

BBC



Pre-Investigation Activities:

What are time zones?

What is Greenwich Mean Time?

Investigation 3 - Time

Teacher Resource





Introduction

Watch:

Stargazing LIVE have produced a number of films linked to the theme of Earth and Space. Please check the Terrific Scientific website for the links to these films.

Note:

These optional activities help to set the bigger picture and provide a deeper insight into the concept of timekeeping. We recommend you work through them with your class before the week of the main Time investigation.

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Throughout history, from Egyptian shadow clocks to Mayan calendars, humanity has always linked space and time together. We are space travellers; each day our planet is hurtling around its path within the solar system as we orbit our nearest star, the Sun. We also notice the effect of the Earth spinning on its axis, each rotation taking 24 hours, thus creating night and day. This period is subdivided into smaller units of time - hours and minutes; each fragment of time, not only marking life on earth, but our journey through the solar system.

In order to help children to understand the ideas of day, night and time zones they are going to create simple models and follow the activities provided below. Scientists often use models to explore or communicate an idea that cannot be experienced directly. Physical models are a great way for children to explore ideas in astronomy.

Learning intention

- **Consolidate** the children's understanding of day and night.
- Use modelling to **support** the children's understanding of time zones.
- **Develop** observational skills and encourage children to draw simple conclusions from their observations using scientific language.



Children will show evidence of learning by:

Duration:



These activities should take around 1 hour to complete.

- **Creating** a model to demonstrate day and night.
- **Explaining** that the Earth rotates on its axis.
- **Demonstrating and explaining** that the Sun's apparent movement across the sky is not caused by the Sun moving, but by the rotation of the Earth.
- **Giving an example** of what might be happening in two different time zones at the same moment on Earth.

Resources needed

- Internet connected display to show video (optional).
- White card printed with sundial templates (provided) OR protractors and plain white card.
- Cocktail sticks.
- Sticky tack or Plasticine.
- Scissors.
- Globes or dark coloured beach balls / footballs / basket balls or polystyrene balls.
- Torches.
- Plastic mini figures.
- Darkened classroom.



Health and safety and control measures

Important!



Looking straight at the Sun can cause damage to the eyes, so warn pupils not to look directly at it. Sunglasses offer no effective protection and telescopes or binoculars should never be used. Looking at the Sun is not needed for any of these activities.

The BBC deems this activity safe if following some basic precautions. It is your responsibility as a School to carry out your own risk assessment. We recommend you consider the risks and mitigations we have described in this activity pack, as well as any risks which may be relevant to your specific class environment.

The children will be required to insert a cocktail stick into their cardboard sundial. In order to do this safely they should place a blob of sticky-tack or plasticine behind the card. Place the card onto the table and then press the pointed end of the cocktail stick downwards through the card into the sticky-tack or plasticine, which can then be used to secure the stick in place.

Activity one:

Instructions

Learning Objective: To model day & night

Practise with these models yourself before the children explore them.

1. Darken your classroom to a safe level.
2. Split class into groups of 2 or 3 and give each group a torch, a mini figure, sticky tack and a globe.
3. Show the class this Bitesize clip which explains how to model day and night: bbc.co.uk/education/clips/zkynvcw
4. Now ask the children to model how you get day and night and to explain this idea to their group.

Watch this clip:



How to model day and night: bbc.co.uk/education/clips/zkynvcw



Important!



Make sure that one of the children in the group holds the torch still (they are the sun!) and another child rotates the globe. The torch (sun) should not move!

Watch this clip:



Watch the Brain Freeze film:
How does the Earth spin on its axis?

<https://bbc.co.uk/guides/z8cjp bk>

Check the children know that it takes 24 hours for the Earth to rotate on its axis. The children should shine the torch at the globe and indicate that the part of the Earth bathed in light is in daytime, whilst the part of the Earth in darkness is in night time.

Check that they understand that the Earth rotates and the Sun stays where it is.

Ask the children what is the difference between day-time and night-time?

5. Now ask the children to stick a mini figure on their globe and use their model to answer:
 - What would the mini figure person be doing at different points over 24 hours?
 - Where is the Sun in the sky? The children might explain the apparent movement of the Sun across the sky from sunrise to sunset.
 - What happens to the length of the shadow cast by the mini figure over the day?
 - When is its shadow shortest?
 - Where is the Sun when the shadow is shortest?

At sunrise the figure's shadow is pointing towards the west, ending the day with the shadow pointing east. The shadow should be at its shortest at midday or local noon. At local noon the Sun is directly overhead or at its highest point in its path across the sky.

Local noon happens at different longitudes at different moments. So, if 12 o'clock is our time at midday or local noon, we must have different times if we're at different longitudes. This would be inconvenient if we used minutes of difference, so we use hours instead and have "time zones" which advance by one hour as we move east around the globe.

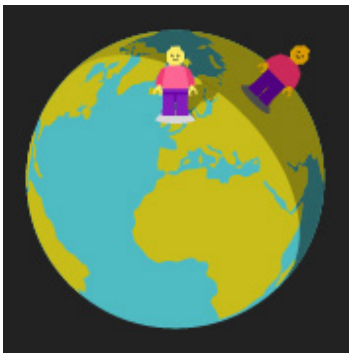


Activity two:

Instructions

Learning Objective: To explore why people across the Earth live in different time zones.

1. Set up your globe with one mini figure on the UK and another figure on another country on the other side of the globe. Make sure your “Sun” is shining directly towards the globe, illuminating the UK as shown below.



This shows that at the same moment on Earth, it is day in one place (UK) and night in another (Russia).

2. Ask the children:
 - What time of day is it in the UK?
 - Is the figure in daylight or night time?
 - Now look at your other figure.
 - Are they in day time or night time?
 - How do you know?
 - What time do you think it is there?



Important!



Instruct children to hold the cocktail stick in the centre between their thumb and forefinger before pressing downwards. Warn children that they should not place their hands on the pointed end of the stick to push downwards.

Activity three:

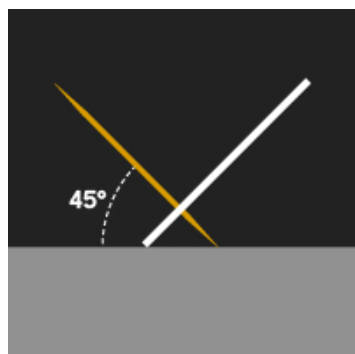
Instructions

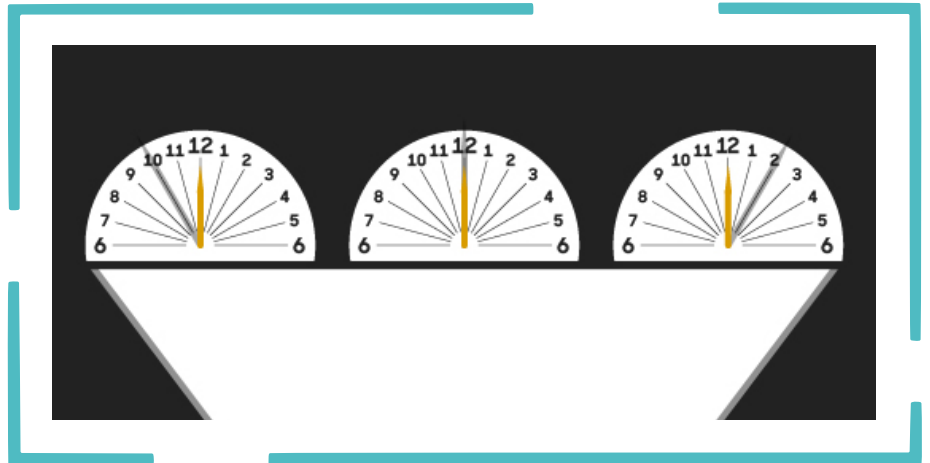
Learning Objective: To explore how shadow position can be used to tell the time.

A common misconception children have is the Sun moves across the Earth. However it is the Earth's rotation that changes the position in which we see the Sun at different times. The following models help children to see how the Earth's rotation causes the position of shadows, caused when sunlight is blocked, to move.

This activity should be done individually to ensure that children manipulate the model and see the changes clearly.

1. Cut out the sundial template. (Available at the end of this activity sheet).
2. The children should place a blob of sticky-tack underneath the template. Stick the sharp end of the cocktail stick through the cross in the centre. Instruct children to hold the cocktail stick in the centre between their thumb and forefinger before pressing downwards. Warn children that they should not place their hands on the pointed end of the stick to push downwards. The sundial base should then rest at an angle of approximately 45 degrees against the stick, which you can secure in place using sticky-tack. The children should place the sundial directly in front of them with the gnomon, or shadow-casting (cocktail) stick, pointing upwards.
3. Find out where the torch which represents the Sun needs to be for the sundial to say 12noon. Try making the sundial say 6am / 9am / 3pm / 6pm. **What do you notice about the position of the shadow over the day?**
4. Line up several sundials along a desk. Angle the torch towards the sundials. **Why do the Sundials all say different times?** The children should see that each shadow on the sundial is in a slightly different position, so they all tell a different time, even when lit from just one light source.





Ask:



Check understanding:
ask the children which
is moving - the Sun
or the Earth?

5. Remove the previous activities figures from the globe. Use sticky-tack to stick the sundial onto the northern hemisphere of the globe, with the 12 at the top. Line up the Sun so that it is casting a shadow to 12 noon. As you move the globe around, what happens to the shadow? (It should move to tell different times) This model should help the children to understand that it is the Earth's rotation that causes the passing of time on the sundial.
6. Now try adding another sundial to another part of the globe so that you can see the Sun shining on it too. You will see that the second sundial will tell a different time to the first, illustrating time zones, the idea that it is different times of day in different location on the Earth.

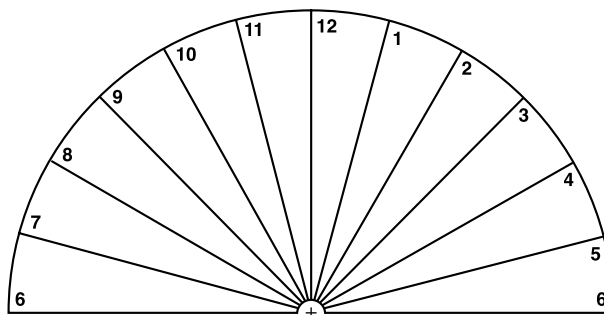


Image: Two sundials in different time zones showing different times.



Charts, tables, paperwork needed

We have included this sundial template at the end of this document as a separate sheet so that you can easily print and cut out the sundials.





Curriculum points – England, Scotland, Wales and Northern Ireland

Northern Ireland

History: Page 89: 3.4 Technological changes and the impact of inventors and inventions over time. Science: Page 90: 3.4 Technological challenges of living in Space

Wales

Page 13a 1. The daily and annual movements of the Earth and their effect on day and year length.

Scotland

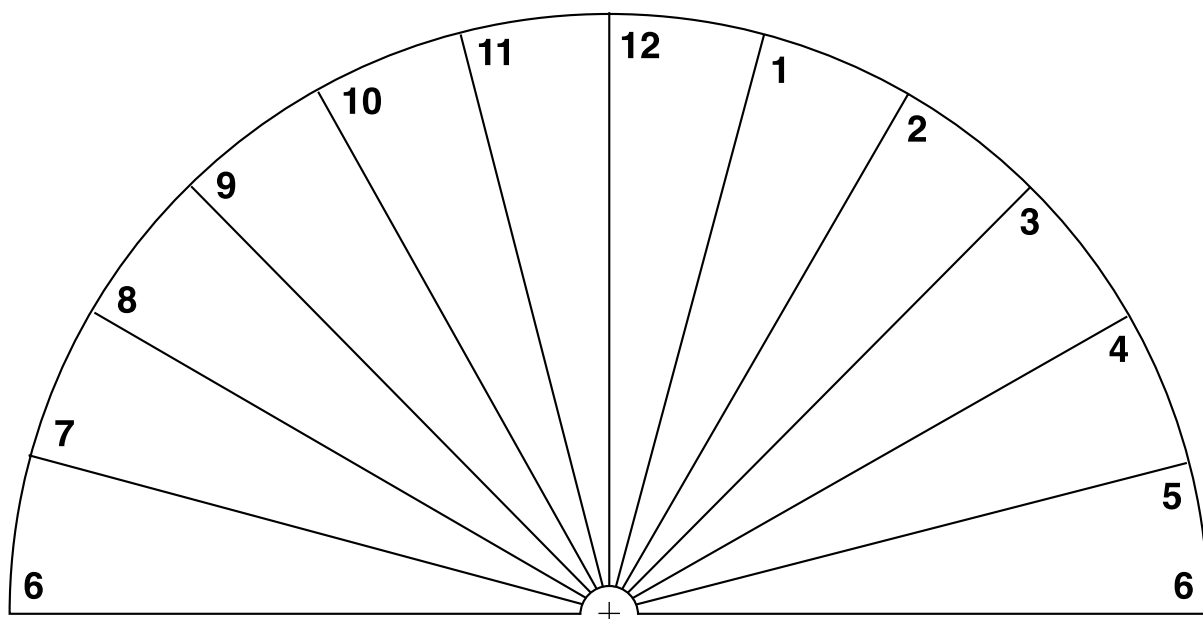
By observing and researching features of the solar system, I can use simple models to communicate my understanding of size, scale, time and relative motion within it. SCN2-06a p264.

England

Page 170 Y5 Earth& Space - Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

Page 166 Working Scientifically Year 5/6:

- i) Planning different types of science enquiries to answer questions.
- ii) Identifying scientific evidence that has been used to support or refute ideas or arguments.



**Sundial template to print separately
and cut out.**