

Telling Time



PATRICIA J.
MURPHY

A Note to Parents

DK READERS is a compelling program for beginning readers, designed in conjunction with leading literacy experts, including Dr. Linda Gambrell, Professor of Education at Clemson University. Dr. Gambrell has served as President of the National Reading Conference and the College Reading Association, and has recently been elected to serve as President of the International Reading Association.

Beautiful illustrations and superb full-color photographs combine with engaging, easy-to-read stories to offer a fresh approach to each subject in the series. Each DK READER is guaranteed to capture a child's interest while developing his or her reading skills, general knowledge, and love of reading.

The five levels of DK READERS are aimed at different reading abilities, enabling you to choose the books that are exactly right for your child:

- Pre-level 1:** Learning to read
- Level 1:** Beginning to read
- Level 2:** Beginning to read alone
- Level 3:** Reading alone
- Level 4:** Proficient readers

The “normal” age at which a child begins to read can be anywhere from three to eight years old. Adult participation through the lower levels is very helpful for providing encouragement, discussing storylines, and sounding out unfamiliar words.

No matter which level you select, you can be sure that you are helping your child learn to read, then read to learn!





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READERS



Telling Time

Written by Patricia J. Murphy



DK Publishing

Do you know what time it is?
We tell time many times a day.

*When is soccer
practice?*





What time is dinner?

*When does
the party start?*



*What time will
you get there?*



We use clocks to tell time.

They help people plan their day.

People have been telling time
for a long, long time.

Clocks from long ago did not look like ours and they did not keep the best time either.

This is the story of how clocks have changed.



Timeline



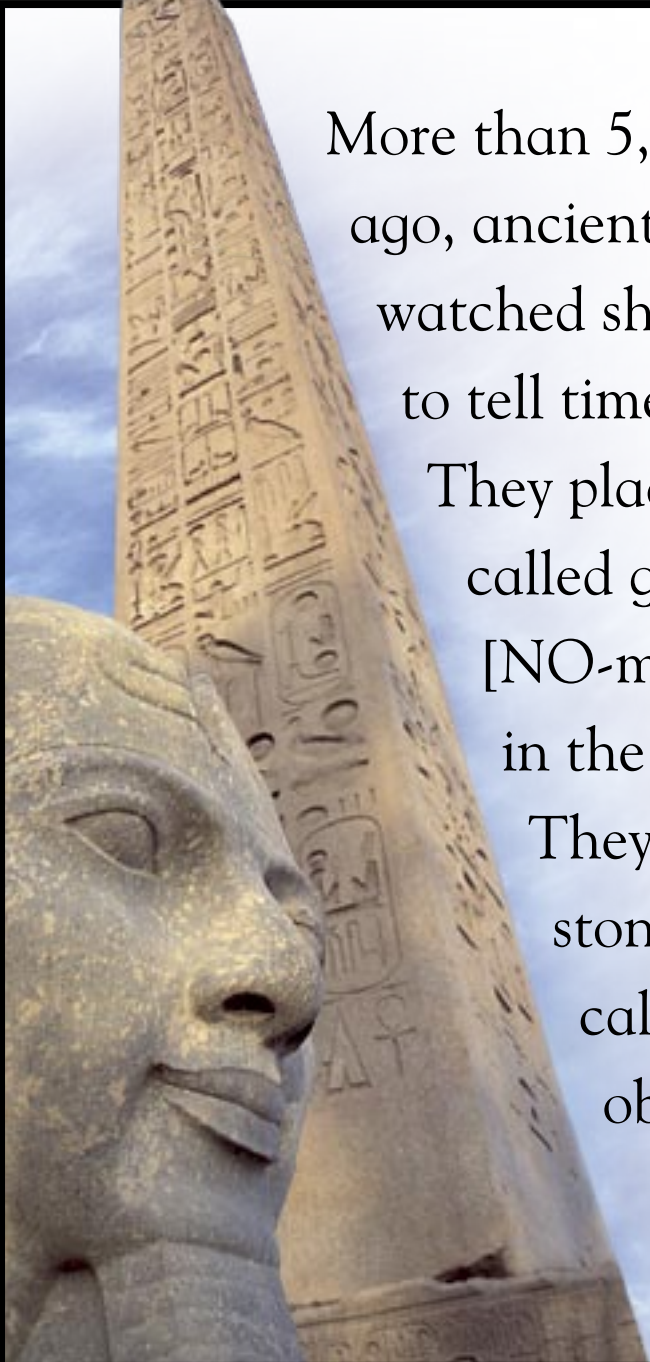
Prehistoric times

Once upon a time, people woke up when the sun rose and went to bed when the moon and stars came out. These were the first clocks.

Sometimes, people used stone pillars to mark the movement of the sun, moon, and stars during the year.

*Stonehenge
in England*





More than 5,500 years ago, ancient Egyptians watched shadows to tell time.

They placed sticks called gnomons [NO-muns] in the ground.

They also built stone pillars called obelisks.

Obelisk

Timeline

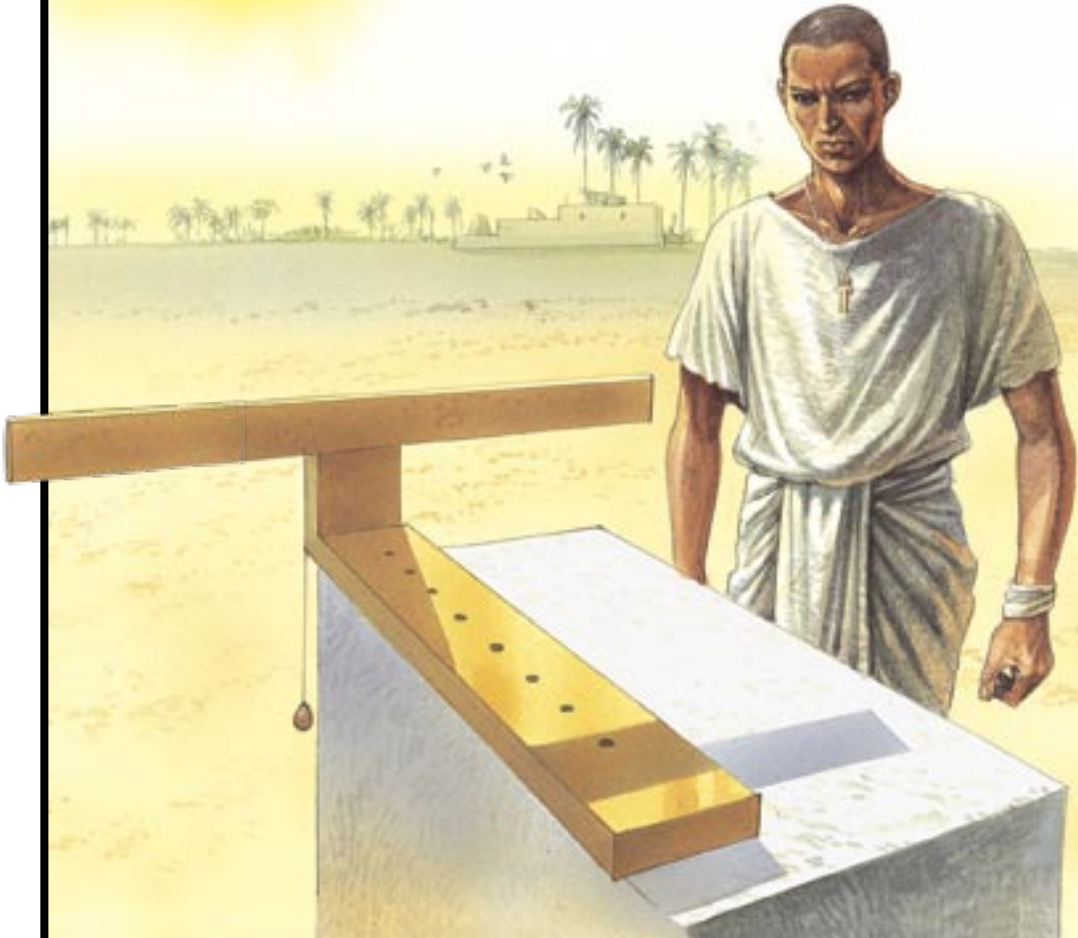


Prehistoric times 3500 BCE

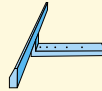


These sticks and obelisks cast long shadows on the ground. As the sun moved, the direction of the shadows told people what part of the day it was. These devices were the very first sundials.

In 1500 BCE,
the Egyptians built
an even better
sundial.



Timeline



Prehistoric times 3500 BCE 1500 BCE

It was shaped like a T and had special markings.

The marks split the day into ten hours of daylight and two hours of twilight.

Like all sundials, this one could only tell time in sunlight.

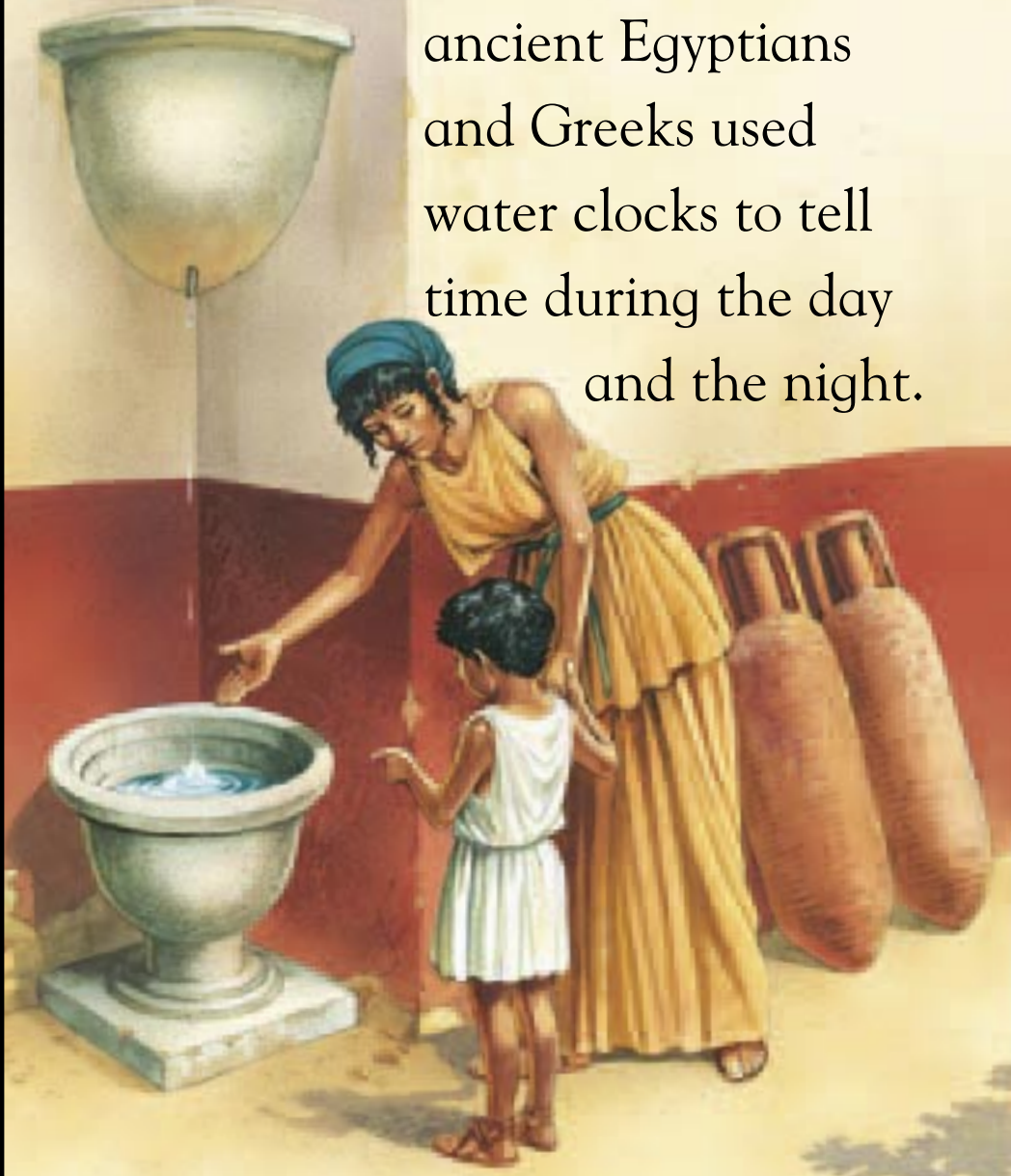
People could not tell what time it was on cloudy days or at night.

Time for bed, Tut!

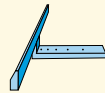
Around 600 BCE, Egyptians lined up merkhets [MER-kets] with the stars to tell the time at night.



Starting in 1400 BCE,
ancient Egyptians
and Greeks used
water clocks to tell
time during the day
and the night.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE

Water-clock tower

In 1088, Su Sung, a Chinese monk, built an amazing water-clock tower. It was more than 30 feet (9 m) tall and had many moving parts.

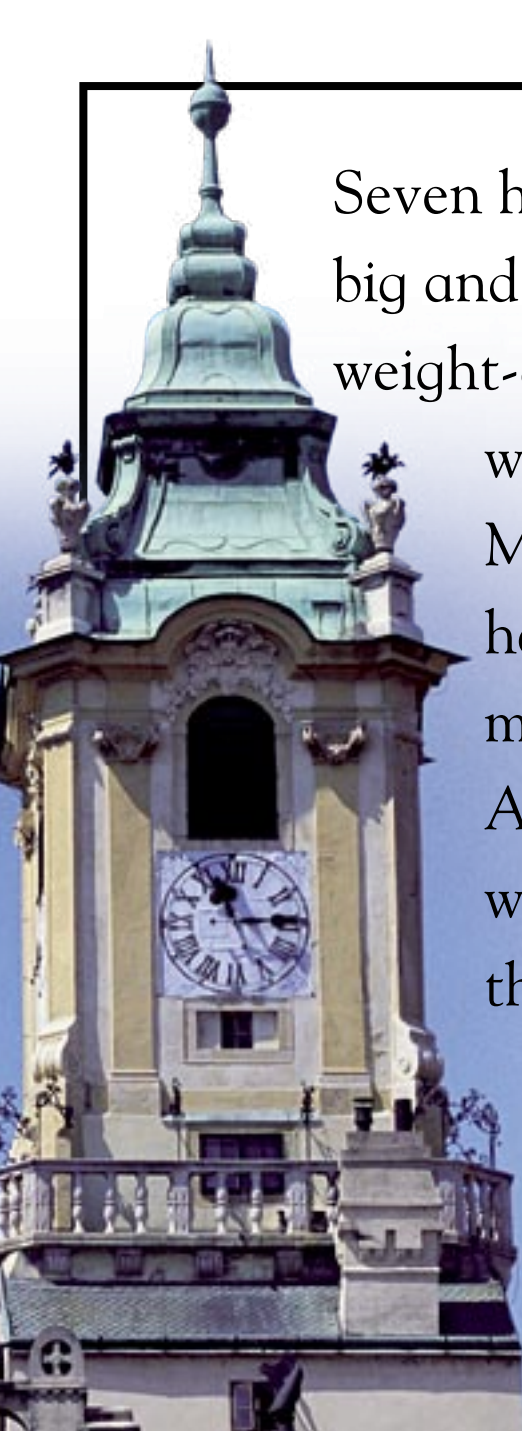


Water was poured into a bowl with holes in it. As the water dripped out through the holes, people checked the water levels using special marks. This told them how much time had passed.



Water-level marks

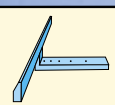




Seven hundred years ago,
big and heavy
weight-driven clocks
were invented.
Many of these clocks
had round faces and
moving hands.
After the weights
were raised up,
they would lower
slowly to make
the clocks work.

*Bells on this clock tower
rang on the hour.*

Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

*The outside
and inside of
a pocket
watch*



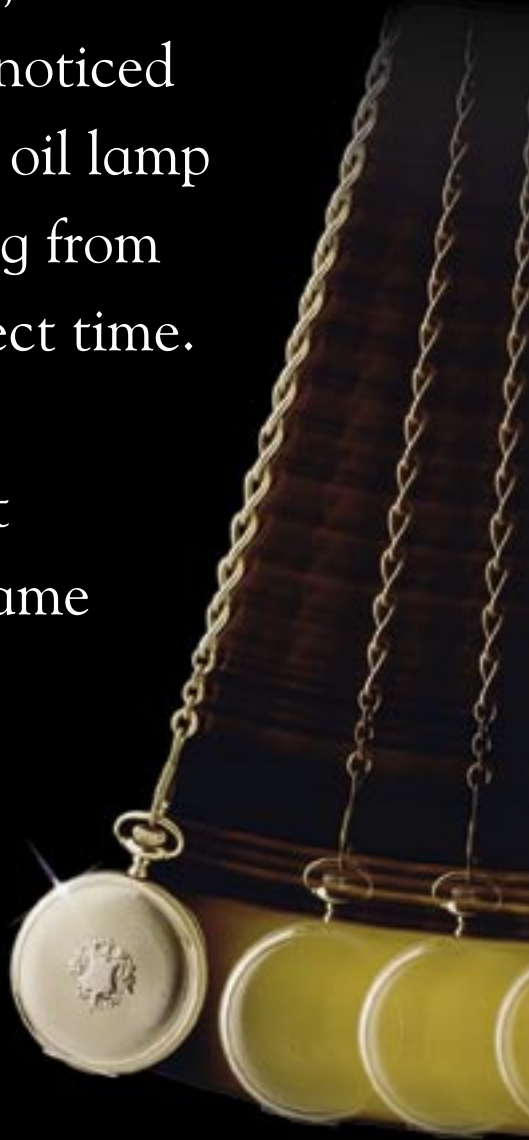
Two hundred years later, clocks were made that were powered by springs instead of weights. They were small and light, and some were made to fit in pockets. These tiny timepieces were the first pocket watches.



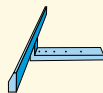
1500



In 1582, Galileo Galilei noticed that an oil lamp swinging from a chain kept perfect time. He found that a swinging weight always took the same number of beats to go backward and forward.



Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

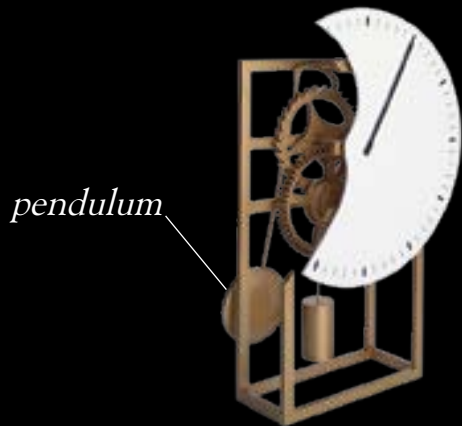
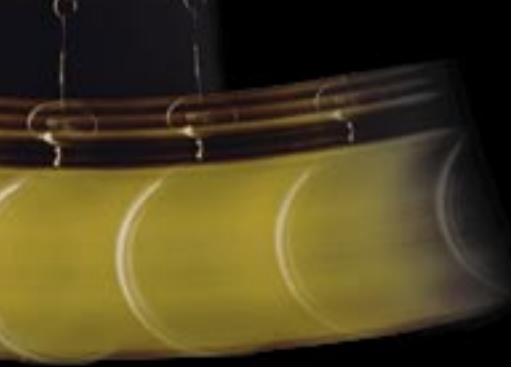
The cuckoo clock

This pendulum clock makes a whistle that sounds like a cuckoo bird every hour. If it is 12 o'clock, it whistles 12 times!



Another name for a swinging weight is a pendulum.

In 1657, Christiaan Huygens invented a clock that used a pendulum to keep time.



1500



1657

On the high seas, sailors needed to know the exact time to find their way.

Pendulum clocks needed to stand still and would not work on choppy waters.

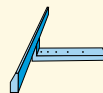


Sands of time

Sometimes, sailors used hourglasses filled with sand or powdered eggshells to tell time. The powder would take one hour to flow from the top bulb to the bottom bulb.



Timeline



Prehistoric times

3500 BCE

1500 BCE

1400 BCE

1300



John Harrison

H4 chronometer

In 1759, John Harrison invented the H4 chronometer, a special clock to use on ships.

It worked so well that it won a prize from the British government.



1500



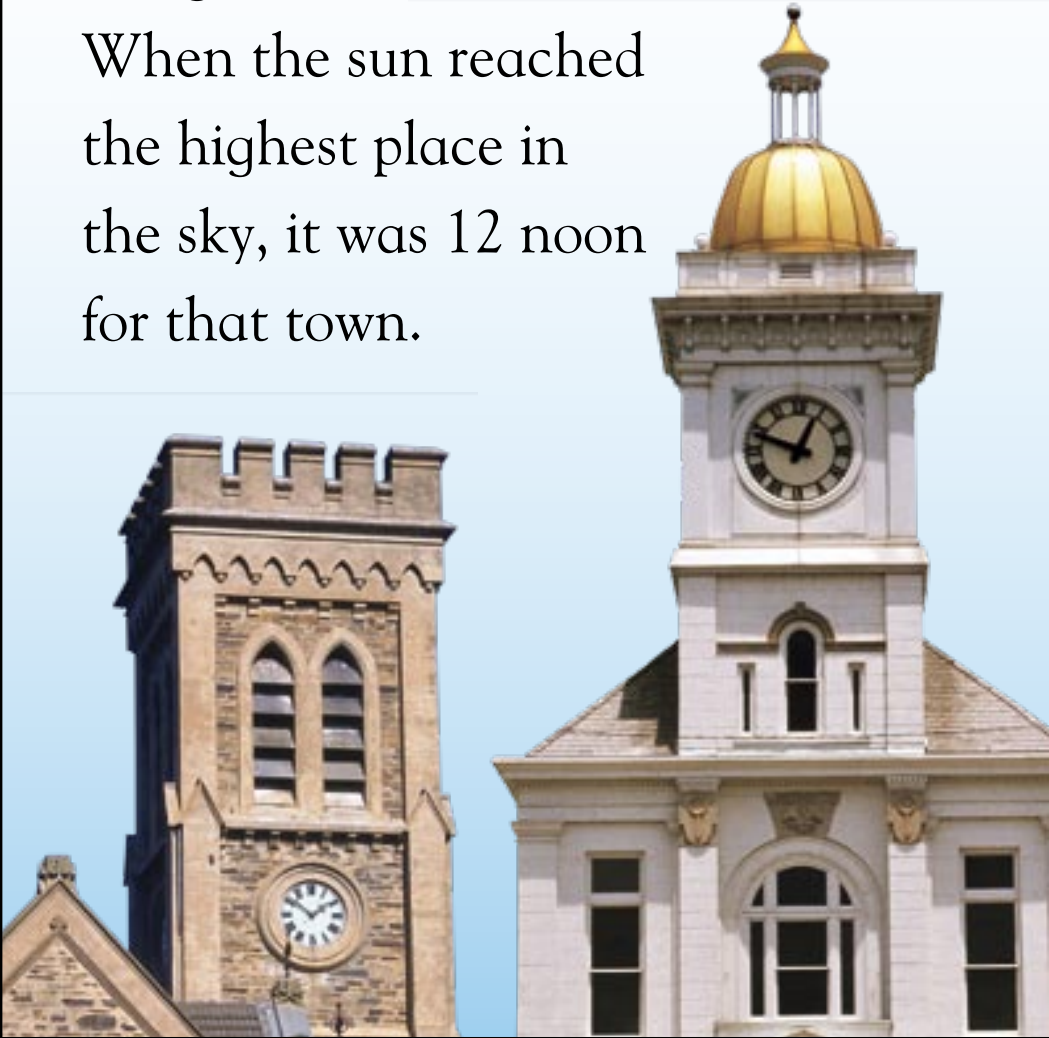
1657



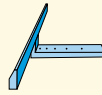
1759

Clocks had problems on land, too.
Each town set its clocks
using the sun.

When the sun reached
the highest place in
the sky, it was 12 noon
for that town.



Timeline



Prehistoric times *3500 BCE* *1500 BCE* *1400 BCE* *1300*

Since the sun reaches the highest place in the sky at different times in different places, every town had its own 12 noon!
Time was different all over the place.
It was a mess!



1500



1657



1759

Many people thought it was silly for every town to have its own time. They asked questions like:

“How can railroads and mail coaches run on time?”

“How can people meet for lunch or do business?”

“How can we fix this problem?”

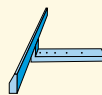
Sandford Fleming, a railroad worker, knew the answer.

Greenwich Mean Time

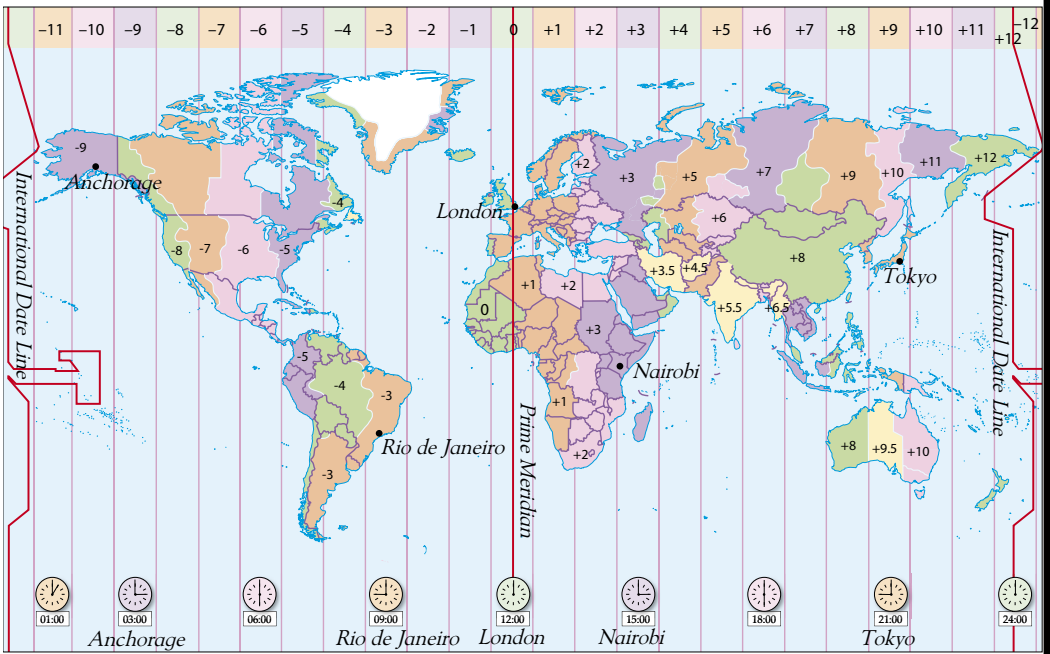
Greenwich Mean Time (GMT) is the time in Greenwich, England. Each time zone was described by how many hours away from GMT it was.



Timeline



Prehistoric times *3500 BCE* *1500 BCE* *1400 BCE* *1300*



A map of the world's time zones

His idea was to divide the world into 24 time zones.

Each zone was exactly one hour apart from its neighbors.

Now, time was the same for everyone in each zone.



1500



1657



1759

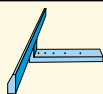


1884



In the 1880s, women were the first to wear wristwatches. After soldiers wore them in World War I, men liked to wear them as well.

Timeline



Prehistoric times 3500 BCE 1500 BCE 1400 BCE 1300

Later, watches with tiny quartz crystals inside would become the best timekeepers.



Quartz crystal

The crystals moved like pendulums, but kept even better time.

Quartz watches are still popular today.



Quartz watch

Digital quartz watches

In 1972, quartz watches went digital. A display of numbers appeared instead of a clock face.



1500



1657



1759

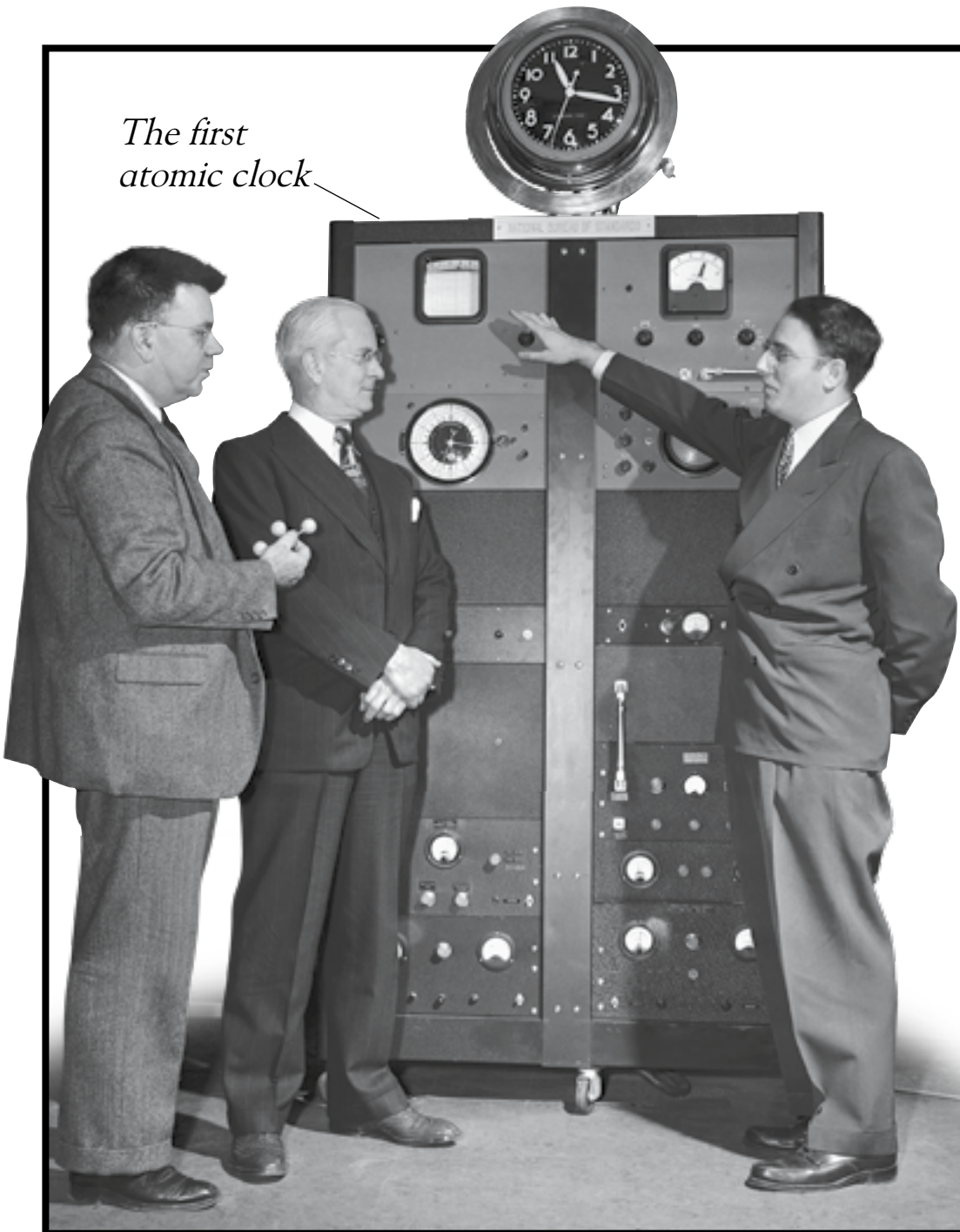


1884

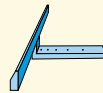


1885

The first atomic clock



Timeline



Prehistoric times

3500 BCE

1500 BCE

1400 BCE

1300

Quartz watches no longer keep the most exact time.

What does?

Atomic clocks do!

Atomic clocks use atoms—tiny particles, too small for us to see—to help tell time.

The atoms act like pendulums.

They move backward and forward billions of times per second.

This lets atomic clocks tell time to a billionth of a second.

Modern atomic wristwatch



1500



1657



1759



1884



1885



1949

Exact timekeeping

In 1999, scientists invented the world's most exact clock. It is called NIST-F1. It will not gain or lose a second in millions of years.



*Space
travel*

So, why do we need to tell time to a billionth of a second?



Satellites



Radio and television broadcasts

Many forms of technology that we use today need the split-second time of an atomic clock to work.

These pages show just a few examples.




Cell phones

Today, clocks
come in all
shapes, sizes,
colors, and
styles.

Some flash,
make sounds,
play music,
or say
the time
out loud.

Others time
how fast
you run.



A large red alarm clock frame is the central focus, containing several smaller images of timepieces. At the top is a yellow bell. Below it is a silver analog clock. In the center is a circular inset showing a building with a dome. Below that is a green analog clock. At the bottom is a circular inset showing a hand holding a blue digital stopwatch.

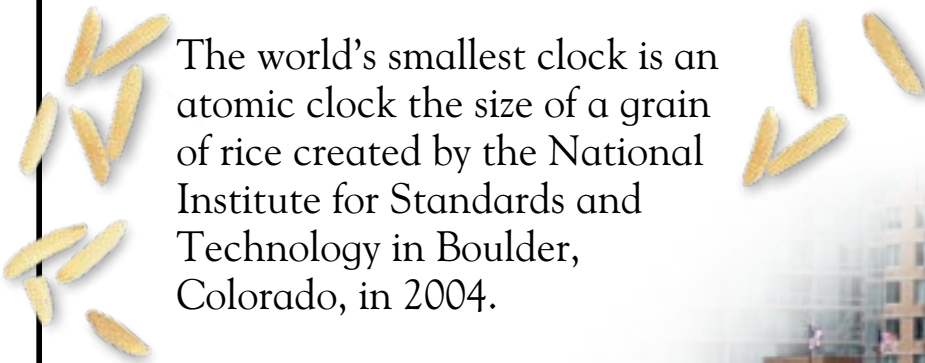
These timepieces
are very different
from the early
sundials,
obelisks, and
water clocks.
But one thing
is the same.
They help us
plan our day,
so that we
can be sure
to always be
on time!



Timely facts

Long-case clocks were built to hide their long pendulums. The song “Grandfather’s Clock” written in 1876, inspired people to call them grandfather clocks.

The ancient Egyptians were the first people to divide the hour into 60 parts, or minutes. Their number system was based on the number 60, which is easy to divide by 2, 3, 4, 5, and 10.



The world’s smallest clock is an atomic clock the size of a grain of rice created by the National Institute for Standards and Technology in Boulder, Colorado, in 2004.

The Colgate Palmolive clock is one of the world’s biggest clocks. It measures 55 feet (16.8 m) around! It is located in Jersey City, New Jersey. It was built in 1924.



Level 2

Dinosaur Dinners	Outback Adventure: Australian Vacation
Bugs! Bugs! Bugs!	Sniffles, Sneezes, Hiccups, and Coughs
Slinky, Scaly Snakes!	Starry Sky
Animal Hospital	Earth Smart: How to Take Care of the Environment
The Little Ballerina	Water Everywhere
Munching, Crunching, Sniffing, and Snooping	Telling Time
The Secret Life of Trees	Ice Skating Stars
Winking, Blinking, Wiggling, and Wagging	Let's Go Riding!
Astronaut: Living in Space	I Want to Be a Gymnast
Twisters!	LEGO: Castle Under Attack
Holiday! Celebration Days around the World	LEGO: Rocket Rescue
The Story of Pocahontas	Star Wars: Journey Through Space
Horse Show	MLB: A Batboy's Day
Survivors: The Night the Titanic Sank	MLB: Let's Go to the Ballpark!
Eruption! The Story of Volcanoes	<i>iInsectos! en español</i>
The Story of Columbus	<i>iBomberos! en español</i>
Journey of a Humpback Whale	La Historia de Pocahontas <i>en español</i>
Amazing Buildings	Meet the X-Men
Feathers, Flippers, and Feet	Spider-Man: Worst Enemies

Level 3

Spacebusters: The Race to the Moon	Spiders' Secrets
Beastly Tales	The Big Dinosaur Dig
Shark Attack!	Space Heroes: Amazing Astronauts
Titanic	The Story of Chocolate
Invaders from Outer Space	School Days Around the World
Movie Magic	LEGO: Mission to the Arctic
Plants Bite Back!	NFL: Super Bowl Heroes
Time Traveler	NFL: Peyton Manning
Bermuda Triangle	NFL: Whiz Kid Quarterbacks
Tiger Tales	MLB: Home Run Heroes: Big Mac, Sammy, and Junior
Aladdin	MLB: Roberto Clemente
Heidi	MLB: Roberto Clemente <i>en español</i>
Zeppelin: The Age of the Airship	MLB: World Series Heroes
Spies	MLB: Record Breakers
Terror on the Amazon	MLB: Down to the Wire: Baseball's Great Pennant Races
Disasters at Sea	Star Wars: Star Pilot
The Story of Anne Frank	The X-Men School
Abraham Lincoln: Lawyer, Leader, Legend	Abraham Lincoln: Abogado, Líder, Leyenda <i>en español</i>
George Washington: Soldier, Hero, President	Al Espacio: La Carrera a la Luna <i>en español</i>
Extreme Sports	

Index

- ancient Egyptians 8, 10, 11, 12, 32
ancient Greeks 12
atomic clock 26, 27, 29, 32
Colgate Palmolive clock 32
cuckoo clock 17
digital quartz watches 25, 27
Fleming, Sandford 22
Galilei, Galileo 16
gnomons 8
grandfather clocks 32
Greenwich Mean Time 22
H4 chronometer 19
Harrison, John 19
hourglasses 18
Huygens, Christiaan 17
merkhets 11
moon 7
NIST-F1 28
obelisks 8, 9, 31
pendulum 17, 25, 27
pendulum clocks 17, 18
pocket watches 15
quartz crystals 25
springs 15
stars 7
sun 7
sundials 9, 10, 11, 31
Sung, Su 13
time zone 22, 23
water clocks 12, 13, 31
weight-driven clocks 14
weights 14, 15, 16, 17
wristwatches 24

 READERS

My name is _____

I have read this book



Date _____