

## Earth, Sun and Moon






















Earth, Sun and Moon is a set of interactives designed to support the teaching of the QCA primary science scheme of work 5e - 'Earth, Sun and Moon'.

Learning Connections Primary Science Interactives are teaching tools which have been created with interactive whiteboards in mind but can be used on a personal computer by small groups of children or by individuals.

There are five interactives on the CDROM:

- |                                 |   |
|---------------------------------|---|
| <b>How big, how far</b>         | <ul style="list-style-type: none"><li>▪ compare the relative sizes of the Sun, Earth and Moon and the distances between them</li></ul>  |
| <b>Day and night</b>            | <ul style="list-style-type: none"><li>▪ observe the Earth rotating once every 24 hours</li><li>▪ view a moving 24 hour clock as the Earth rotates</li><li>▪ view a changing shadow stick during daylight hours</li><li>▪ pause the animations at any hour of the day or night</li></ul>             |
| <b>The Moon's orbit (side )</b> | <ul style="list-style-type: none"><li>▪ observe the Moon's 28 day orbit of the Earth in 3D</li><li>▪ see the changing shape of the visible Moon</li><li>▪ see the Moon's orbit in plan view</li><li>▪ pause the animations on any day throughout the month</li></ul>                                |
| <b>The Moon's orbit (plan)</b>  | <ul style="list-style-type: none"><li>▪ observe the Moon's 28 day orbit of the Earth in plan view</li><li>▪ see the changing shape of the visible Moon</li><li>▪ overlay a sight line to explain the visible Moon's changing shape</li><li>▪ pause the animations on any day of the month</li></ul> |
| <b>The Earth's orbit</b>        | <ul style="list-style-type: none"><li>▪ observe the Earth's 52 week orbit in 3D</li><li>▪ view the orbit in plan view</li><li>▪ see how the tilt of the Earth's axis causes daylight hours to change over the year</li><li>▪ pause the animations at any week of the year</li></ul>                 |

Earth, Sun and Moon can be used to support learning across the scheme of work. The table below shows which interactives can be used to support individual objectives.

Children should learn	Interactive title				
	How big, how far	Day and night	The Moon's orbit (side )	The Moon's orbit (plan)	The Earth's orbit
that the Sun, Earth and Moon are approximately spherical					
about the relative sizes of the Sun, Moon and Earth					
that the Sun appears to move across the sky over the course of a day					
that it is the Earth that moves, not the Sun, and the Earth spins on its axis once every 24 hours					
that it is daytime in the part of the Earth facing the Sun and night-time in the part of the Earth away from the Sun					
that the Sun rises in the general direction of the East and sets in the general direction of the West					
that the Earth takes a year to make one complete orbit of the Sun, spinning as it goes					
that the Moon takes approximately 28 days to orbit the Earth					
that the different appearance of the Moon over 28 days provides evidence for a 28-day cycle					

This table shows where the interactives provide coverage of the objectives from the scheme of work.

### Children should learn

that the Sun, Earth and Moon are approximately spherical	<b>All interactives</b> show that the Earth, Sun and Moon are spherical. This is reinforced by the 3D views of the Earth and Moon's orbits.
about the relative sizes of the Sun, Moon and Earth	<b>How big, how far</b> shows the relative sizes of the Earth, Sun and Moon.
that the Sun appears to move across the sky over the course of a day	<b>Day and night</b> has an option to view the Sun appearing to move across the sky as the Earth rotates and the resulting length of the shadow created by a stick in the ground.
that it is the Earth that moves, not the Sun, and the Earth spins on its axis once every 24 hours	<b>Day and night</b> animates the Earth's rotation which can be paused at any hour. <b>The Moon's orbit (side and plan)</b> show the Earth rotating once per day throughout the 28 day orbit.
that it is daytime in the part of the Earth facing the Sun and night-time in the part of the Earth away from the Sun	<b>Day and night</b> and <b>The Moon's orbit (side and plan)</b> show the Earth illuminated by the Sun so that half is in the light and half in darkness. <b>The Earth's orbit</b> has an option to observe how the tilt of the Earth's axis affects daylight hours throughout the year.
that the Sun rises in the general direction of the East and sets in the general direction of the West	<b>Day and night</b> has an option to view the Sun appearing to move across the sky from East to West as the Earth rotates.
that the Earth takes a year to make one complete orbit of the Sun, spinning as it goes	<b>The Earth's orbit</b> shows a 3D view of the Earth as it orbits the Sun in a 52 week cycle. The animation can be paused at any week during the year.
that the Moon takes approximately 28 days to orbit the Earth	<b>The Moon's orbit (side and plan)</b> show the Moon orbiting the Earth in a 28 day cycle. The Earth is shown rotating once every day and the visible shape of the Moon can be seen changing over 28 days. The animation can be paused at any time during the month.
that the different appearance of the Moon over 28 days provides evidence for a 28-day cycle	<b>The Moon's orbit (side and plan)</b> shows the Moon rotating once every 28 days to explain why the visible Moon's face is always the same. The sight line option demonstrates why the visible shape of the Moon changes.

## Index

The index page is where you access each of the five Primary Science Interactives and the teaching notes.

It's also the place where you exit the program.

### Buttons

The buttons, used throughout the interactives, can be clicked with a mouse-button, or touched on an interactive whiteboard, to run parts of the program and to control animations.



#### Play

Click on the **play** button, next to a title to run the interactive. The play button is also used in interactives to play animations that have been paused.



#### Pause

Click on the **pause** button to stop an animation. Click on the **play** button to resume the animation.



#### Help

Click on the **help** button to display or hide the on-screen help.



#### Index

Click on the **index** button to return to the index.

## How big, how far



**How big, how far** shows the relative sizes of the Sun, Earth and Moon and the distance from the Earth to the Moon in relation to the size of the Sun.

Only part of the Sun is shown – otherwise the Earth and Moon would not be visible.



Click on the information button to reveal some facts about the Sun, Earth and Moon.

### Earth, Sun and Moon facts

Distance from the Earth to the Sun - 149,597,890 km

Distance from Earth to the Moon - 384,467 km

#### Diameter

Sun - 1,391,940 km

Earth - 12,742 km

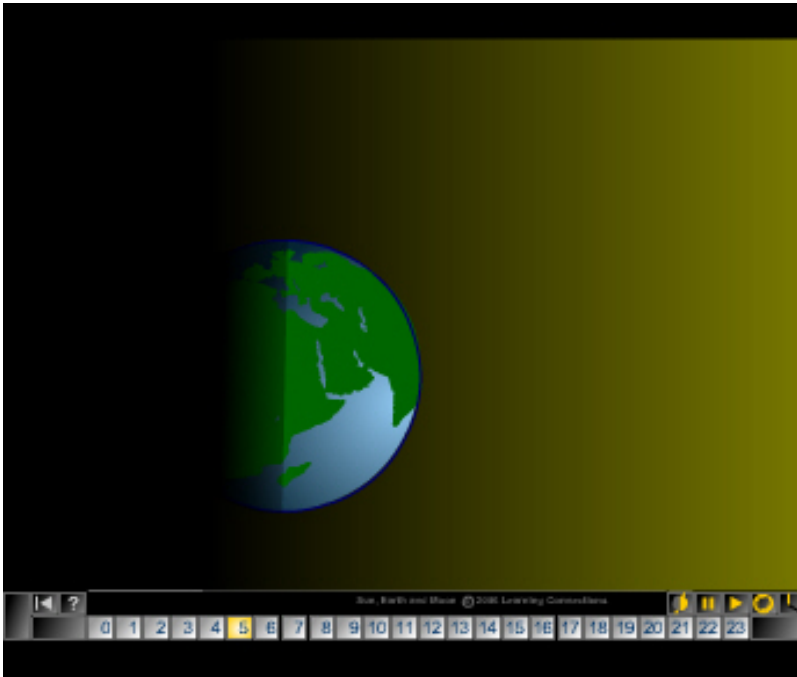
Moon - 3,476 km

The diameter of the Sun is about 100 times bigger than the Earth and 400 times bigger than the Moon.

If the Sun was as big as a soccer ball, the Earth would be about the size of a small dried pea. The distance between them would be 2.3 m.

You could fit 107 Suns between the Sun and the Earth

## Day and Night



**Day and night** allows you to see the Earth rotating once every 24 hours.

Sunlight, coming from the right of the screen, illuminates one side of the Earth (day) while the other side is in shade (night).



The current hour is shown highlighted on the hour buttons at the bottom of the screen.

Click on an hour button to pause the animation at that hour.

Click on the **play** button to resume the animation



Click on the **Earth axis** button to view or hide a line which represents the axis running from North to South.



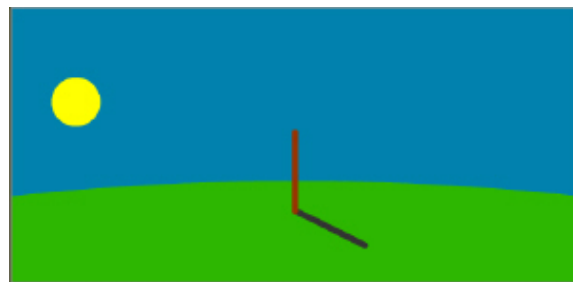
### Clock

Click on the **clock** button to view or hide a 12 hour clock which shows the time as the Earth rotates.



### Shadow stick

Click on the **shadow stick** button to view or hide the shadow stick animation. This represents the apparent movement of the Sun across the sky during the day and its effect on the shadow cast by a stick in the ground.

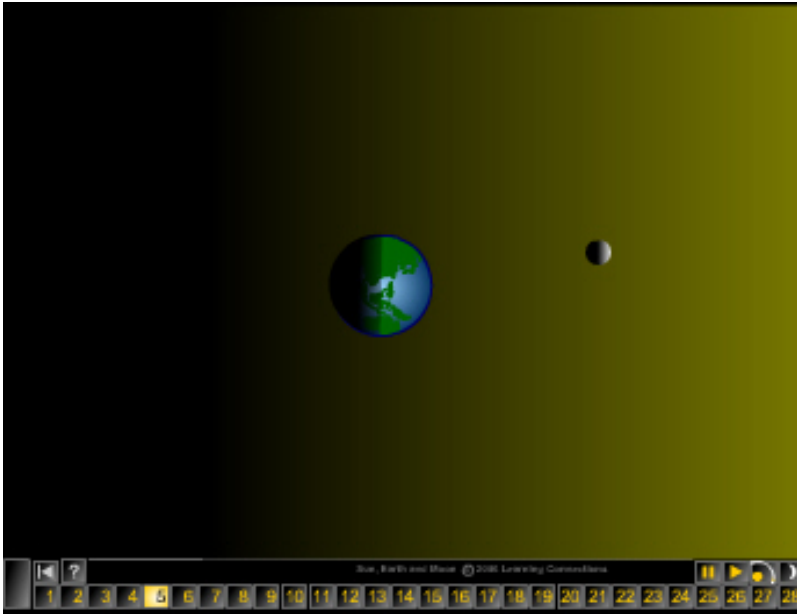


The animation works on a 12 hour day/night cycle – i.e. in Spring or Autumn.

### Teaching points

- Run the animation to show that the Earth is revolving on its own axis.
- Point out that the different parts of the Earth move into the sunlight during the 24 hour period.
- Locate the UK on the globe and use the hour buttons to step through 24 hours seeing when the UK is in the light and when it is in the dark. Display the shadow stick animation to reinforce the point.
- Display the Earth's axis ( which is tilted to  $23.5^\circ$  ) to lead into discussions about seasons.

## The Moon's orbit (side view)



**The Moon's orbit (side view)** allows you to see the Moon orbiting the Earth once every 28 days.

The 3D animation shows the Moon moving further away from the view point as it moves behind the Earth and nearer as it moves in front of the Earth.

Sunlight, coming from the right of the screen, illuminates one side of the Earth and the Moon.



The current day is shown highlighted on the day buttons at the bottom of the screen.

Click on a day button to pause the animation at that day. Click on the **play** button to resume the animation



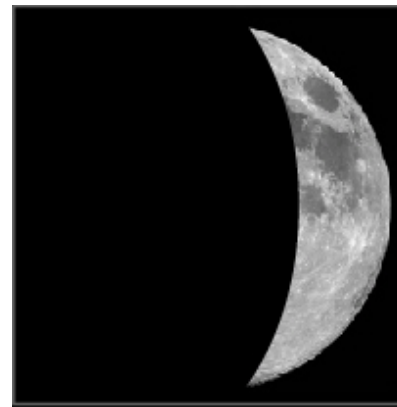
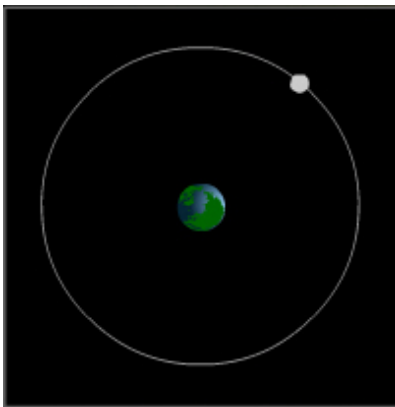
### Plan view

Click on the **plan view** button to view a plan of the Moon's orbit.



### Moon phase

Click on the **Moon phase** button to view or hide the Moon phase display which shows how the Moon would look from the UK on the current day.



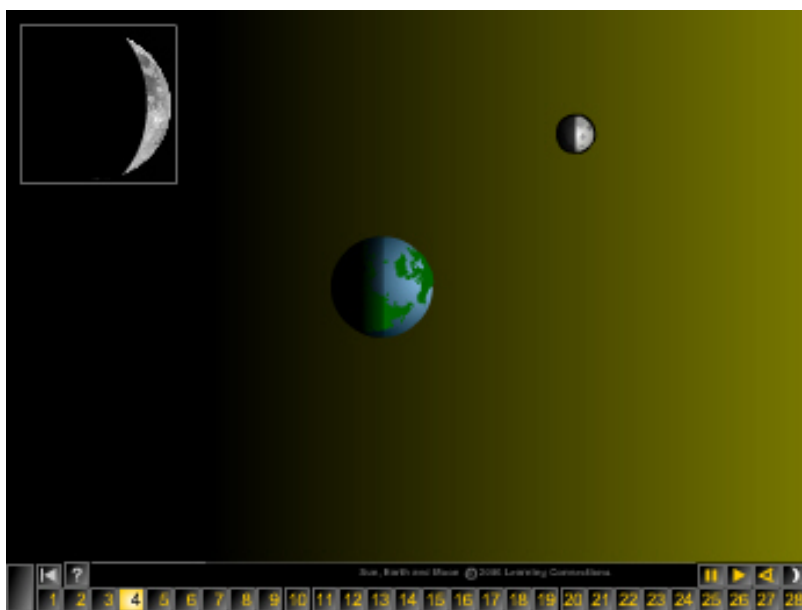
### Teaching points

- Run the animation to show that the Moon orbiting the Earth which is revolving on its own axis.
- Use the day buttons to step through the animation to show that the Moon is moving in a circular orbit around the Earth in a 28 day cycle. Use the Plan View to reinforce this idea.
- Point out that half of the Moon is always illuminated by the Sun while the other half is in the shade.
- Click on day 1 and point out that the Moon's illuminated side is away from the Earth so it is not visible. This is known as a 'New Moon'. Display the Moon phase window with no visible Moon in it.
- Click on day 15 to show that the illuminated side of the Moon is facing the Earth so that it is fully visible – a 'Full Moon'.

### Note

The distance between the Earth and the Moon, in relation to their size is not shown to scale. If it was, the Moon would be much further away than is shown.

## The Moon's orbit (plan view)



**The Moon's orbit (plan view)** allows you to see the Moon orbiting the Earth once every 28 days.

Sunlight, coming from the right of the screen, illuminates one side of the Earth and the Moon.



The current day is shown highlighted on the day buttons at the bottom of the screen.

Click on a day button to pause the animation at that day. Click on the **play** button to resume the animation

**Note** The distance between the Earth and Moon, in relation to their sizes, is not shown to scale.



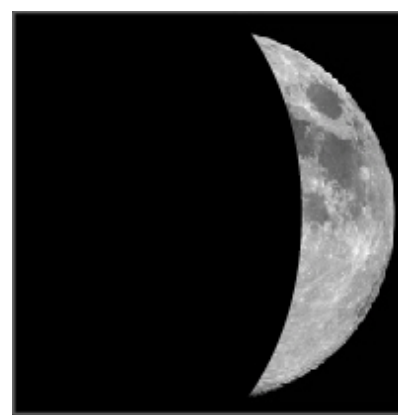
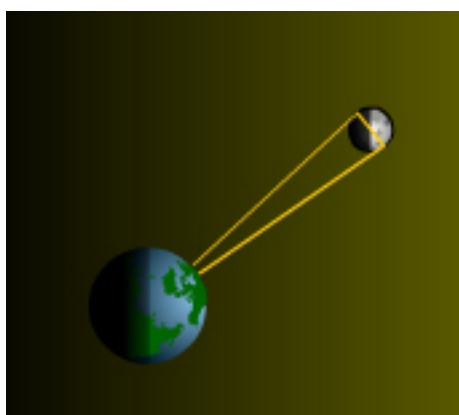
### Sight line

Click on the **sight line** button to display an area to represent the part of the Moon can be viewed from Earth.



### Moon phase

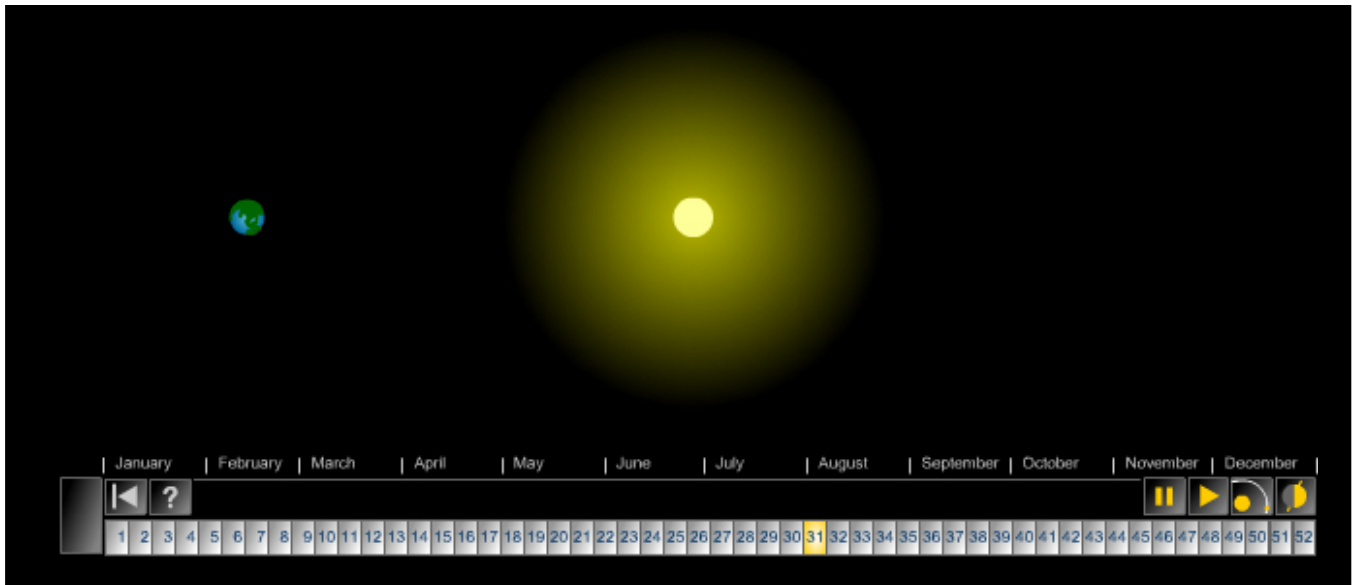
Click on the **Moon phase** button to view or hide the Moon phase display which shows how the Moon would look from the UK on the current day.



### Teaching points

- Run the animation to show that the Moon orbiting the Earth which is revolving on its own axis. Remember that the view is from above.
- Use the day buttons to step through the animation to show that the Moon is moving in a circular orbit around the Earth in a 28 day cycle.
- Point out that half of the Moon is always illuminated by the Sun while the other half is in the shade.
- Display the sight line and the Moon phase view and use the day buttons to step through the cycle. Compare the Moon phase with the area within the sight line.
- Note that the Moon revolves on its axis once every 28 days. This is why it always has the same face towards the Earth.

## The Earth's orbit



The **Earth's orbit** allows you to observe the Earth's 52 week orbit around the Sun.



The current week is shown highlighted on the week buttons at the bottom of the screen. The 3D animation shows the Earth moving further away from the view point as it moves behind the Sun and nearer as it moves in front of the Sun.

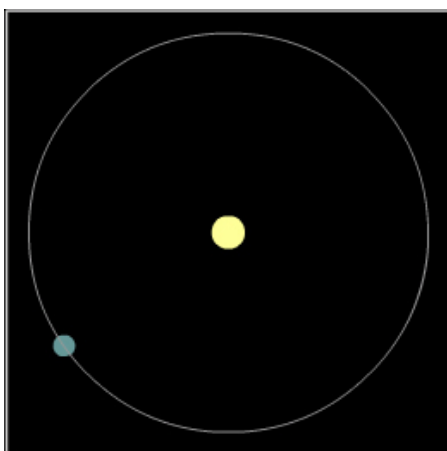
Click on a **week** button to pause the animation at that week. Click on the **play** button to resume the animation

**Note** The distance between the Earth and Sun, in relation to their sizes, is not shown to scale.



### Plan view

Click on the **plan view** button to show or hide a plan view of the Earth's orbit.



### Seasons

Click on the **Seasons** button to view or hide the seasons display which demonstrates how the tilt of the Earth's axis causes the seasonal changes in day length throughout the year.



Click on the **step** button to pause the animation at each hour throughout the day.

### Teaching points

- Run the animation to show that the Earth orbiting the Sun. Display the plan view to reinforce the point.
- Use the week buttons to step through the animation to show that the Earth is moving in a circular orbit around the Sun in a 52 week cycle.
- Remember that the Earth is revolving on its own tilted axis, once every day, as it orbits the Sun.

### Explaining the seasons

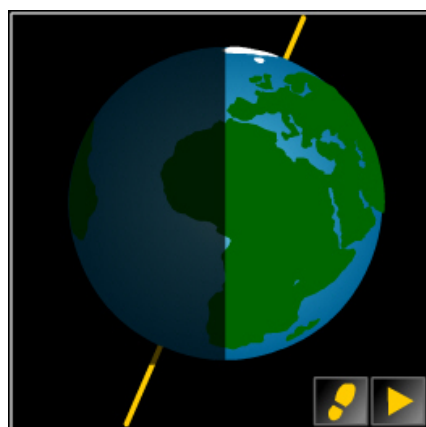


The UK experiences seasonal changes because the Earth's axis is tilted (about 23° from the perpendicular).

This causes more sunlight to fall on the northern hemisphere in Summer and less in Winter. The southern hemisphere is the opposite.

Click on **week** button 1 to pause the animation and open the **seasons viewer** to show the Earth as it is in Winter – with its axis tilted away from the Sun.

Click on the **step** button and step through the day, hour by hour, noting how many hours the UK is in daylight.



Now click on **week** button 27 to show the Earth in mid-Summer and note that the Earth's northern hemisphere is tilted towards the Sun.

Click on the **step** button and step through the day, hour by hour, noting how many hours the UK is in daylight compared to week 1.