ROYAL OBSERVATORY GREENWICH

The Spinning Earth

Key Stage 2

Topics covered: Earth, Sun, day and night, time, angles, fractions

Teacher's Notes

In this activity pupils are introduced to the rotating Earth and the concept of longitude. They will carry out simple arithmetic involving angles that relates the 24 hour clock with the Earth's rotation.

Equipment: a ball, a torch, a Lego man or cardboard man, pencils, extra paper for calculations (if required).

Class demonstration before the activity:

Hold the ball so that you can spin it with the axis of rotation pointing toward the students. Explain that the ball represents the Earth and that they are looking down on the North pole. Ask a volunteer to stand to one side and shine the torch to represent the Sun. Attach the Lego man to the top of the ball using blu-tack. Rotate the ball so that the Lego man is in darkness and ask what time of day the model represents. Rotate through 'sunrise', 'midday' and 'sunset' and repeat the question.

Questions to ask the class before the activity:

How long does it take the Earth to spin round once on its axis?
Answer: 24 hours.

Where are we on the Earth relative to the Sun at night time?
Answer: On the other side of the Earth, away from the Sun.

What about at midday?
Answer: On the side of the Earth directly facing the Sun.

How many hours pass from midday to midnight?
Answer: 12 hrs

What fraction of the day is 12:00 pm to 12:00 am?
Answer: a half

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Questions to ask the class after the activity:

What is the angle of a full circle?
Answer: 360^0

What is the angle of a straight line?
Answer: 180^0

On a standard 12 hour clock, what is the angle between 12:00 and 3:00? (you may wish to draw this on the board)
Answer: 90^0

What is the angle between 12:00 and 1:30?
Answer: 45^0

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The Spinning Earth: Answers

How many hours would it take the Earth to rotate by 30°?
Answer: The Earth rotates through 15° each hour so to rotate through 30° degrees it would take 2 hours.

This is a 24 hr clock. What is the angle of each section (hour)?
Answer: 15°

What time is 16:00 hours? Is it morning or afternoon?
Answer: 4:00 pm

What time is 22:30?
Answer: 10:30 pm

What do 00:00 and 12:00 hours signify?
Answer: 00:00 = midnight (the start of a new day), 12:00 = midday

How many degrees will the Earth have rotated through from 04:00 to 06:00?
Answer: 2 x 15 = 30°

How many degrees will the Earth have rotated through between 12:00 and 16:00?
Answer: 4 x 15 = 60°

How many degrees will the Earth have rotated through from 12:00 to 21:00? What time is 21:00?
Answer: 9 x 15 = 135°, 21:00 = 9:00 pm

How many degrees will the Earth have rotated through from 12:00 to 00:00?
Answer: 180° (straight line)

What is the angle of rotation from 06:00 to 12:00? What fraction of a circle is this?
Answer: 90°, ¼

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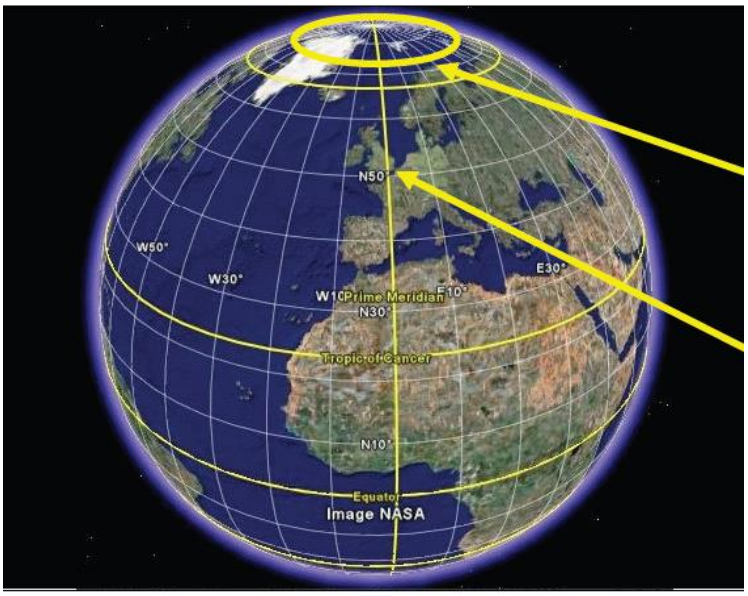
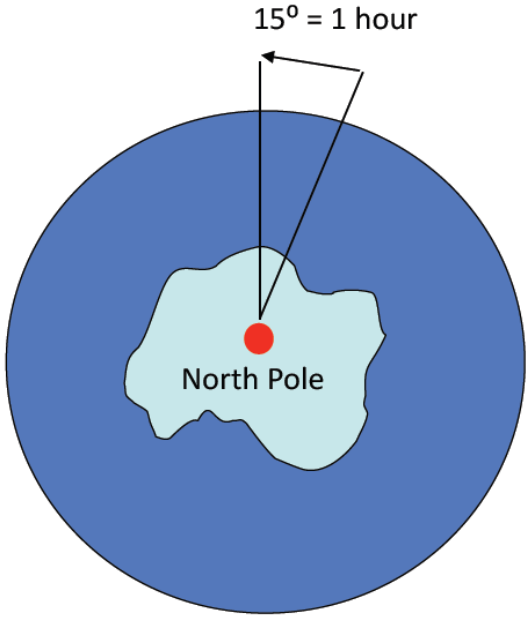
Activity: The Spinning Earth



We use a system of imaginary lines to tell us where we are on the surface of the Earth.
A series of imaginary circles – called ***lines of latitude*** – tell us how far North or South of the Equator we are. Imaginary arcs called ***lines of longitude*** tell us how far East or West of Greenwich we are. These lines split the Earth into segments, like the wedges of an orange.

There are 360 segments of latitude, each covering an angle of 1 degree. This is written like this: 1^0

The total angle of all of the segments in a circle is 360^0. As the Earth spins on its axis, we rotate through a full circle of 360^0 in 24 hours. We rotate by 15^0 every hour. We get this value by dividing 360^0 by 24 hours.



How many hours does it take the Earth to rotate by 30^0?

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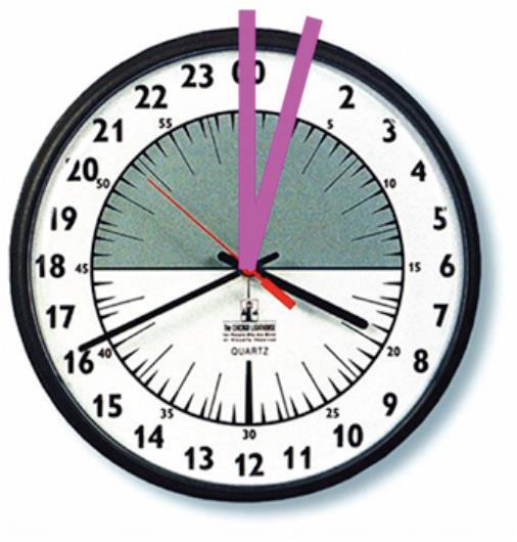
Hours and Angles

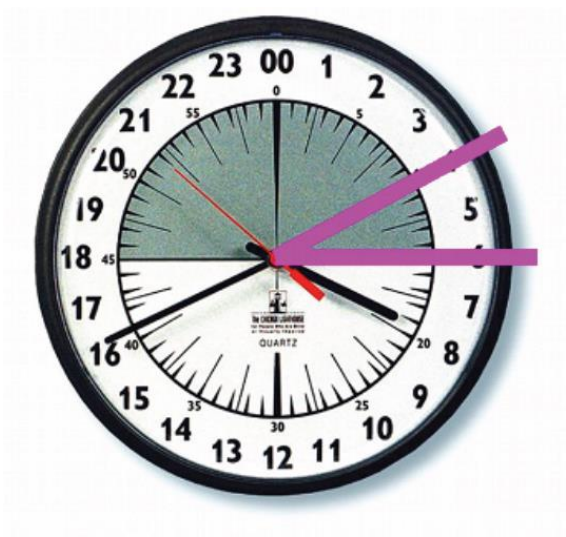


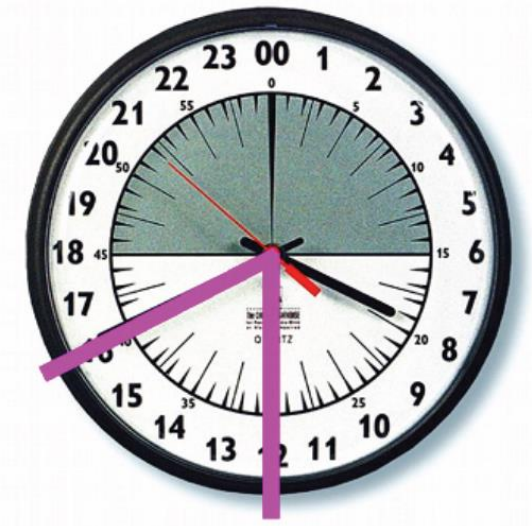
This is a 24 hour clock. It is split into 24 sections. What is the angle of each section (or hour)?

What time is 16:00 hours? Is it morning or afternoon?

What time is 22:30?

What times are 00:00 hours and 12:00 hours?





Look the clock on the left. By how many degrees will the Earth rotate from 04:00 to 06:00?

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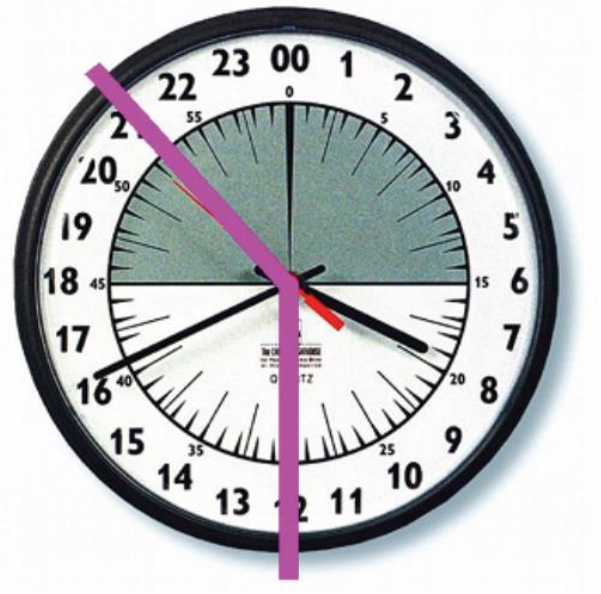
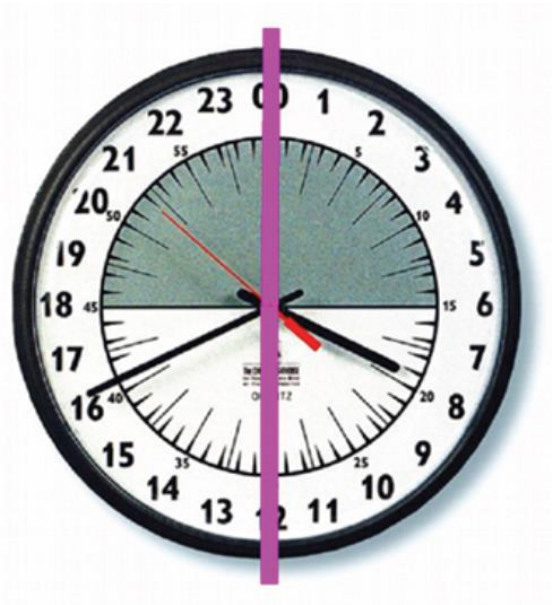
Look at the clock on the right. By how many degrees will the Earth rotate from 12:00 to 16:00?



What time is 21:00? How many degrees will the Earth have rotated through from 12:00 to 21:00?



Look at the diagram on the left.
How many degrees will the Earth have rotated through from 12:00 to 00:00? This is the angle of a straight line.

What is the angle between 6:00 and 12:00? This is called a right angle. What fraction of a circle is this?