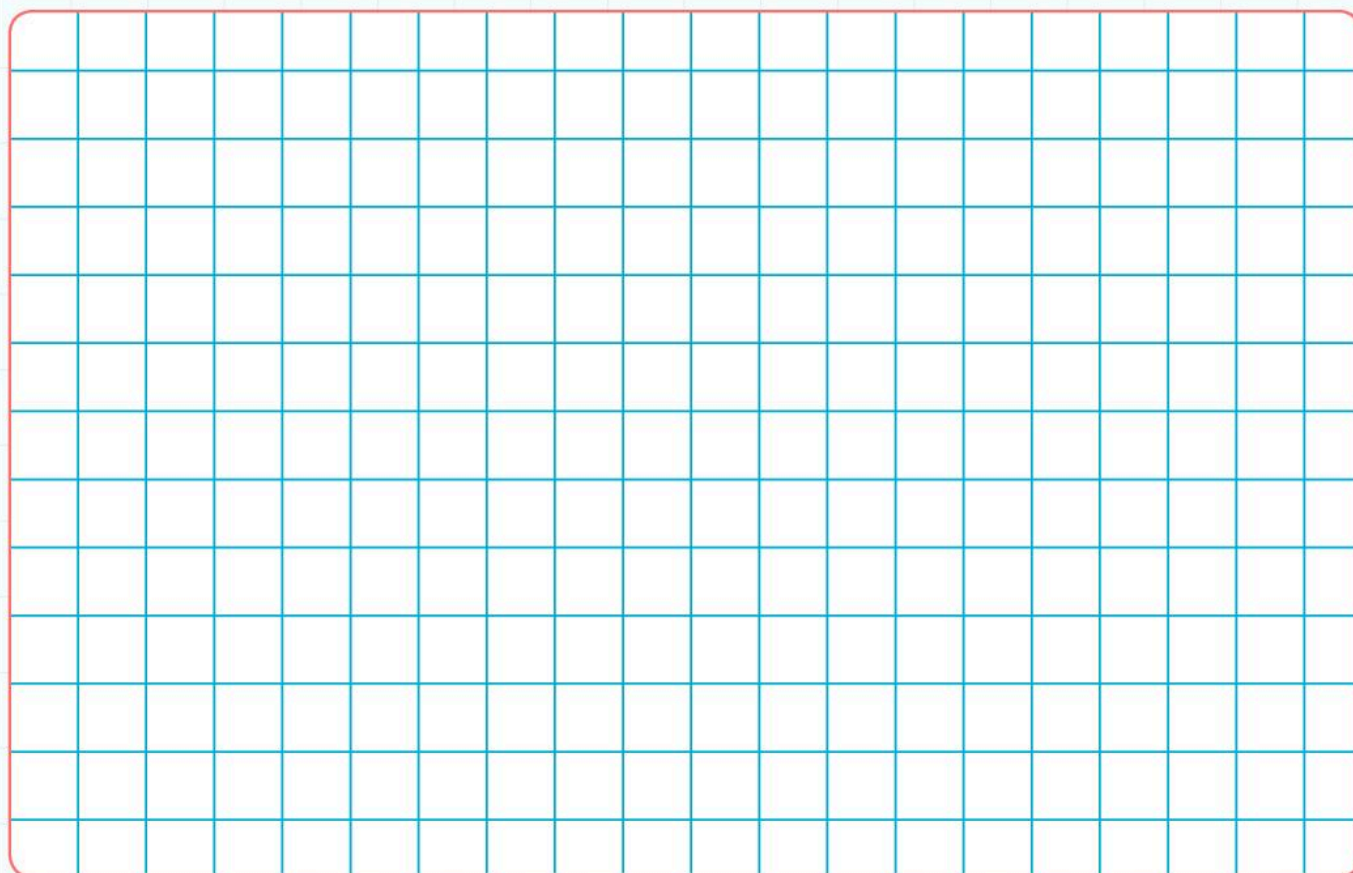
7 Position and movement

Connect

Look at the logos below:



- Design a logo for your school.
- Use repeated simple shapes.
- Draw your logo on the grid below so that it is easy to reproduce:



7 Position and movement

Review

- Design a poster to explain all the important terms from this Unit. You and your friends can use this poster to remember these terms.
- Include images to illustrate the meanings of the following terms:

origin

coordinates

quadrants

line of symmetry

axis of symmetry

mirror line

reflection

translation

rotation

clockwise

anti-clockwise

8 Length, Mass and Capacity

Engage



You don't need to measure accurately.

I think everyone uses measurement at work.

Did you measure something yesterday?

8A Selecting and using appropriate units of measure

Discover

I. Complete this table.

Write down objects that you can use these units to measure:

Unit	Object
kilometre	
metre	
centimetre	
millimetre	
tonne	
kilogram	
gram	
milligram	
litre	
centilitre	
millilitre	

2. Sometimes we use different units of measure called 'Imperial units'.

(Miles)

In the USA they use miles to measure distance.

A kilometre is $\frac{5}{8}$ of a mile.

Write similar sentences which include the following units:

a) **(Feet)**

b) **(Inches)**

c) **(Pounds)**

d) **(Ounces)**

e) **(Pints)**

3. In a group, choose an animal and find out facts about it.

- Prepare a presentation.
- Include the following information:

The animal **weighs**...



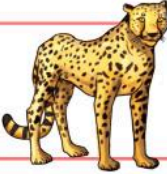




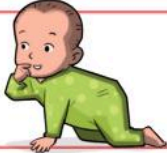

The animal has a **length** of...

The animal can run/fly/swim at a speed of...

8A Selecting and using appropriate units of measure

Explore

1. Draw a line to connect each description to the correct measurement on the right.

Tallest building: Burj Khalifa		65 km per hour
Smallest animal: Kitti's hog-nosed bat		6650 km
Fastest animal: cheetah		149 600 000 km
Longest river: the Nile		830 m high
Distance from the Earth to the sun		3.4 kg
Tallest human: Robert Wadlow		3 cm long
Weight of a blue whale		5 ml
Weight of an egg		1 litre
Weight of a cubic centimetre of sand		53 g
Weight of an average baby		190 tonnes
Capacity of a large carton of fruit juice		2.6 g
Capacity of a teaspoon		2.34 m

2. Write a sentence for each fact.
Include a comparison.

The height of Burj Khalifa is about the same distance as two laps round an athletics track.

A baby weighs about the same as **1000** cubic centimetres of sand.

8B Converting units of measurement

Discover

- Work in pairs.
- Convert the **units of measure** and complete the tables.
- Find an object, or think of an object, as an example for each measurement.

1. Length

Metres	Centimetres	Millimetres	Object
		1 mm	
		10 mm	
		34.5 mm	
	50.7 cm		
	75 cm		
0.855 m			
10.3 m			
150 m			

2. Capacity

Litres	Centilitres	Millilitres	Object
		3.2 ml	
		8 ml	
		57.8 ml	
	25.9 cl		
	68.7 cl		
0.55 litres			
15.2 litres			
50 litres			

3. Weight

Kilograms	Grams	Milligrams	Object
	0.5 g		
	0.85g		
		220 mg	
		325 mg	
0.050 kg			
0.750 kg			
22.5 kg			
175.5 kg			

What did you notice about converting between units?

I noticed that when you convert from _____ to _____ you _____.

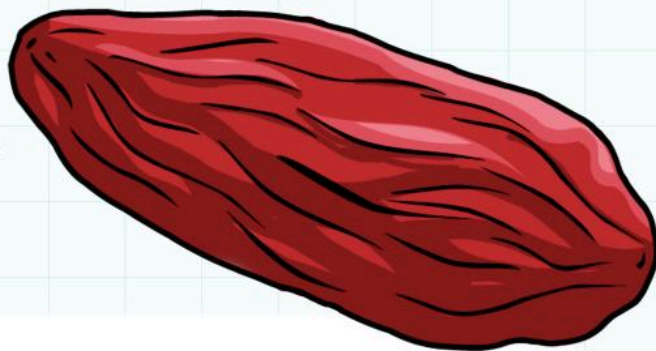
8B Converting units of measurement

Explore

1. The width of a currant is approximately 3 mm.
How many currants can you fit on the length of:

a) your desk _____

b) your classroom _____



2. 100 g of uncooked lentils contains 25 g of protein.

How much do you weigh (in grams)?

How much protein does your bodyweight
of lentils contain?



3. A can of fizzy drink has a capacity of 25 centilitres.
A **gallon** is approximately 4.5 litres

How many cans of fizzy drink fill a jug with a
capacity of 1 gallon?



4. Which coin has the highest value in your currency? _____

How much does that coin weigh? _____

How much do you weigh? _____

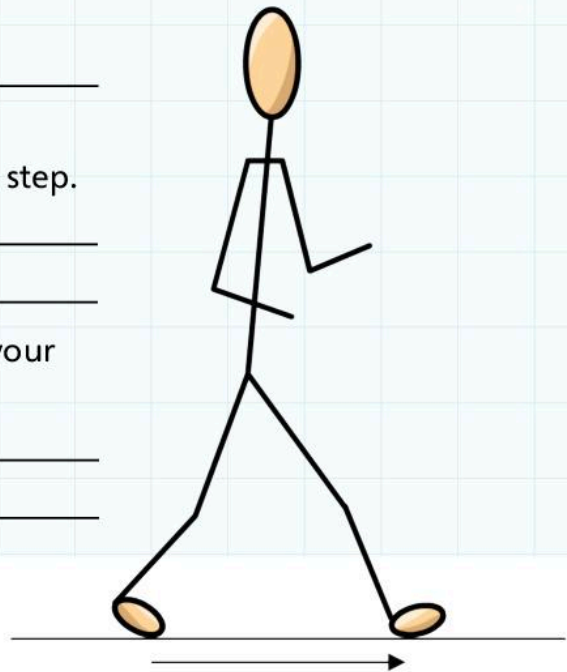
What is the value of your bodyweight in these coins? _____



5. What is the distance between your home and the school? _____

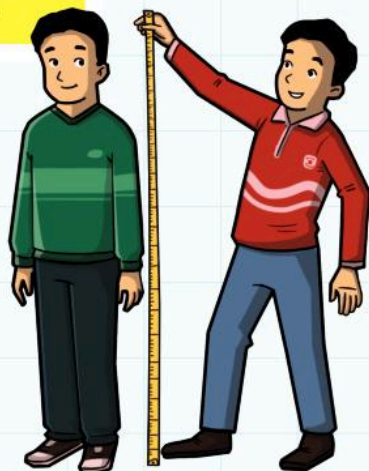
- Measure the length of your stride.
Your stride is the distance you travel in one step.

How many strides would it take to walk from your home to your school?

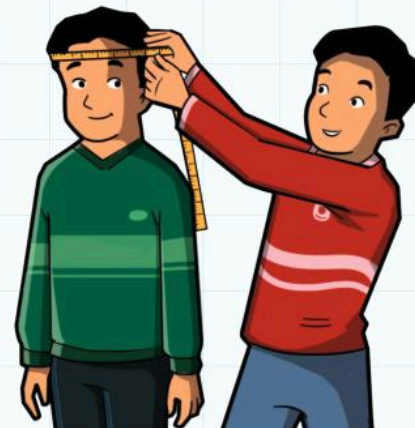


8C Using scales and constructing accurately using measures

Discover



I think that my height is 4 times the circumference of my head.



Is this true?

- Use this table to record your measurements:

Height	Circumference of head	Height ÷ circumference of head

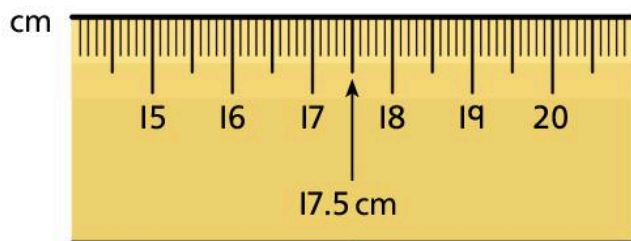
I discovered that your height is approximately times the circumference of your head.

8C Using scales and constructing accurately using measures

Explore

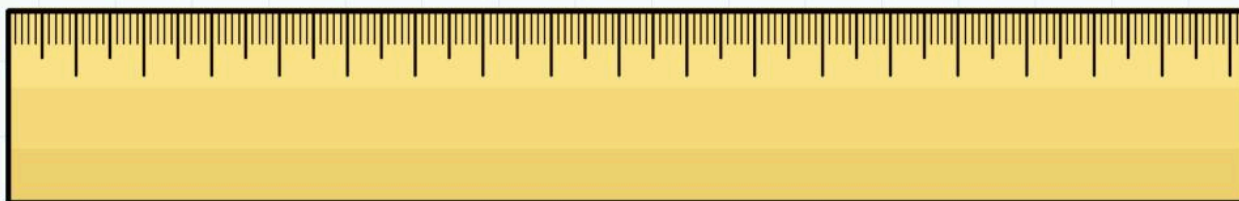
I.

This ruler shows 17.5 cm:

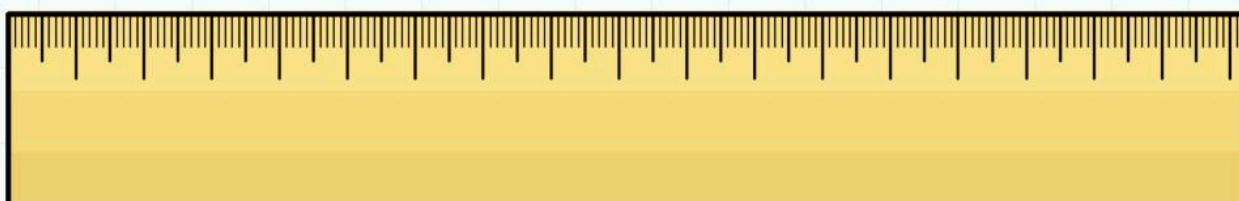


- Mark each of these rulers to show the measurement:

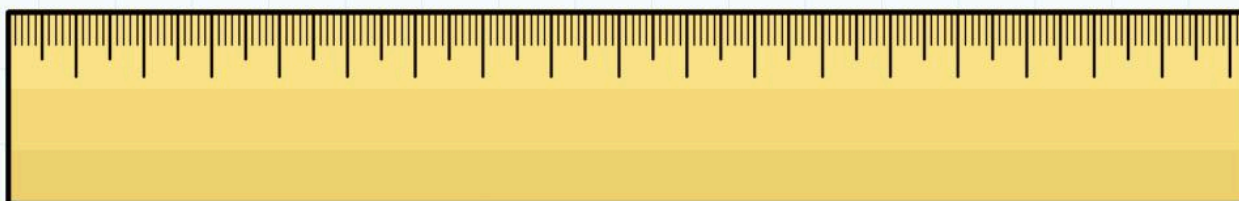
a) 28 cm



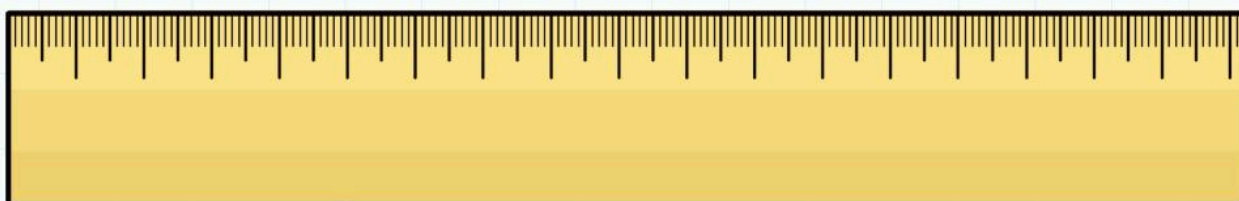
b) 4.5 cm



c) 0.5 cm

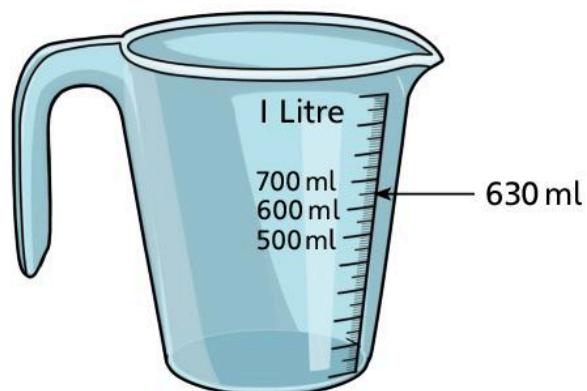


d) 11.5 cm



2.

This measuring jug shows 630 ml:

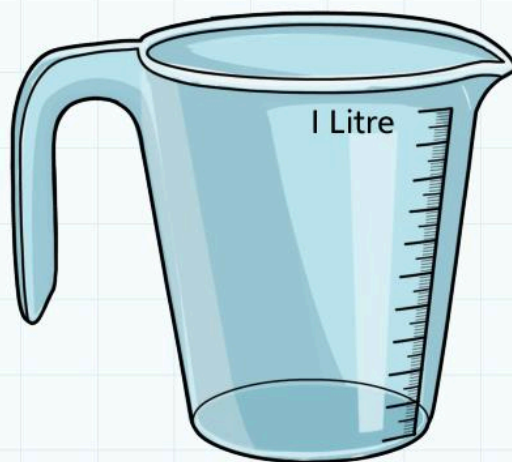


- Mark each of these measuring jugs to show the measure:

a) 170 ml



c) 35 ml



b) 890 ml

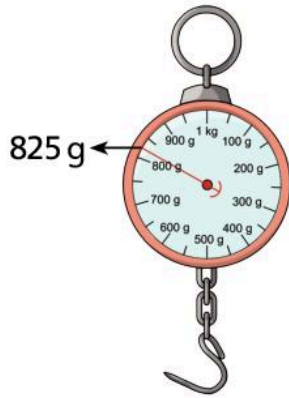


d) 250 ml



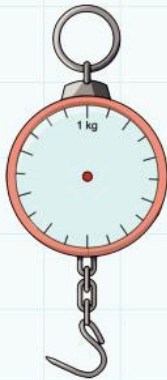
3.

This scale shows 825 g:

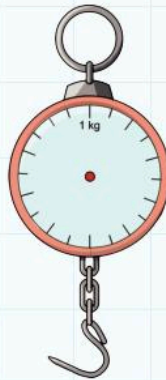


• Mark these scales to show the weights:

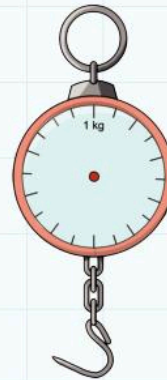
a) 950 g



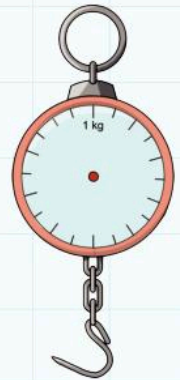
b) 15 g



c) 520 g



d) 430 g



4. Draw lines next to these measurements:

Draw your lines accurate **to the nearest millimetre**.

a) 10.7 cm

b) 5.3 cm

c) 1.2 cm

d) 15.8 cm

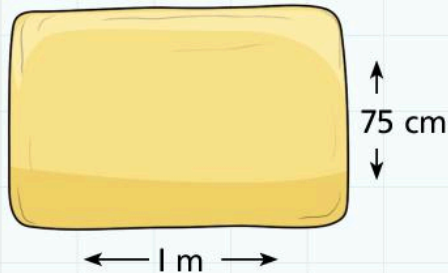
e) 12.5 cm

8 Length, mass and capacity

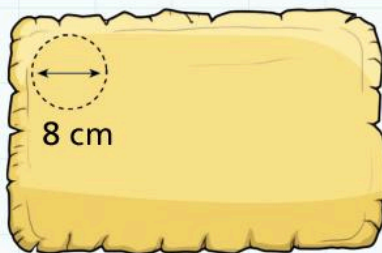
Connect



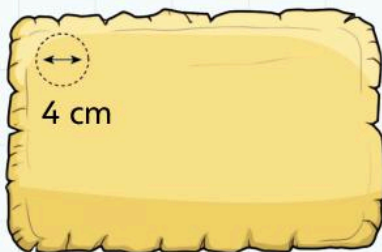
You are working for a pie-making company.
The pastry rolling machine rolls out rectangles of pastry that measure 1 m by 75 cm.



The circular base of a pie has a diameter of 8 cm.

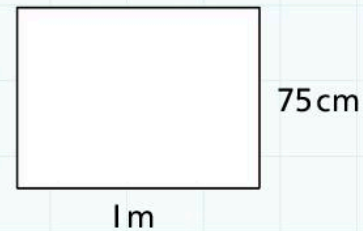


The circular top of a pie has a diameter of 4 cm.



How can you cut the pastry to make the maximum number of pies?

Draw a diagram to show your solution:



A pie contains 25 ml of filling.

The filling is sold in jars of 250 ml.

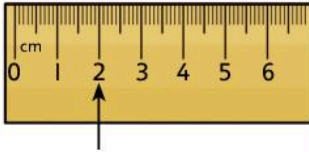

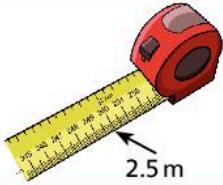




How much filling do you need to fill all of the pies you make?

How many jars of filling do you need to buy? _____

8 Length, mass and capacity

Review

- Colour the boxes with matching measures in the same colour.
- Fill in the empty boxes with two new sets of matching measures.

2.5m	$\frac{7}{10}$ litre	2.4 kg	
0.6 kg		$\frac{1}{4}$ litre	$2\frac{1}{2}$ m
250 ml	0.015 litre	600 000 mg	
		0.02 m	700 ml
0.7 litre		1.5 cl	0.25 litre
2400 g		$2\frac{2}{5}$ kg	250 cm
2 cm	600 g		
15 ml			20 mm

9 Time

Engage

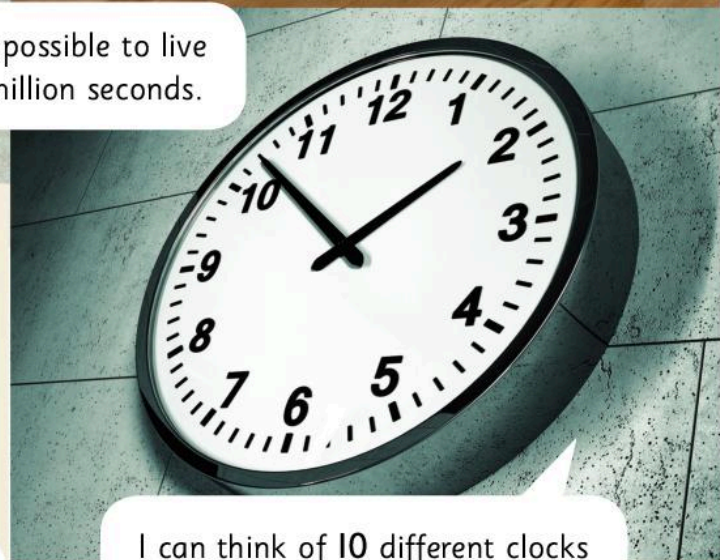
I sleep for 8 hours a night. How many hours will I sleep for in my whole life?



It is impossible to live for a million seconds.



I can think of 10 different clocks or timers I see in a normal day.



It is always night-time somewhere in the world.



How many hours will I spend in school in total?

How many minutes have there been so far this year?



August 2013

	monday	tuesday	wednesday	thursday	friday	saturday	sunday
07				1	2	3	4
08	5	6	7	8	9	10	11
09	12	13	14	15	16	17	18
10	19	20	21	22	23	24	25
11	26	27	28	29	30	31	

9A Converting between units of time

Discover

I. On a digital 24-hour clock, at certain times, all the digits are consecutive.



The same times shown on an analogue clock:



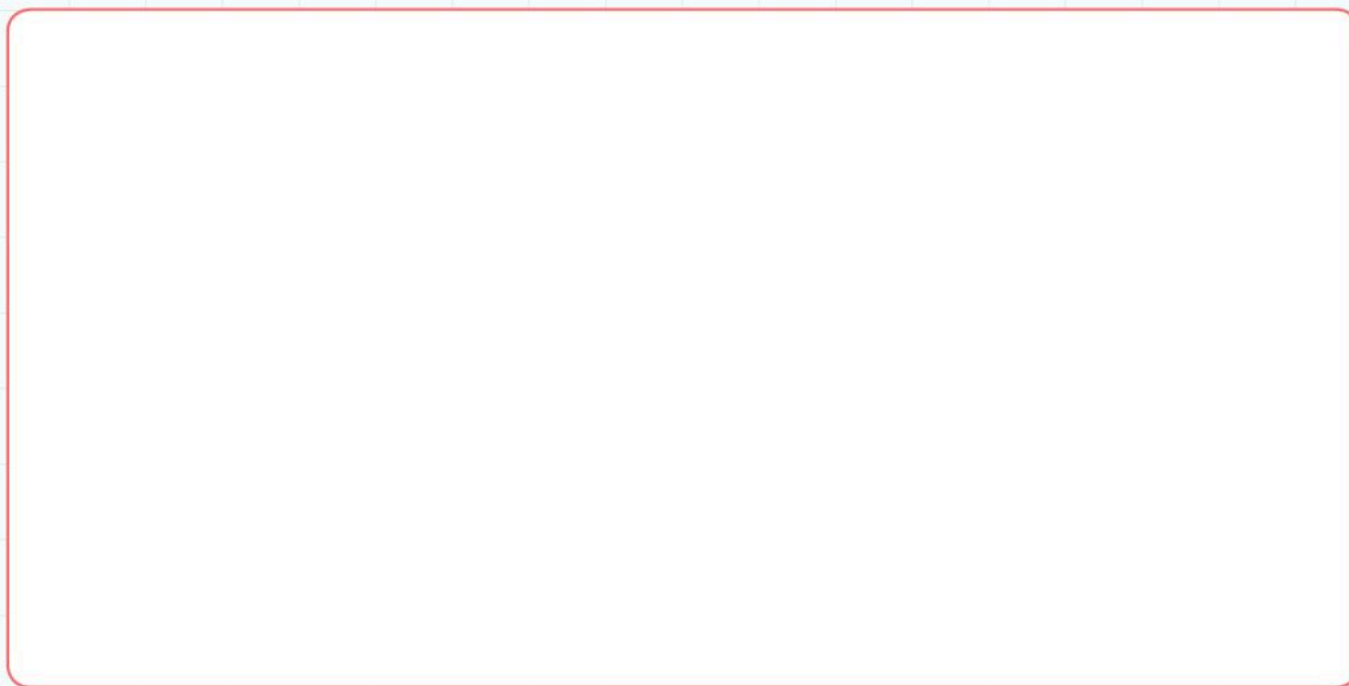
How many times like this are there between:

a) 23:00 and 05:00? _____

- Record your answers as **analogue times** and **digital times**:

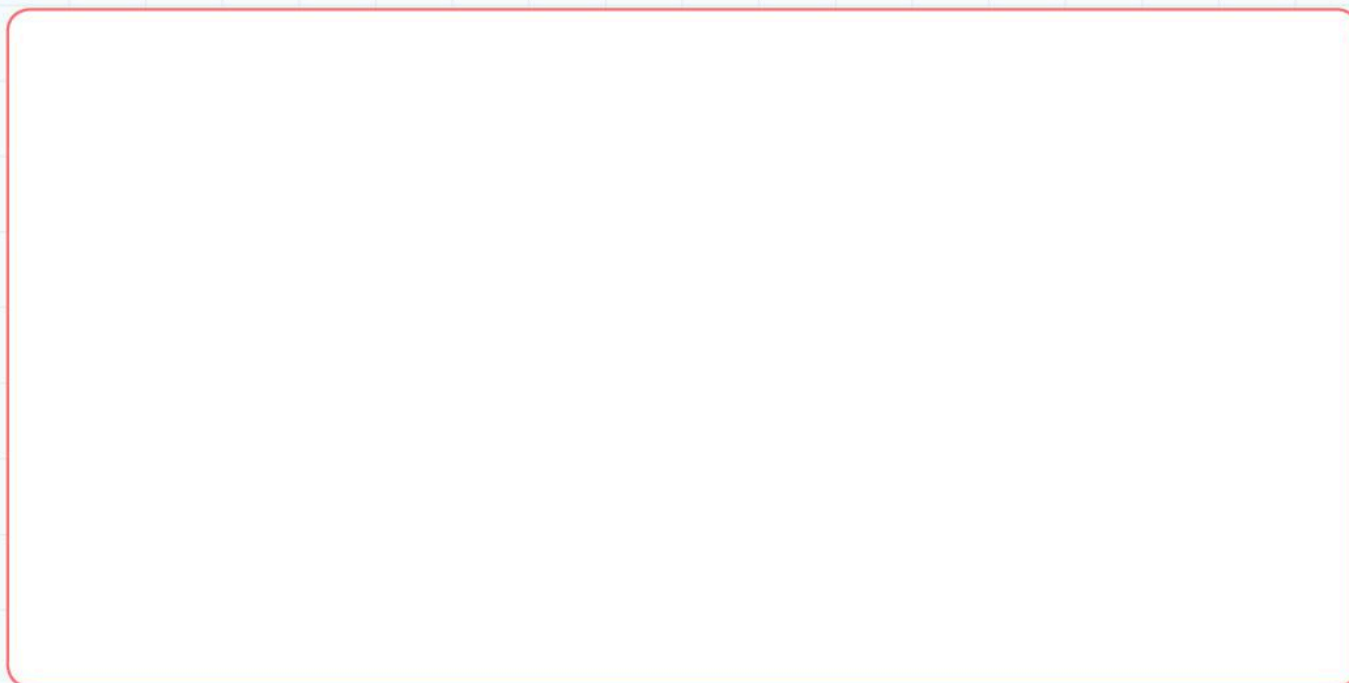
b) 09:00 and 13:00? _____

- Record your answers as analogue times and digital times:



c) **midday** and **midnight**?

- Record your answers as analogue times and digital times:



9A Converting between units of time

Explore

1. Complete this table:

Number of centuries in a millennium	
Number of decades in a century	
Number of years in a decade	10
Number of months in a year	
Number of weeks in a year	
Number of days in a week	7
Number of hours in a day	
Number of minutes in an hour	
Number of seconds in a minute	
Number of milliseconds in a second	

• Use the information in the table to answer these questions:

2. How many days old are you?

3. How many seconds have there been in this year so far?

4. How many milliseconds are there in a maths lesson?

5. Pick 3 different historical events. How many decades ago did they happen?

6. It is 2014 seconds after the start of 2014. What day is it? What time is it?

7. Find a friend who is younger than you. How many days older than them are you?

8. What date is 1 million days after the start of this millennium?

9. How many weeks are there in this century?

9B Using the 24-hour clock and timetables

Discover

- Complete these **timetables**.
- Use the **24-hour clock**.
- Use each timetable to write down five facts.

For example: Lunchtime is from 12:30 to 13:30.

1. A school day

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

2. A holiday

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

3. A school trip

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

9B Using the 24-hour clock and timetables

Explore

You are the manager of a bus company.

You need to design a route for buses to bring students to your school and take them home.

There is also a community centre at your school.

The community centre offers classes that start at 11:00 and 13:00.

The last bus leaves the bus station at 19:30.

1. Draw a map below to show the route the bus will take.

On your map include:

- six different bus stops including the school and the bus station
- the time taken between each stop
- a circular route.

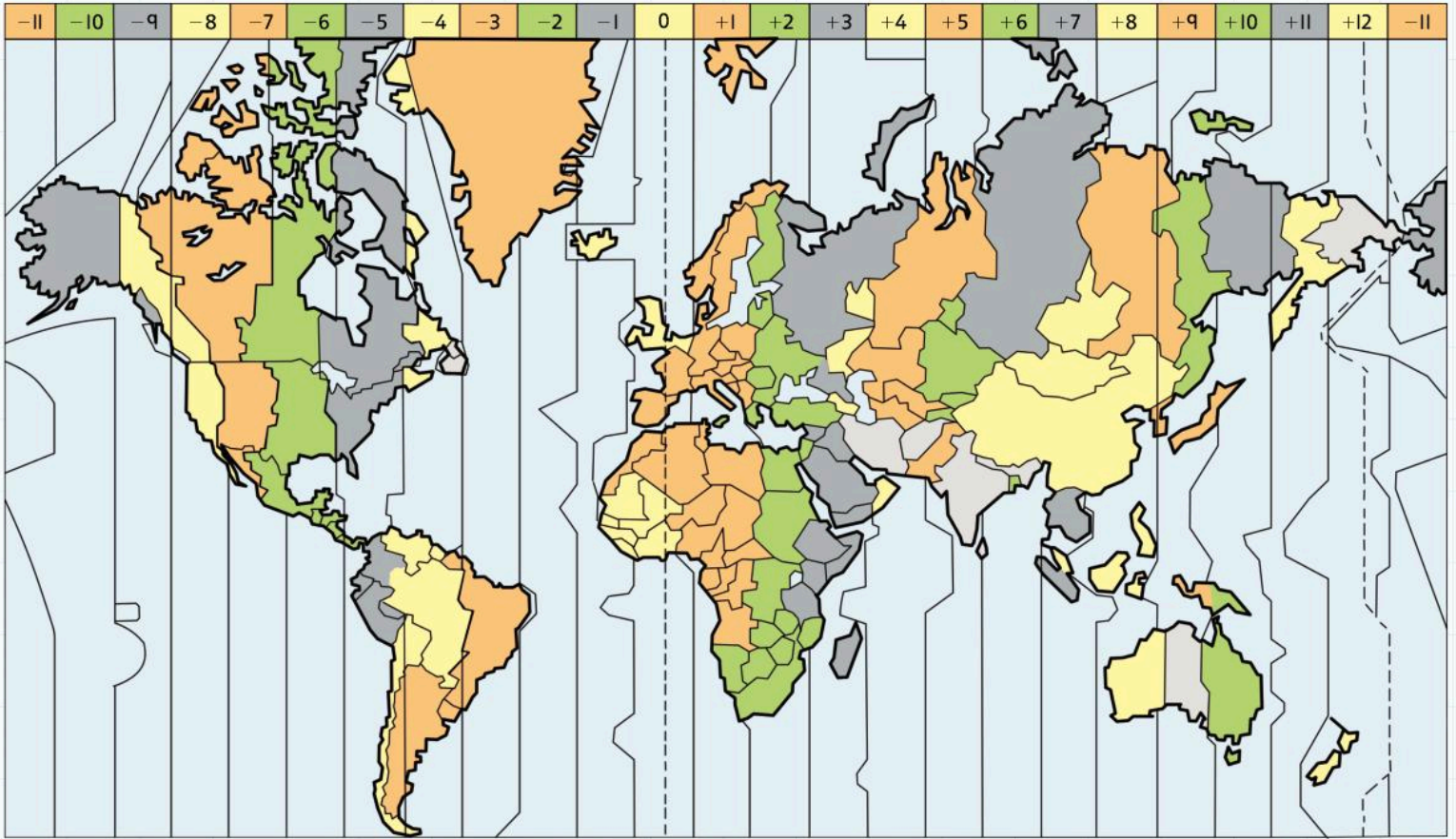
2. Now complete this timetable for the journeys:
Your buses leave at 10 different times.

Bus Station										
Stop 1										
Stop 2										
Stop 3										
Stop 4										
Stop 5										
Bus Station										

9C Calculating time intervals including time zones

Discover

- Look at this map of **international time zones** around the world:



- Use this map to write down ten facts:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

9C Calculating time intervals including time zones

Explore

- What is the best time to telephone your friend in Australia?

- Your friend in California goes to bed at 22:20. What time is this where you live?

- You come home from school at 16:00. What time is this for your friend in the UK?

- Will your friend in Argentina celebrate New Year before or after you? _____
By how many hours?

- Your class is twinned with a class in Madagascar.
When is the best time to have a Skype conversation?

- a) Complete this table to show the times in different cities of the world.
b) Add two cities that you would like to visit.

Home	00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00	16:00	18:00	20:00	22:00
New York												
Tokyo												
Sydney												
Cape Town												
Bangkok												

- c) You fly from New York to Tokyo.
The flight takes 14 hours.
It **departs** at 09:30.
What time (local time) do you **arrive** in Tokyo?

- d) You fly from Cape Town to Sydney.
It takes 13 hours 45 minutes.
You depart at 22:30.
What time (local time) do you arrive in Sydney?

- e) You fly from Sydney to Bangkok.
The flight takes 9 hours 15 minutes.
You depart from Sydney at 13:15.
What time (local time) do you arrive in Bangkok?

9 Time

Connect

You are planning a school trip to an island.
You cannot reach the island when the tide is high.
You cannot depart from school until 08:30.
You must be back at school by 19:30.
The journey to the coast takes 45 minutes.
You want to spend at least 4 hours on the island.
You have four possible dates to choose from for the trip.
This timetable shows the times when the tide is high:

5 July	08:00–10:00	15:00–17:00
12 July	10:00–12:00	17:00–19:00
19 July	12:00–14:00	19:00–21:00
26 July	14:00–16:00	21:00–23:00

1. How long can you spend on the island on each of these days?

2. Which is the best day for your school trip? _____

- Write the timetable below.

3. Why is this the best day for the trip?

Review

- Write five questions to test your friends on what they have learned during this Unit.
- Include a solution for each method and illustrate the method.

1. Telling the time on analogue and digital clocks

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

2. Converting between units of time

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

3. Using the 24-hour clock

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

4. Using timetables

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

5. Using international time zones

- a) _____
- b) _____
- c) _____
- d) _____
- e) _____

10 Area and Perimeter

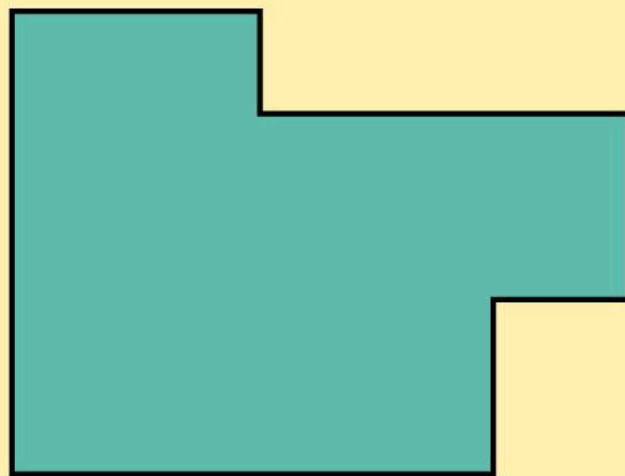
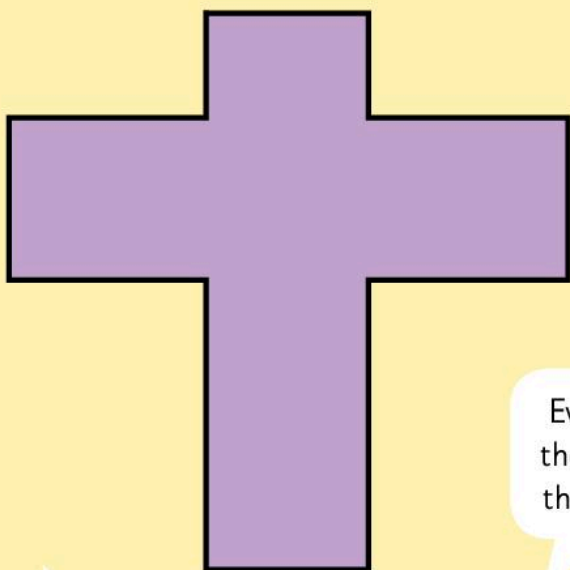
Engage



Every shape with a perimeter of 24 cm has the same area.

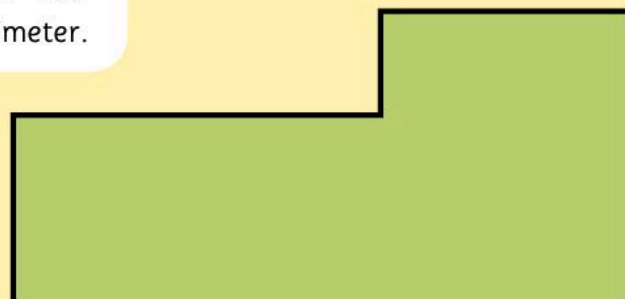
I double the perimeter. The new area is always double the original area.

There are lots of different shapes with the same area.



Every shape with the area 16 cm^2 has the same perimeter.

I don't think that is always true.

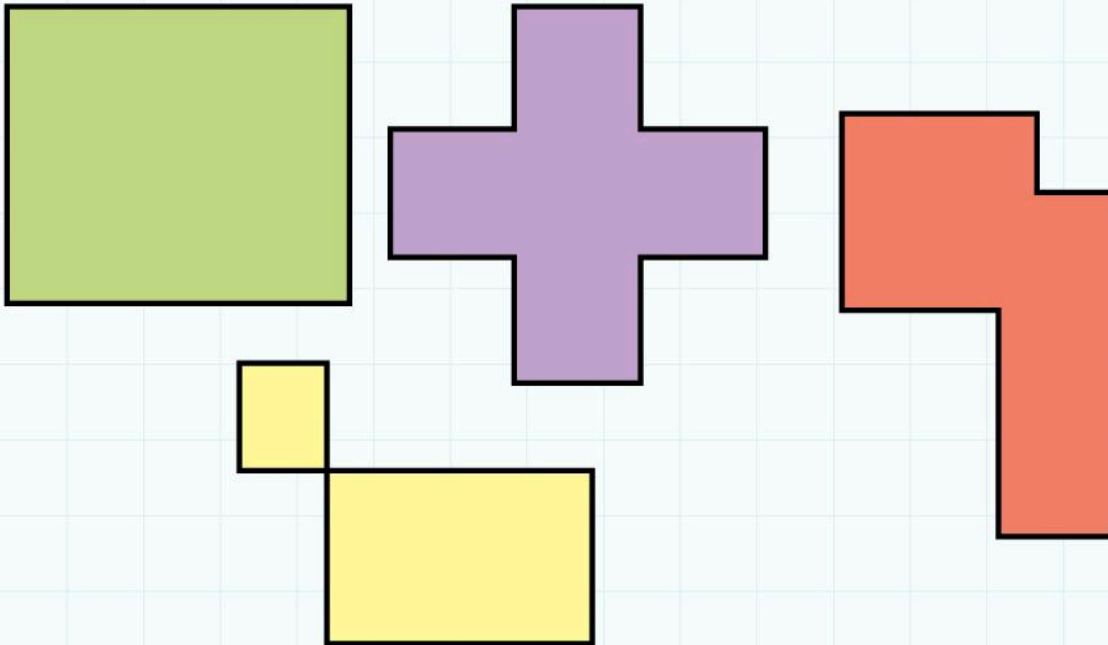


10A Area and perimeter of rectilinear shapes

Discover

A farmer has 24 metres of wire fencing. He wants to enclose the maximum possible **area** of land to allow his goats to graze. What shape of area do you advise him to enclose?

- Investigate a range of rectangles and other **rectilinear** shapes like these:

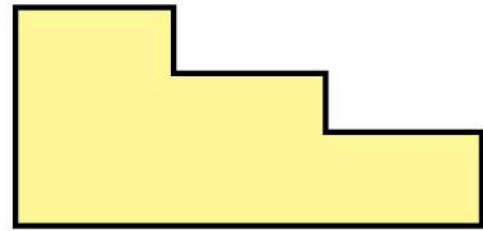
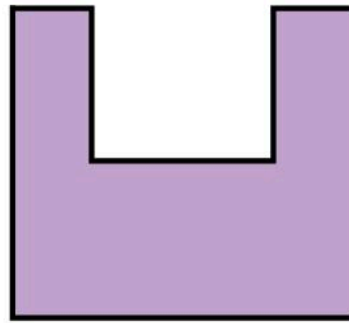
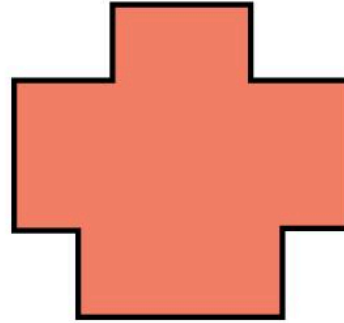
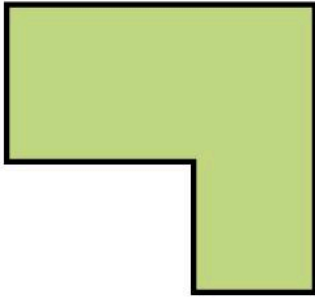


10A Area and perimeter of rectilinear shapes

Explore

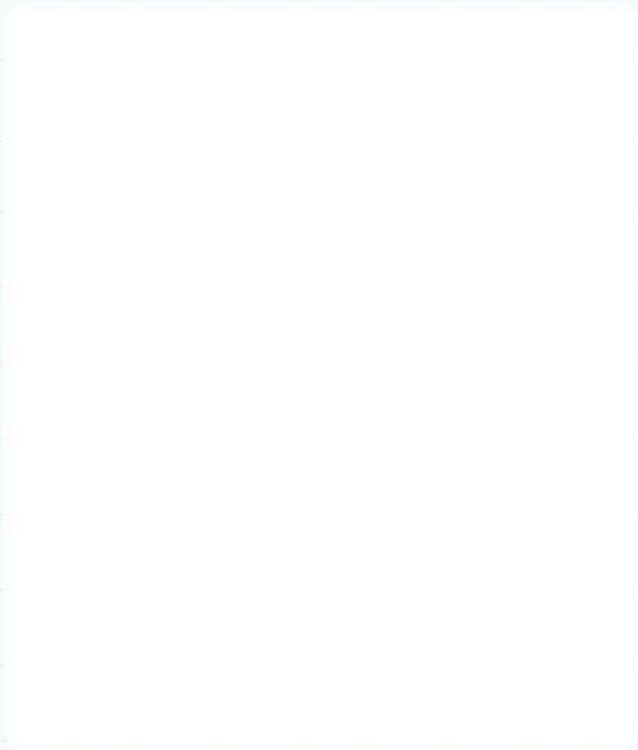
Rectilinear shapes are not just rectangles.

Here are some examples:



- Draw two different rectilinear shapes with the following areas.
 - Write the **perimeter** under each shape.
1. Area of 36 cm^2

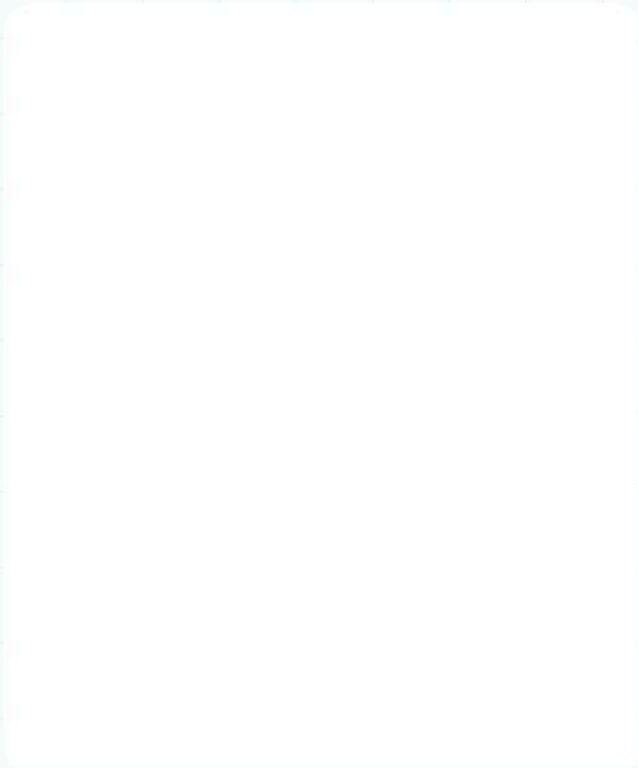
2. Area of 68 cm^2



4. Area of 250 cm^2



3. Area of 125 cm^2



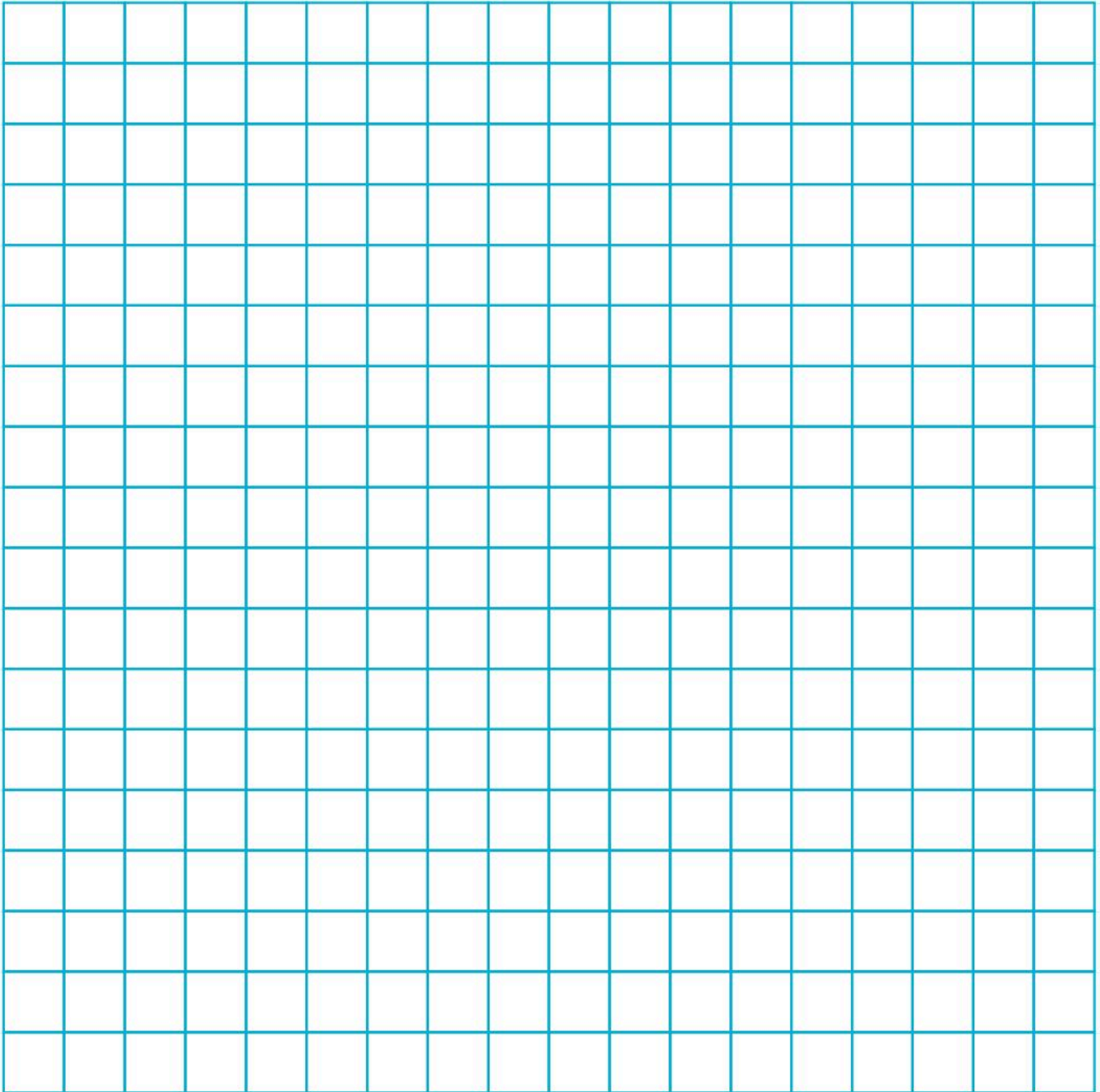
5. Area of 360 cm^2



10B Estimating areas of irregular shapes by counting squares

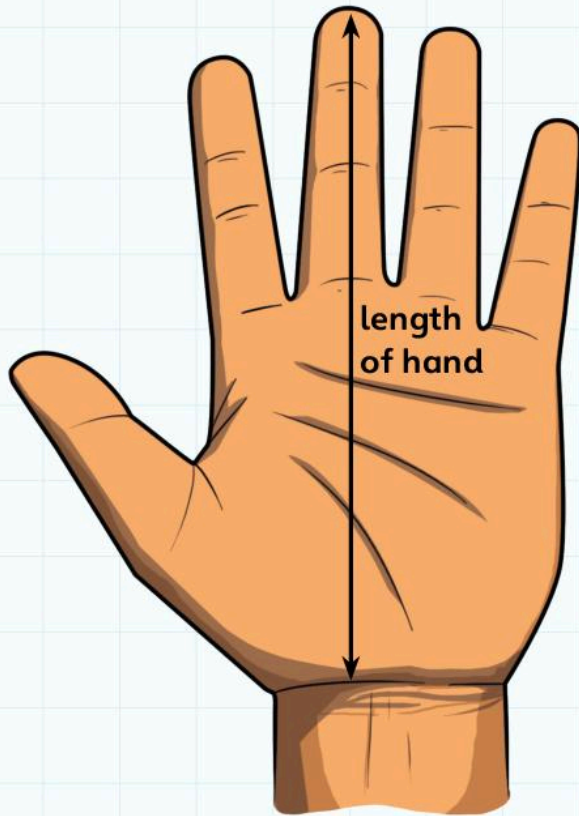
Discover

- On the squared paper below draw round your open hand.
- Count the squares to find the area.



- Complete this table.
- Use 15 other students' measurements.

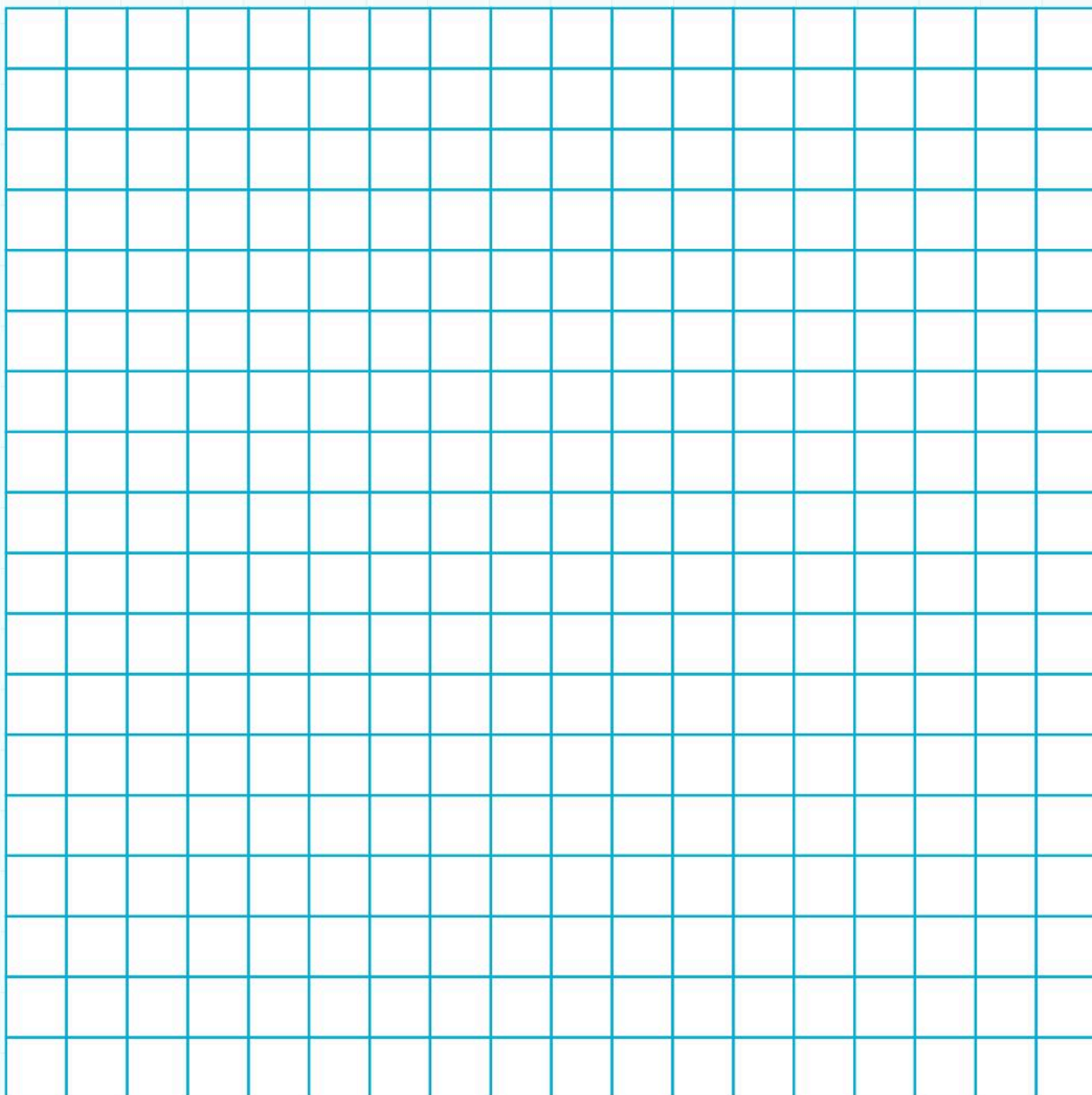
The hand length is from the top of the wrist to the tip of the middle finger.



Friend's name									
Area of hand									
Length of hand									
Friend's name									
Area of hand									
Length of hand									

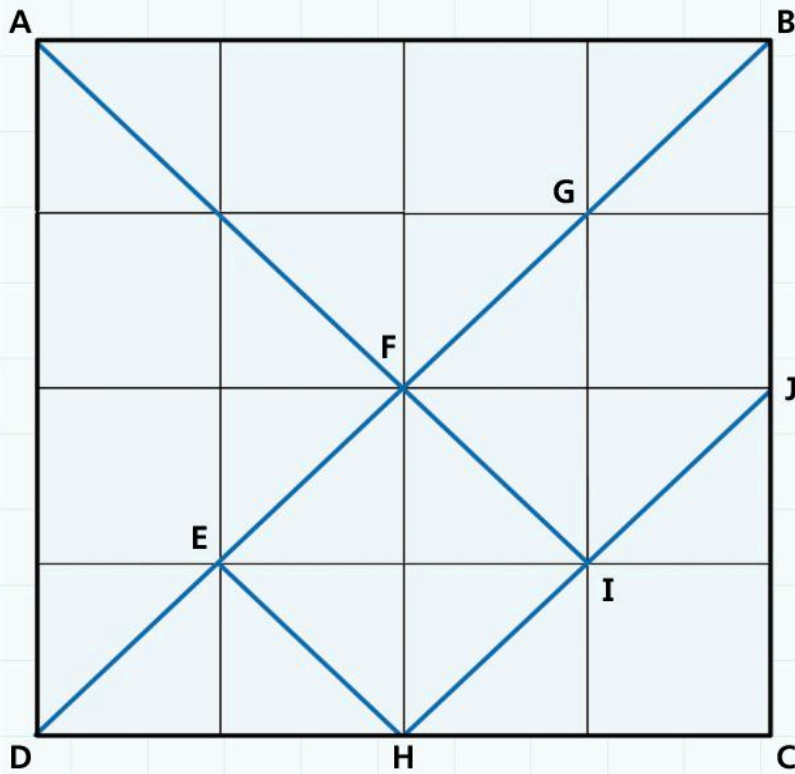
- Use the squared paper below.
- Draw a **scattergram** of area against length.

Is there any **correlation**?



10B Estimating areas of irregular shapes by counting squares

Explore



- Write the area of each piece of the tangram on the diagram above.
- Sketch five different shapes using pieces of the tangram:
 - I. An arrangement using three pieces:

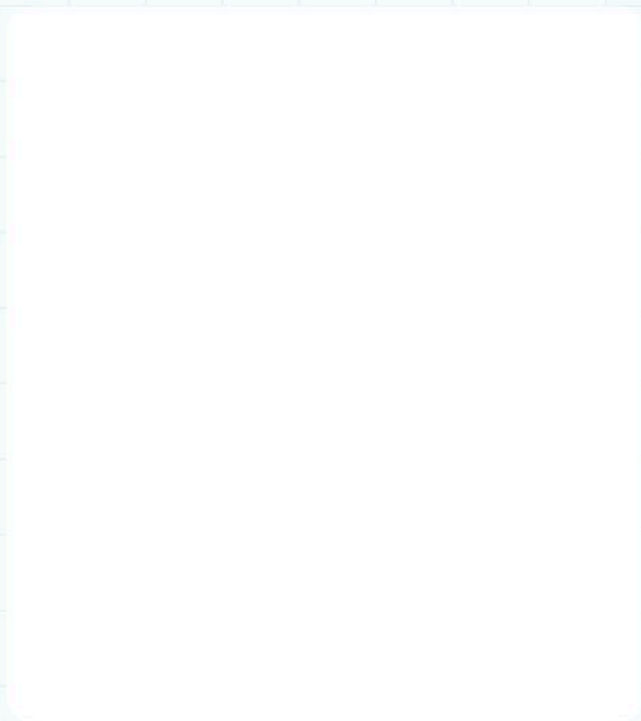
2. An arrangement using four pieces:



4. A different arrangement using five pieces:



3. An arrangement using five pieces:



5. An arrangement using six pieces:



- Write the area and perimeter under each shape.

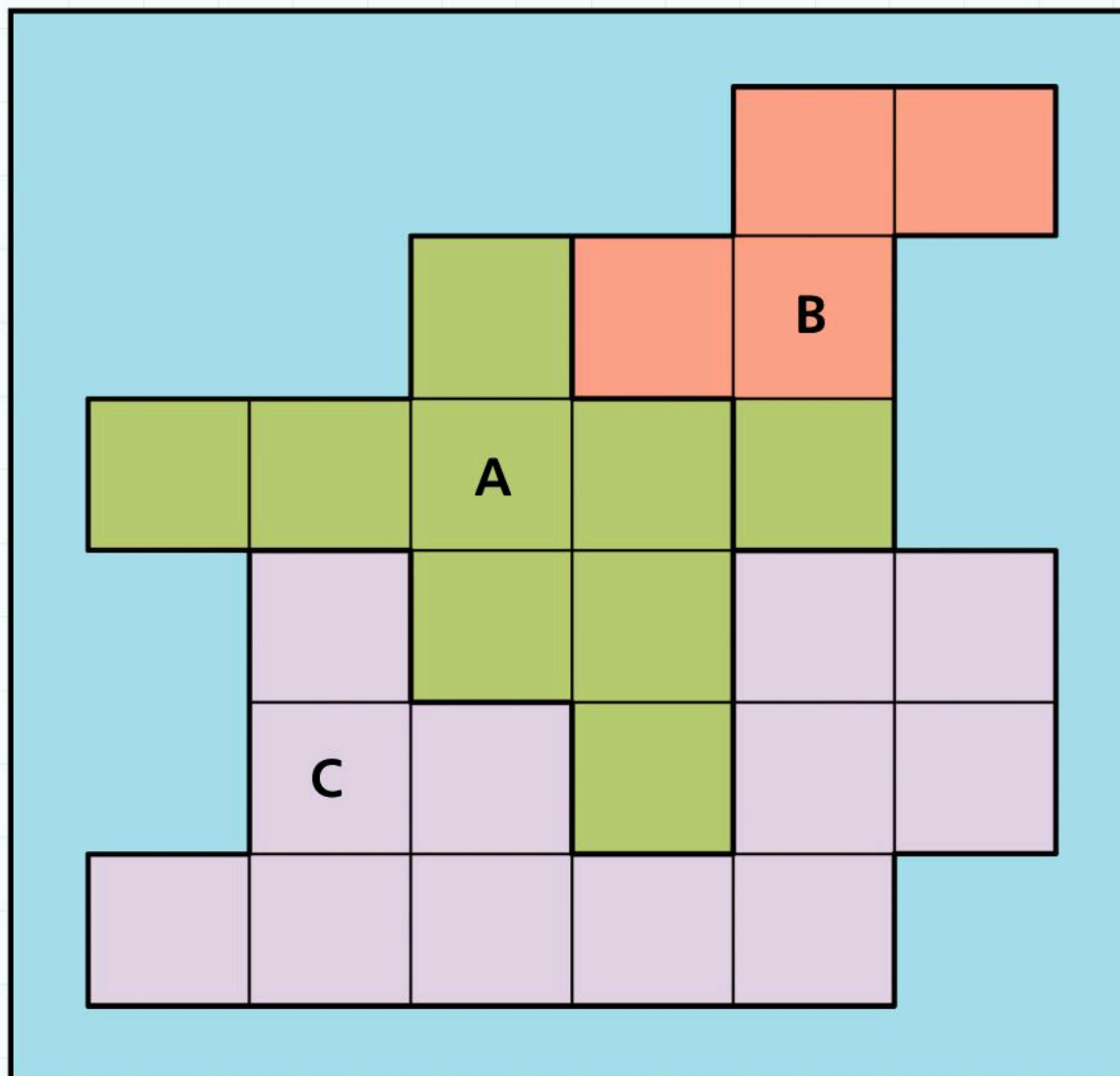
10C Calculating areas and perimeters of compound shapes

Discover

You can represent data in different ways so that it is easier to understand.

The example below shows an example of a three-country continent.

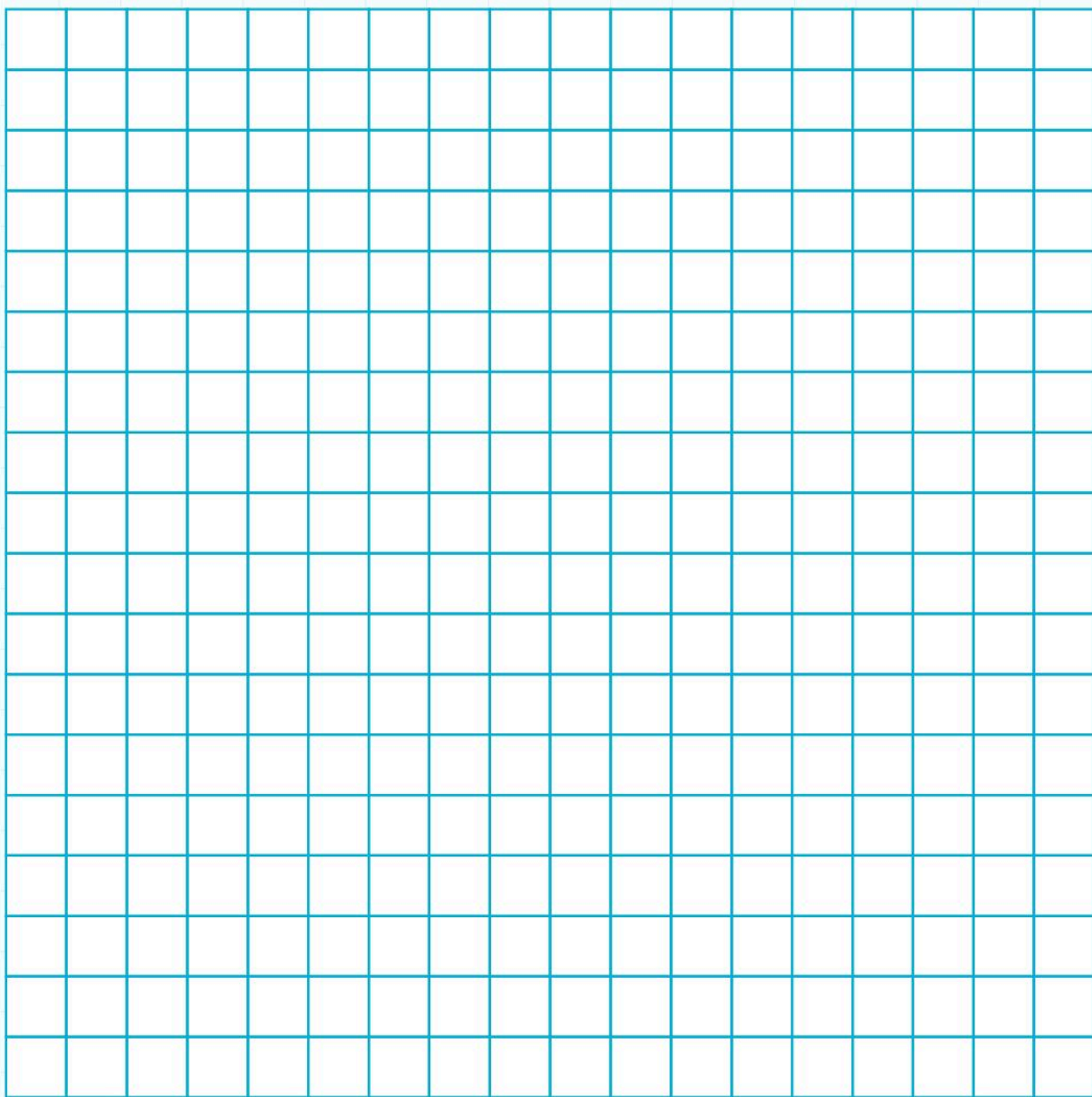
The countries all share a border with each other. They are surrounded by sea.



In this view, the areas of countries A, B and C are shown as 18, 8 and 24 million km^2 (so each square represents 2 million km^2).

- Draw a new view of these countries to show different information.
- Represent countries A, B and C as having populations of 40, 36 and 24 million people.

Make sure that you can recognise each country and its position. Keep the shapes and positions of the countries relative to each other as similar to the original as possible.

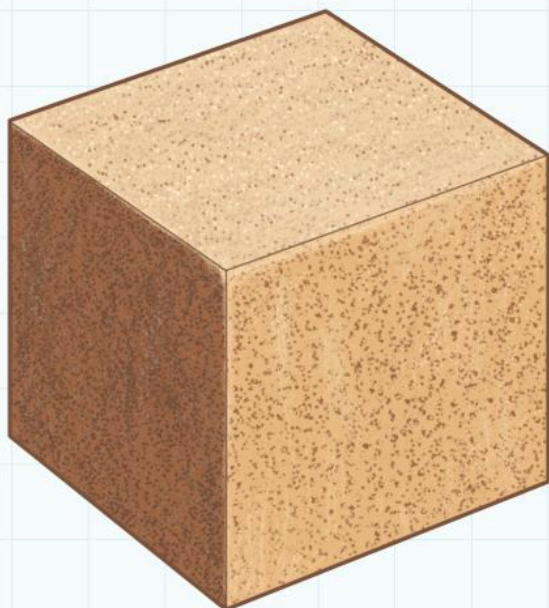


10C Calculating areas and perimeters of compound shapes

Explore

You work for a company that sells stock cubes.

You sell the stock cubes in packs of 12, 24, 40 and 100.



1 stock cube is a 2 cm cube.

- Use cubes to model the size of the boxes that you need to make to hold the stock cubes.
- Include two different possibilities for each.
- Sketch the nets of each of the boxes below.
- Under each net write the **surface area** (total area of net) and the perimeter.

1. Nets for 12 cubes:

a)

b)

2. Nets for 24 cubes:

a)

b)

3. Nets for 40 cubes:

a)

b)

4. Nets for 100 cubes:

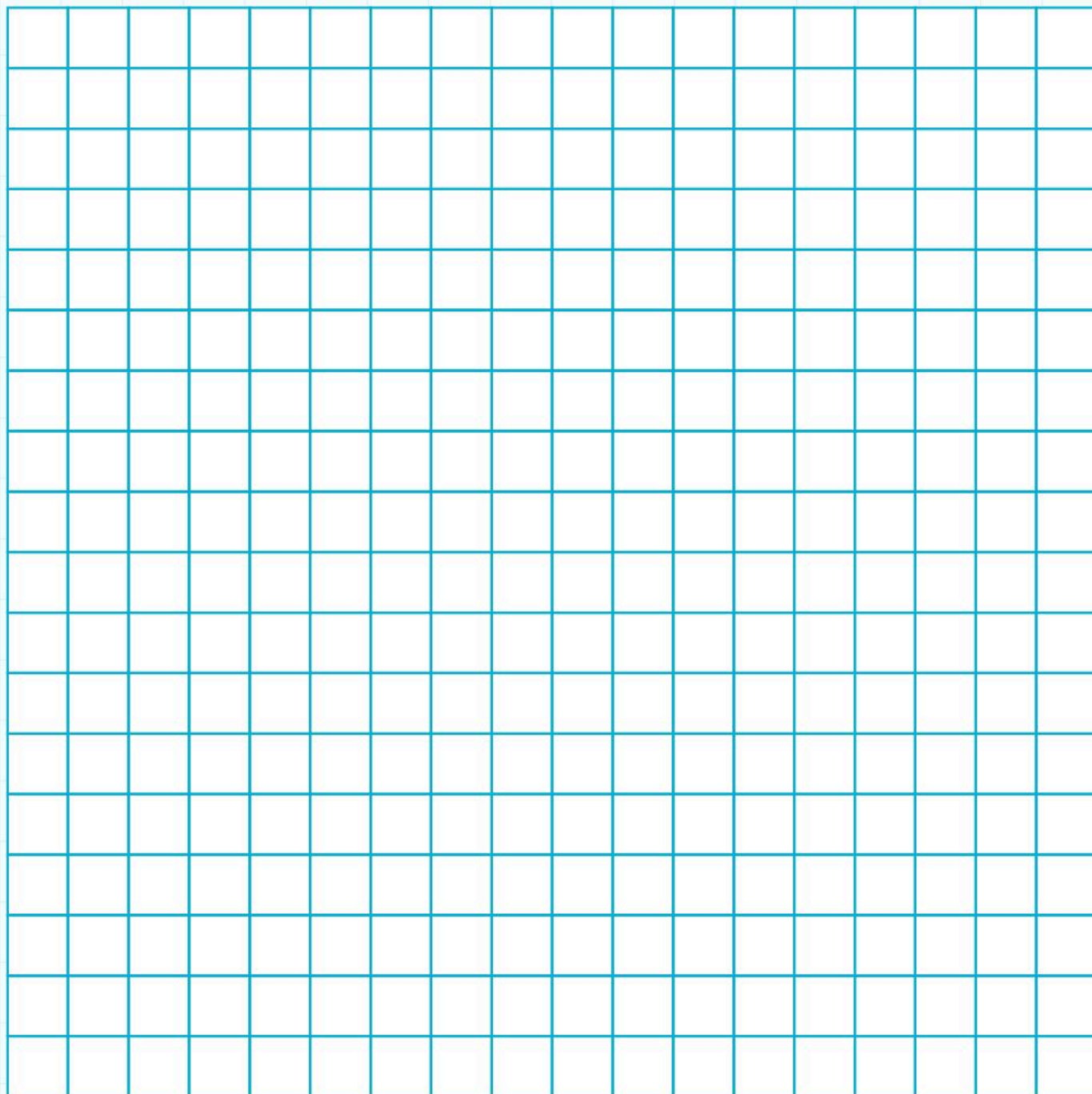
a)

b)

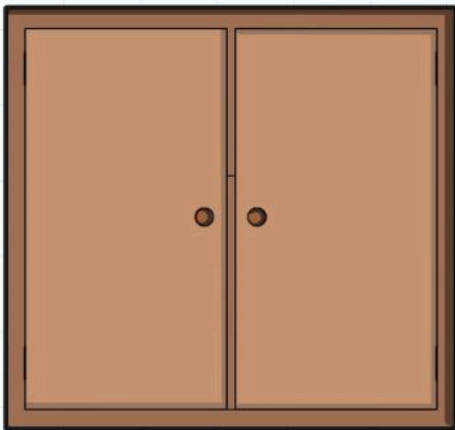
10 Area and perimeter

Connect

- Draw a scale drawing of your classroom below:



You decide to buy four cupboards.



The dimensions of their bases are:

A: 1.5 m by 0.5 m

B: 2 m by 0.75 m

C: 1 m by 0.75 m

D: 2.5 m by 0.5 m

- Decide where you want to put the cupboards in the room.
- Draw them onto your scale plan.

You want to tile the classroom floor using three different colours of tile.

All tiles are squares of side 0.5m. They cost:

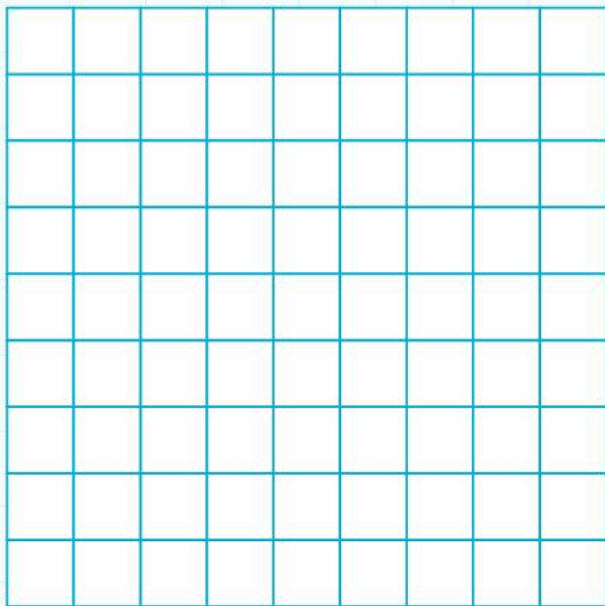
blue tiles \$20 per square metre

red tiles \$25 per square metre

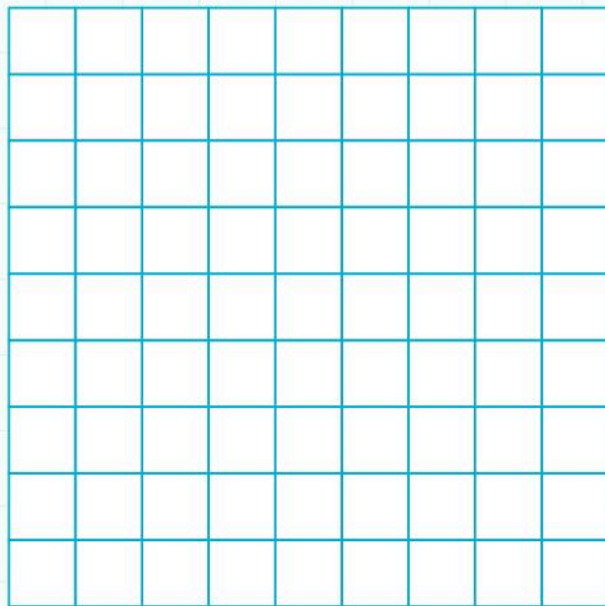
patterned tiles \$32 per square metre

- Draw three different designs for the classroom floor.
- Work out the cost for each design.

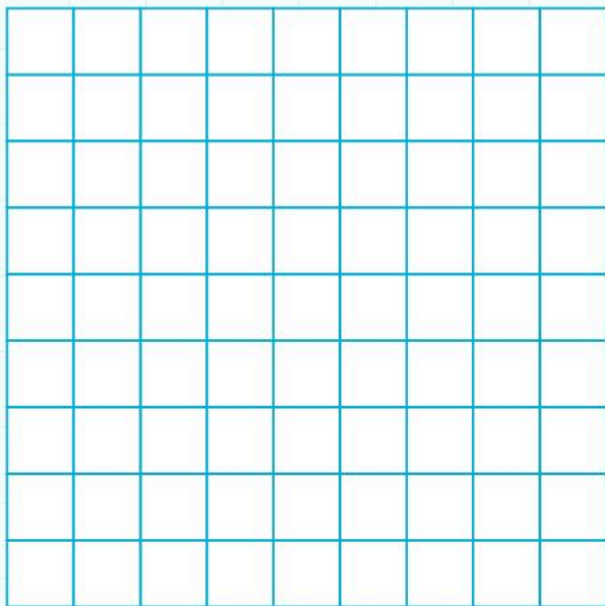
Design 1



Design 3

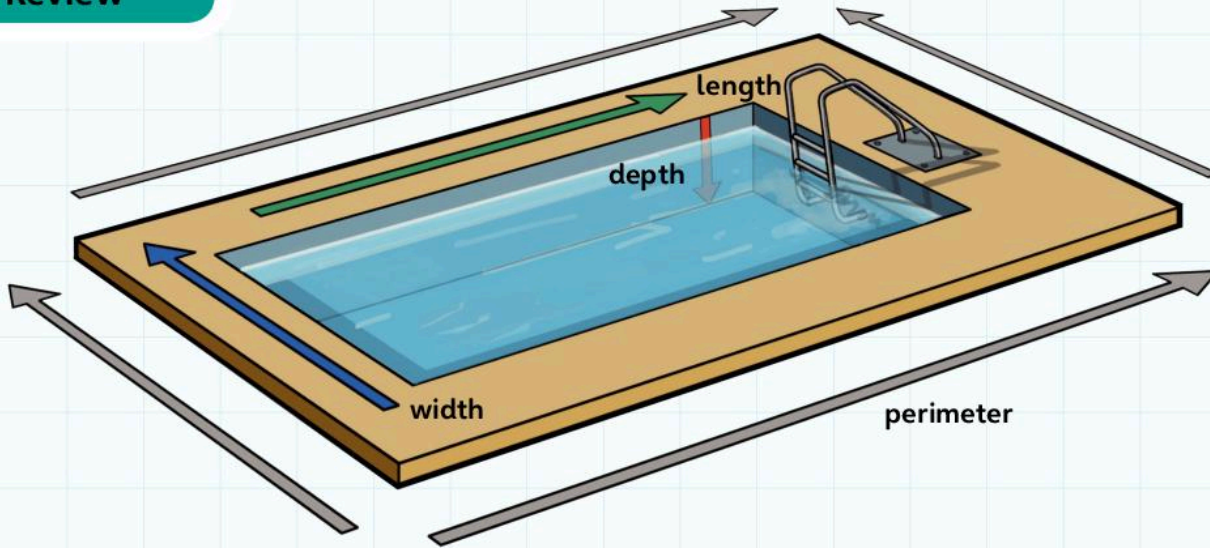


Design 2



10 Area and perimeter

Review



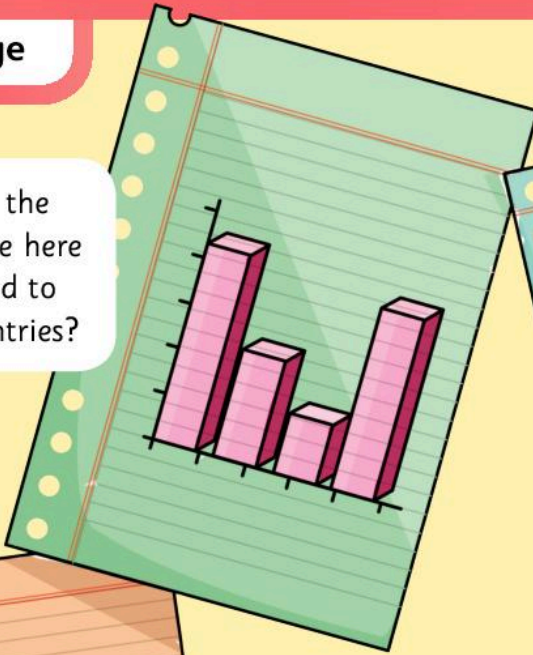
- Use the box below to sketch ideas for a poster.
- In your poster explain the key terms from this Unit.
- Draw pictures and label them with the following words:
length, width, height, depth, breadth
edge, perimeter, circumference
area, surface, face
square centimetre (cm^2), square metre (m^2), square millimetre (mm^2)

11

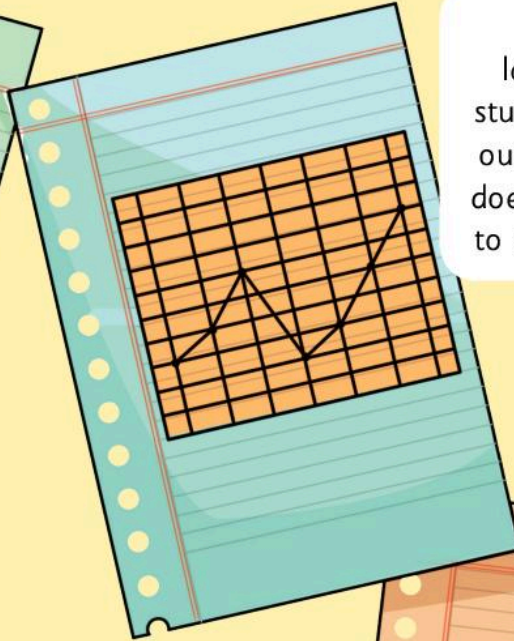
Handling Data

Engage

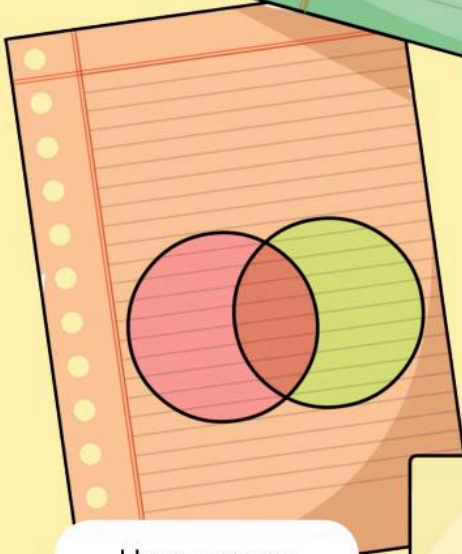
What is the climate like here compared to other countries?



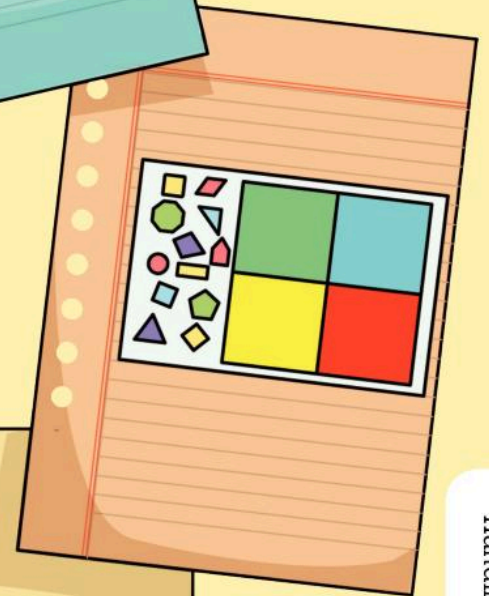
How many languages do students speak in our school? How does this compare to other schools?



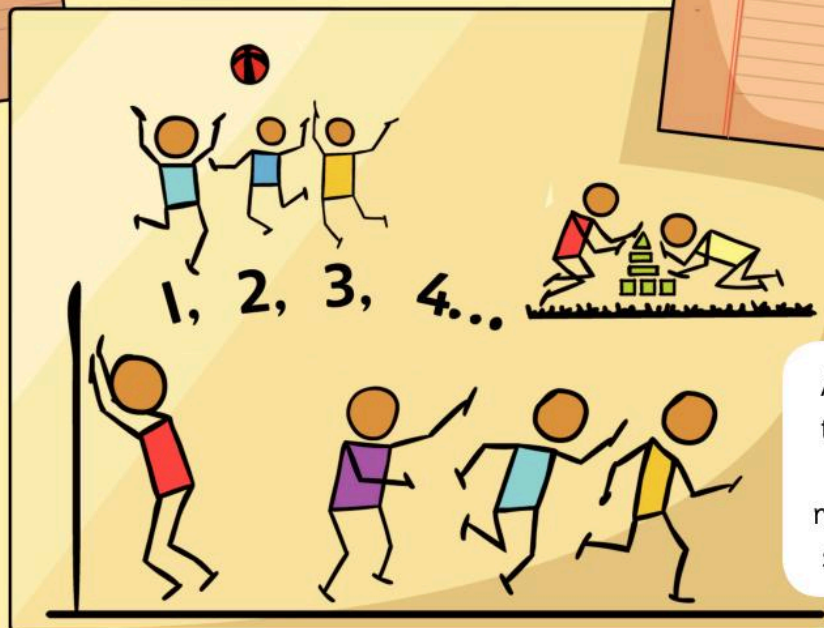
How do children travel to my school? Is this the same as schools in other places?



How can we encourage people to be more environmentally friendly?



When is the best time to have school holidays?



Are women's times getting closer to men's times in sprint races?

11A Handling data

Defining my question

What are we interested in finding out?

List all your ideas here:

Pick one question you are particularly interested in and write it here:

11A Handling data

What do I know already?

Our question is:

Source	Information we found out

11A Handling data

Carrying out a survey

Our survey question is:

These are questions that we will ask people:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

We are asking the following people:

Group	Number of people asked	Reason for asking this group of people

These are the results of our survey listed in a **frequency table**:



11A Handling data

Interpreting the data – planning a presentation

Our question is:

Our reason for asking this question

We wanted to ask this question because:

What we found out from research

Our research showed us that:

What we found out from our survey

We found out from our survey that:

What we found out

So, we now know that:

Another question we would like to ask based on our findings

Now we would like to ask this question:

11B Probability

Discover

- Play the Great Horse Race game with your friends.

Horse										Winning post
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										

You play the game again. Which horse do you choose as a winner?

Why do you choose this horse? _____

Which horse do you definitely not choose? _____






Why do you definitely not choose this horse? _____

What is the probability that horse number 5 wins?

11B Probability

Explore

I. Complete this table:

Chosen outcome	Equally likely outcomes	Number of possible required outcomes	Probability fraction	Probability as percentage
Rolling an even number on a 6-sided dice 	I can roll 1, 2, 3, 4, 5 or 6	There are 3 even numbers (2, 4, 6)	There are 3 chances out of 6 so the probability is $\frac{3}{6}$ (or $\frac{1}{2}$)	$\frac{1}{2}$ is the same as 50%
Rolling an even total on two 6-sided dice 				
Rolling a number less than 4 on a 10-sided dice 				
Picking a 7 or a 9 out of a pack of cards 				
Picking a Jack, Queen or King out of a pack of cards 				

2. Write down events with the following probabilities:

a) $\frac{1}{2}$

b) 0 (impossible)

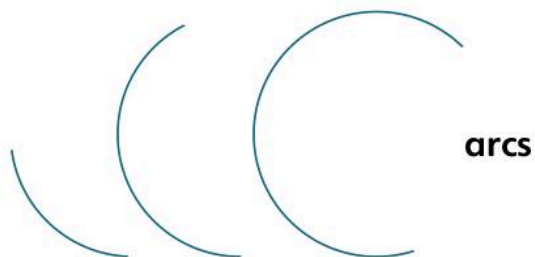
c) $\frac{2}{5}$

d) $\frac{1}{10}$

e) 90%

f) 1 (certain to happen)

arc



average

Here are five numbers ranging from 3 to 9:

3 3 4 6 9

The **mean** is 5 because, $\frac{3+3+4+6+9}{5} = 5$

The **median** is 4 because it is the middle value.

The **mode** is 3 because it occurs most often.

Biased

centilitre

100 centilitres = 1 litre

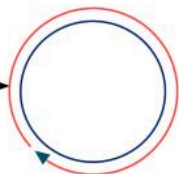
100 cl = 1 l

1 cl = 10 ml

1 centilitre = $\frac{1}{100}$ litre

circumference

circumference →



common multiple

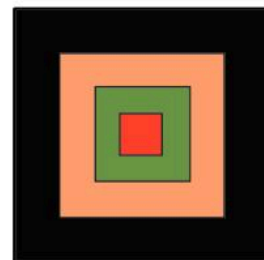
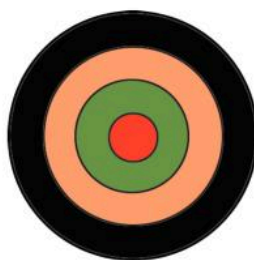
12 is a **common multiple** of 3 and 4. It is also a common multiple of 6 and 2.

composite number

18 is a **composite number** because it can be written as 3×6 or 2×9 .

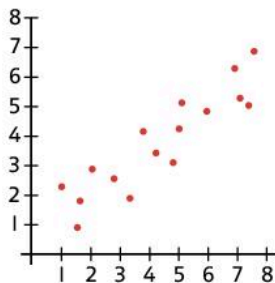
3 and 7 are not composite numbers.

concentric

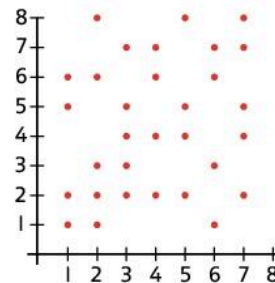


concentric circles **concentric squares**

correlation

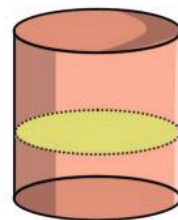


positive correlation



no correlation

cross-section



The **cross-section** of a cylinder is a circle.

decade

1 **decade** = 10 years

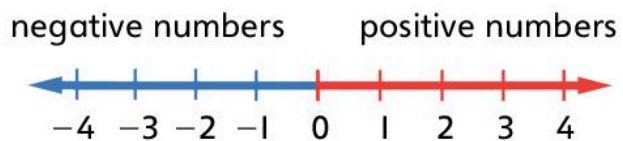
10 **decades** = 1 century

decimal equivalent

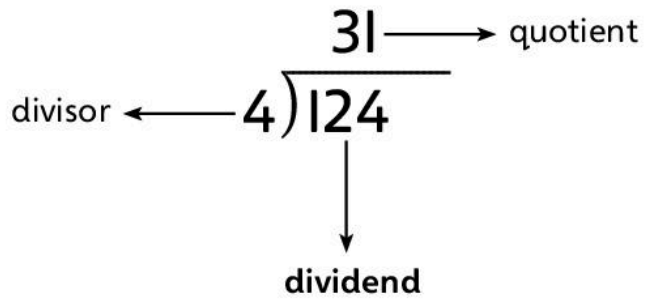
Here are some **decimal equivalents**:

$$\frac{1}{10} = 0.1 \quad \frac{2}{10} = 0.2 \quad \frac{4}{100} = 0.04$$

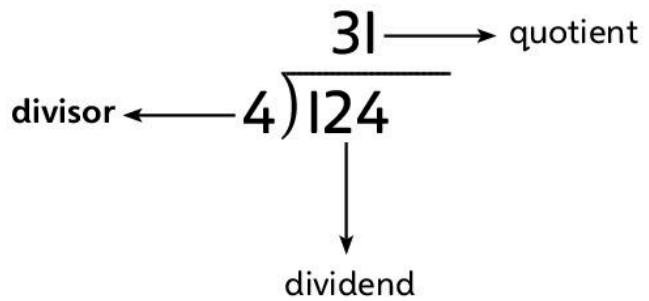
directed numbers



dividend



divisor



dodecahedron



regular dodecahedron

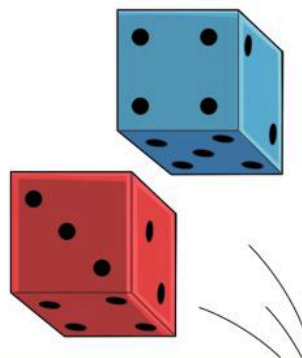
**equal chance (even chance,
fifty-fifty chance)**



equally likely



event



factorise

$$42 = 2 \times 3 \times 7$$

Factorising the number 42.

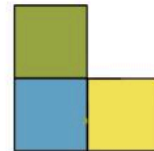
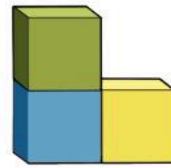
foot (plural feet)

1 foot = 12 inches

3 feet = 1 yard

1 foot = 30.48 cm

front elevation

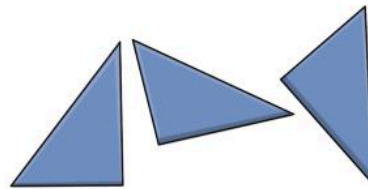


front elevation

hypothesis



identical



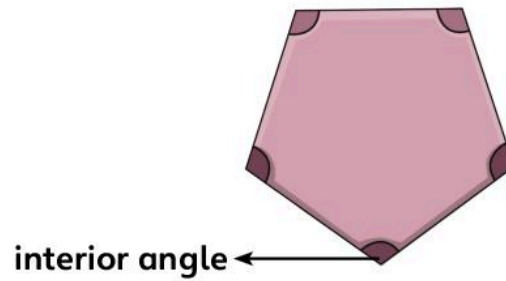
Identical shapes can be in different positions.

inch (plural inches)

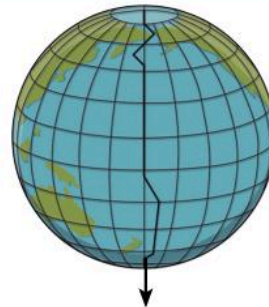
12 inches = 1 foot

1 inch = 2.54 cm

interior angle

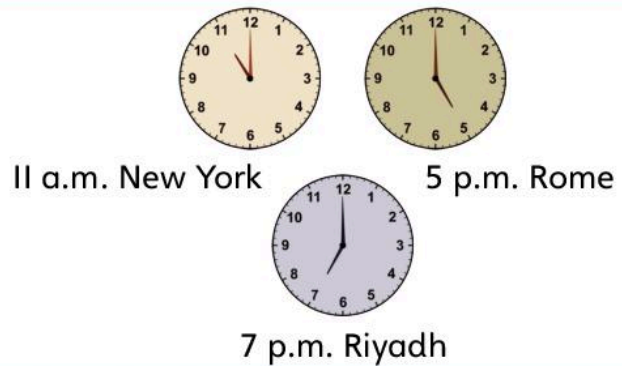


International Date Line

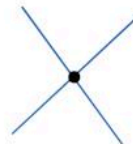


International Date Line

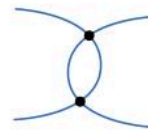
international time zones



intersect

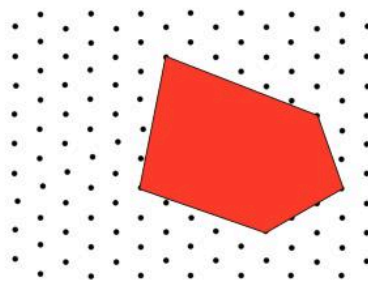


Intersection
of two lines.

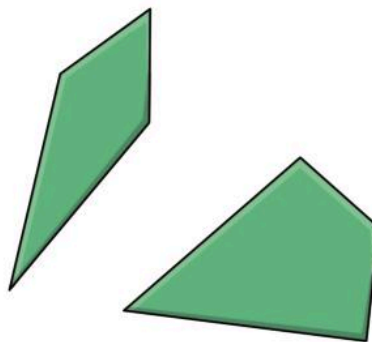


These arcs
intersect in
two places.

isometric drawing



kite



loss

Price paid to buy an item: \$10
Price received selling the item: \$8
Loss: \$2

mean

Here are five numbers ranging from 3 to 9:

3 3 4 6 9

The total is $\frac{3+3+4+6+9}{5} = \frac{25}{5} = 5$.

The **mean** is _____.

median

Here are five numbers ranging from 3 to 9:

3 3 4 6 9

The **median** is 4 because it is the middle value.

millisecond

1000 **milliseconds** = 1 second

operation key

operation keys



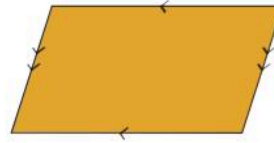
ounce (oz) (plural ounces)

16 **ounces** = 1 pound

16 oz = 1 lb

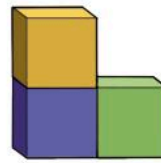
1 **ounce** = 28.3 grams

parallelogram



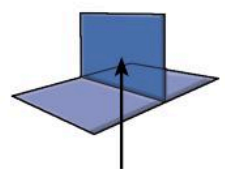
The arrowheads show which sides of the **parallelogram** are parallel to each other.

plan view



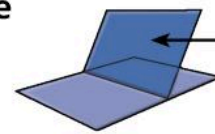
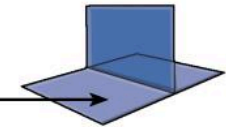
plan view

plane



vertical **plane**

horizontal
plane



oblique **plane**

pound (lb)

1 **pound** = 16 ounces

1 **lb** = 16 oz

1 **lb** = 453.59 g

1 **kg** = 2.204 **lb**

prime factor

The factors of 24 are 1, 2, 3, 4, 6, 8, 12, 24.
The **prime factors** of 24 are 2 and 3.

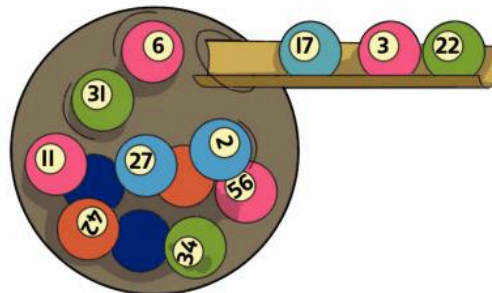
prime number

These are the **prime numbers** less than 20.

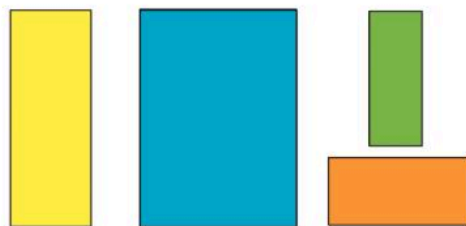
profit

Buy for \$3
Sell for \$50
Profit: \$15

random



rectilinear



rectilinear shapes

recurring

Some **recurring** decimals:

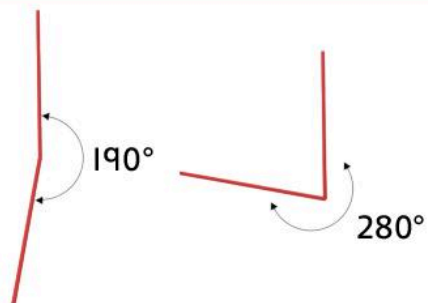
$$\frac{1}{3} = 0.333333333333 \rightarrow$$

This number is called 'zero point three **recurring**'.

$$\frac{22}{7} = 3.1428561428561 \rightarrow$$

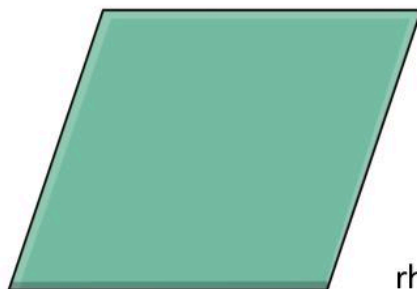
The digits 142856 keep repeating.

reflex angle



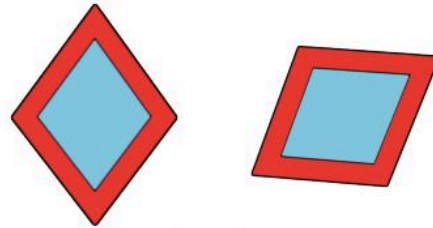
reflex angles

rhomboid



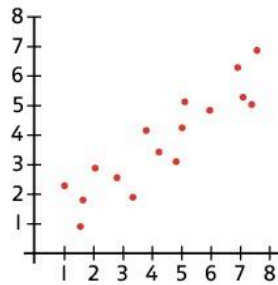
rhomboid

rhombus

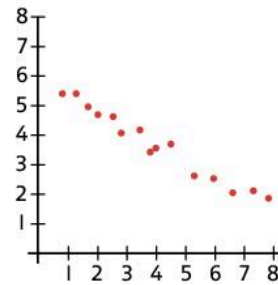


rhombus

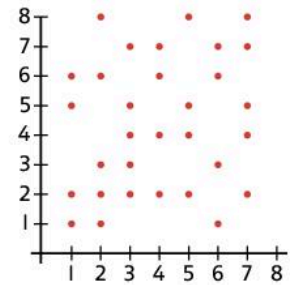
scattergram



scattergram showing positive correlation

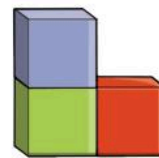


scattergram showing negative correlation



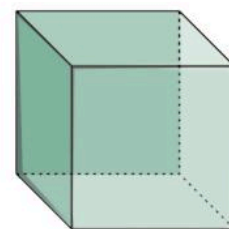
scattergram showing no correlation

side elevation



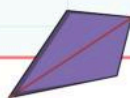
side elevation

surface area



The **surface area** of a cube is 6 times the area of each of its faces.

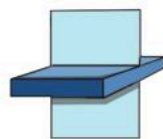
symmetry



A kite has **symmetry** about a line.



A parallelogram has rotational **symmetry** about a point.

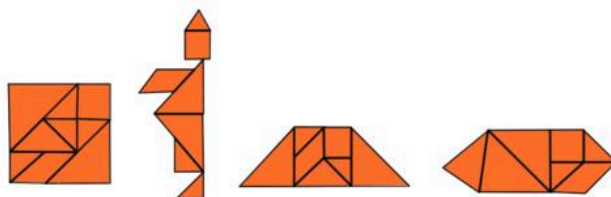


A cuboid has **symmetry** about a plane.



A pyramid has rotational **symmetry** about an axis.

tangram



a **tangram** puzzle

thousandth

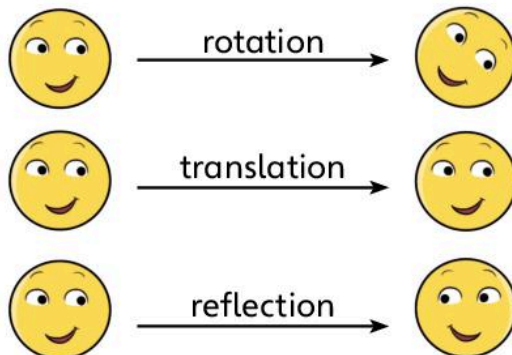
$$\frac{1}{1000}$$

tonne

1 **tonne** = 1000 kilograms

1 **tonne** = 100 kg

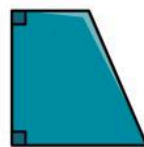
transformation



trapezium



trapezium



right-angled
trapezium



isosceles
trapezium

volume



A 1 cm cube has a volume of $1 \cdot 1 \cdot 1 \text{ cm}^3 = 1 \text{ cm}^3$.

A 2 cm cube has a volume of $2 \cdot 2 \cdot 2 \text{ cm}^3 = 8 \text{ cm}^3$.

yard

1 yard = 3 feet

1 yard = 36 inches

1 yard = 91.44 cm

Oxford International Primary Maths

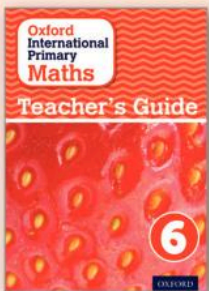
6

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