

Autumn Block 2

Space

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The Solar System

Notes and guidance

In this small step, children learn about the Solar System. The Solar System is made up of the Sun, celestial bodies, eight planets and their moons. It is important to note that children have not studied space and the Solar System before. As a result, they may have a limited understanding of the key terms and what makes up the Solar System.

This step introduces the enquiry question for this block. Children research how our ideas about the Solar System have changed over time by exploring the views of different scientists and mathematicians. They should also compare these views to current ideas about the Solar System.

Things to look out for

- They may think that there is more than one star in the Solar System. Clarify that the only star in the Solar System is the Sun.
- Children may think that Pluto is a planet. Explain that Pluto was reclassified as a dwarf planet as it is not big enough to be regarded as a planet.

Key questions

- What are the different parts that make up the Solar System?
- What is a star?
- What is the name of the star in our Solar System?
- What is a satellite?
- What is the name of the satellite that orbits the Earth?
- How many planets are there in the Solar System?

Enquiry question

- How have our ideas about the Solar System changed over time?

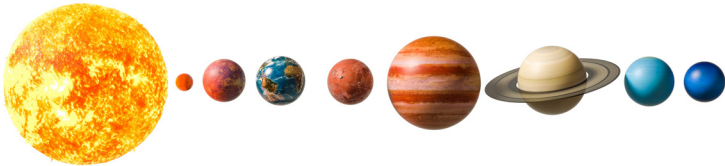
National curriculum links

- Describe the Sun, Earth and Moon as approximately spherical bodies.
- **Working scientifically** – Identifying scientific evidence that has been used to support or refute ideas or arguments.

The Solar System

Key vocabulary

- **The Solar System** – A collection of the eight planets and their moons, which orbit the Sun.



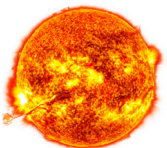
- **Planets** – Large, natural objects that orbit stars, such as the Sun.



- **Spherical** – Shaped like a sphere.



- **Stars** – Large balls of burning gas that release heat and light.
- **Sun** – The star at the centre of our Solar System that releases heat and light.



Practical ideas

- A mnemonic to remember the order of the planets is My (Mercury) Very (Venus) Easy (Earth) Method (Mars) Just (Jupiter) Speeds (Saturn) Up (Uranus) Nothing (Neptune).

Ask children to create their own mnemonic to remember the order of the planets.



- Children can work in pairs to create a number of different true or false statements about the Solar System.

Partners then test another group with their true or false quiz.

Factual knowledge

- The Sun, Earth, Moon and other planets are approximately spherical bodies.
- The Solar System is a collection of planets, moons and the Sun.
- The Sun is a star which releases heat and light.
- The Sun is at the centre of the Solar System.

The planets

Notes and guidance

In this small step, children learn about the eight planets in the Solar System and their features. Children learn that all the planets in our Solar System orbit the Sun. In addition to this, children look at the different surfaces of the planets. They should recognise that the first four planets have solid surfaces whilst the last four planets have gas surfaces.

Children investigate the enquiry question in this step and they should be given opportunities to develop their thinking and reasoning. They will look at how the planets orbit the Sun and, in later steps, compare this to previous ideas on the movement of planets.

Things to look out for

- Children may believe that the Earth is larger than the Sun.
- They may think that all planets have hard rocky surfaces like Earth.
- Children may believe that the Earth is the only planet with a Moon. The Earth has one Moon but different planets can have more than one moon. For example, Uranus has 27 moons.

Key questions

- How many planets are there in the Solar System?
- What is the order of the planets?
- What do the planets orbit in the Solar System?
- What is similar about the first four planets?
What are the differences?
- What is similar about the last four planets?
What are the differences?

Enquiry question

- How have our ideas about the Solar System changed over time?

National curriculum links

- Describe the Sun, Earth and Moon as approximately spherical bodies.
- **Working scientifically** – Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas (non-statutory).

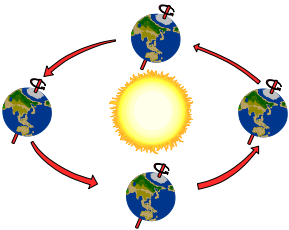
The planets

Key vocabulary

- **Planets** – Large, natural objects that orbit stars such as the Sun.



- **Orbit** – The path an object takes around another object, for example the Earth goes around the Sun.



- **Surface** – The outer layer of something. In terms of space, the land or ground of a planet.



- **Appearance** – The way something looks. In terms of space, how a planet looks, such as its colour and size.



Practical ideas

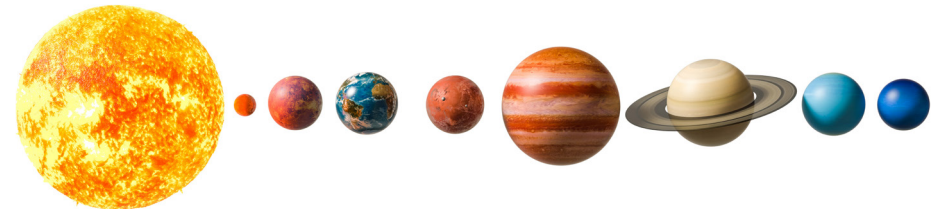
- Split the class into eight smaller groups.

Give each group one planet to focus on.

Ask each group to create a large-scale drawing of their planet to add to a class display.

Children can use secondary sources to research facts about the planet such as its appearance, surface, temperature and how far the planet is from the Sun.

Ask the children what they notice about the first four planets and the last four planets regarding surface, appearance, temperature and distance from the Sun.



Factual knowledge

- There are eight planets that orbit the Sun.
- Mercury, Venus, Earth and Mars all have solid surfaces.
- Jupiter, Saturn, Uranus and Neptune have gas surfaces.
- Pluto is considered a dwarf planet.

Modelling

Notes and guidance

In this small step, children learn how to use models as representations of the Solar System and planets. It is important children recognise that models can be used to visualise concepts that are difficult to understand, as well as highlighting their advantages and disadvantages.

Children continue to explore the enquiry question in this step to further their understanding of the Solar System. They do this by using knowledge from the previous step to create their own models of the Solar System. They should then be able to communicate and justify the reasoning for creating their models.

Things to look out for

- Children may believe that all planets are the same size.
- They may think that all planets are the same distance from the Sun.
- They may believe that the Sun is the same size as the planets.

Key questions

- What is a model in science?
- Why are models used in science?
- What does the model of the Solar System help to show?
- What are the advantages of the Solar System model?
- What are the disadvantages of the Solar System model?
- Which is a better representation of the Solar System and why?

Enquiry question

- How have our ideas about the Solar System changed over time?

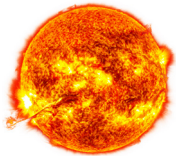
National curriculum links

- Describe the movement of the Earth and other planets relative to the Sun in the Solar System.
- **Working scientifically** – Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.

Modelling

Key vocabulary

- **Sun** – The star at the centre of our Solar System that releases heat and light.



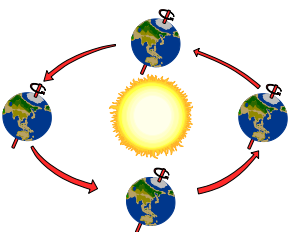
- **Planets** – Large, natural objects that orbit stars such as the Sun.



- **Model** – A physical representation of an idea or process.



- **Orbit** – The path an object takes around another object, for example the Earth goes around the Sun.



Practical ideas

- Ask children to work in small groups to create a model of the Solar System.

Ask children to use spherical foods or different sized balls from the PE cupboard to represent the Sun and the eight planets. Children can then use this equipment to model the motion of the planets relative to the Sun.

Children need to carefully consider the sizing of planets when making their model. The Sun should be larger than the planet representations.



Factual knowledge

- The Solar System is a collection of planets, moons and the Sun.
- The Earth and other planets orbit the Sun.
- Scientific models are physical representations of ideas or processes.
- Models can be created in different ways to represent the Solar System and planets.

Motion of the Earth and planets

Notes and guidance

In this small step, children learn about the movement of the Earth and the other planets in the Solar System. This includes how long it takes for each planet to orbit the Sun and why.

Children continue to explore the enquiry question in this step. They should be given opportunities to develop their thinking regarding motion of the planets and the heliocentric model.

Children should explain the movement of the planets around the Sun with reference to key vocabulary such as gravity, gravitational pull and the heliocentric model. Children should understand that in the Solar System, the Sun has the greatest gravitational pull. This is why all planets orbit the Sun.

Things to look out for

- Children may believe that it takes every planet 365 days to orbit the Sun. Explain that each planet has its own number of days or years to go around the Sun. For example, it takes Earth 365 days, but Jupiter takes the equivalent of 12 Earth years to orbit the Sun.
- Children may need support when drawing a bar graph from a given set of data.

Key questions

- What do the Earth and planets in the Solar System orbit?
- How is the Sun able to keep the planets in orbit?
- Why does Mercury take the least amount of time to orbit the Sun?
- Why does Neptune take the longest time to orbit the Sun?
- What would happen if the Sun was not present in the Solar System?

Enquiry question

- How have our ideas about the Solar System changed over time?

National curriculum links

- Describe the movement of the Earth and other planets relative to the Sun in the Solar System.
- **Working scientifically** – Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

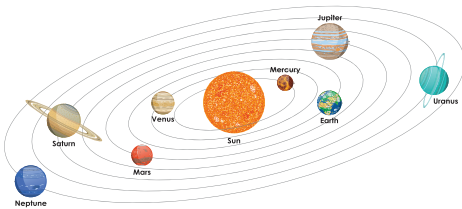
Motion of the Earth and planets

Key vocabulary

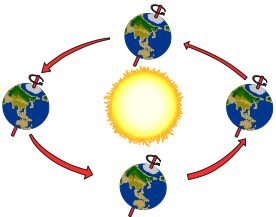
- **Gravity** – An invisible force that pulls things to the centre of the Earth (or other bodies such as planets or the Sun).



- **Gravitational pull** – The force of attraction towards the centre of a planet or the Sun.



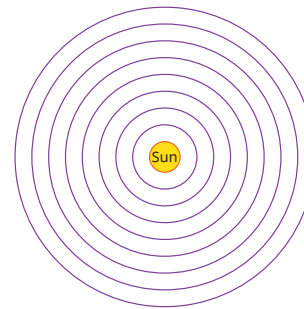
- **Orbit** – The path an object takes around another object, for example the Earth orbits the Sun.



- **Heliocentric** – A model that proposed that the Sun was at the centre of the Solar System. The activity highlighted in the practical ideas section can help children to understand why it takes the planets different lengths of time to orbit the sun.

Practical ideas

- Ask a child to stand in the middle of the playground. This child represents the Sun in the centre of the Solar System. Draw eight circles around that child to represent the positioning and orbit paths of the eight planets.



- Ask children to orbit the Sun in the centre. Children should recognise that as the distance increases from the Sun, so does the time it takes to complete one full orbit.

Factual knowledge

- The Sun is the largest object in the Solar System and has the greatest gravitational pull. This keeps all the planets in orbit around the Sun.
- The Earth takes 365 days, or one year, to complete one full orbit.
- Other planets take different amounts of time to complete a full orbit around the Sun. This is relative to their distance from the Sun.

The Solar System – ideas over time

Notes and guidance

In this small step, children explore how ideas of the Solar System have changed over time. They learn how different scientists and mathematicians have contributed to our understanding of the Solar System, including the positioning of the Sun and planets.

Children provide answers to the enquiry question for this block. They have opportunities to research the work of Aristotle, Ptolemy, Copernicus, Galileo and Newton, to explore how ideas and theories involving science are constantly changing. Children should also be given opportunities to present their findings through presentations, discussions and written responses.

Things to look out for

- Children may believe that planets cannot be seen without a telescope.
- They may believe that the Earth is flat. Explain that this was once thought but is no longer believed.
- Children may think that the Earth is at the centre of the Solar System. Explain that the Sun is at the centre of the Solar System with the eight planets orbiting the Sun.

Key questions

- Who was Aristotle/Ptolemy/Copernicus and what ideas did he have about the Solar System?
- What are the similarities and differences between the geocentric and heliocentric models?
- How have Galileo and Sir Isaac Newton improved our understanding of the Solar System?

Enquiry question

- How have our ideas about the Solar System changed over time?

National curriculum links

- Describe the movement of the Earth and other planets relative to the Sun in the Solar System.
- **Working scientifically** – Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations.

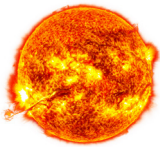
The Solar System – ideas over time

Key vocabulary

- **Geocentric** – A model that proposed that the Earth was at the centre of the Solar System.



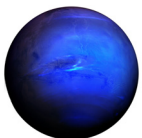
- **Heliocentric** – A model that proposed that the Sun was at the centre of the Solar System.



- **Spherical** – Shaped like a sphere.



- **Planets** – Large, natural objects that orbit stars such as the Sun.



Practical ideas

- In small groups, children could create a timeline showing how scientists and mathematicians have contributed to the changes in ideas about the Solar System.

Children could present their timelines to the rest of the class and compare.

- Ask children to work in groups and assign each group a scientist to research. The children become experts on their given scientist and present their work to the rest of the class.



Factual knowledge

- Different scientists and mathematicians have contributed to our understanding of the Solar System over time.
- It was initially thought that the Earth was at the centre of the Solar System.
- Through scientific advances, we now know that the Sun is at the centre of the Solar System.

Planet Earth

Notes and guidance

In this small step, children look at planet Earth. Children should understand that the Earth completes a full rotation on its axis once every 24 hours. This is why we have a 24 hour day. It is important that children are shown demonstrations of how the Earth rotates on its axis to challenge any misconceptions that they may have. Clarify to children that the Sun does not move, it is the Earth that moves and rotates.

Within this step, there is also an opportunity for children to identify how planet Earth is changing. Children can explore what global warming is and the effects it is having on our planet. Children do not need to discuss this concept in detail in this step as they will explore the impacts of global warming further in the next block.

Things to look out for

- They may believe that the Sun rotates around the Earth.
- Children may think that the Earth is the largest object in the Solar System, not the Sun.
- They may think that other planets can support life.
Explain that currently the Earth is the only planet in the Solar System that is known to be able to support life.

Key questions

- What does the Earth orbit?
- What is the Earth's axis?
- What is meant by the Earth rotating "on its axis"?
- How long does it take for the Earth to rotate once on its axis?
- What are the names of the four seasons on Earth?
- How do the seasons occur on Earth?

Sustainability link

- What is global warming?

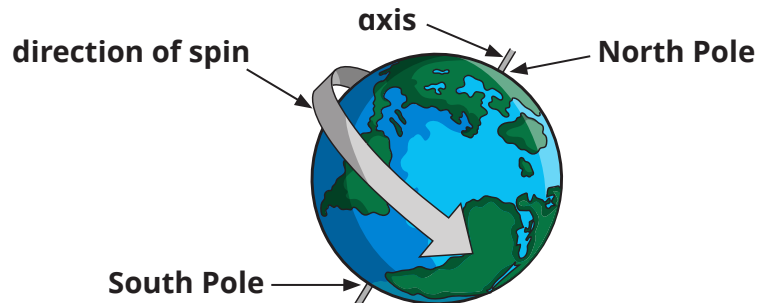
National curriculum links

- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.
- **Working scientifically** – Identifying scientific evidence that has been used to support or refute ideas or arguments.

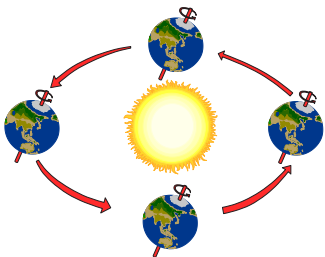
Planet Earth

Key vocabulary

- **Axis** – An imaginary line that runs from the North Pole to the South Pole. The Earth’s axis is slightly tilted.
- **Rotation** – The spinning of the Earth around its axis. The Earth rotates once every 24 hours.
- **North Pole** – The northernmost point on the Earth’s axis.
- **South Pole** – The southernmost point on the Earth’s axis.



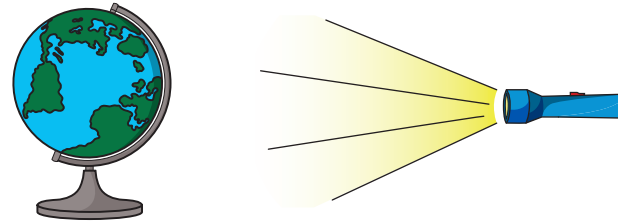
- **Orbit** – The path an object takes around another object, for example the Earth orbits the Sun.



Practical ideas

- Use a globe to demonstrate the Earth’s rotation on its axis to children. Highlight that the axis is slightly tilted. Ask them how long each rotation takes and where the axis is (highlighting the North and South poles).
- A globe and torch can also be used to explain how seasons occur on planet Earth. The torch represents the Sun.

A globe can be rotated to show how the Earth spins on its axis and orbits the Sun. When the North Pole tilts toward the Sun, it’s summer in the Northern Hemisphere and winter in the Southern Hemisphere.



Factual knowledge

- The Earth’s axis is an imaginary line (that is slightly tilted) that runs from the North to the South Pole.
- The Earth rotates once around its axis in a 24 hour period.
- Earth is the only known planet to support plant and animal life.
- The four seasons occur on planet Earth because the Earth’s axis is tilted.

Night and day

Notes and guidance

In this small step, children explore the concept of night and day and how they occur with reference to the rotation of the Earth around its axis.

As in the previous step, it is important that children are shown demonstrations of how night and day occur, to help address any misconceptions that they may have.

By the end of this step, children should understand that it takes the Earth 24 hours to rotate around its axis. As the Earth rotates and one side faces the Sun, daytime occurs. When the Earth rotates and this side faces away from the Sun, night-time occurs.

Things to look out for

- Children may think that the Sun disappears at night.
- They may believe that night and day are caused by the Sun moving around the Earth. Clarify to children that the Earth rotates on its axis and each rotation takes 24 hours.
- Children may think that the Sun rises in the morning and sets in the evening and that the Sun moves across the sky. Clarify to them that the Sun does not move, it is the Earth that rotates.

Key questions

- How long does it take for the Earth to rotate around its axis?
- What causes day and night?
- Why do people in different countries not experience day at the same time?
- Why do people in different countries not experience night at the same time?
- What would happen if the Earth did not rotate around its axis?
- Does the sun rise in the morning and set in the evening?
Explain your thinking.

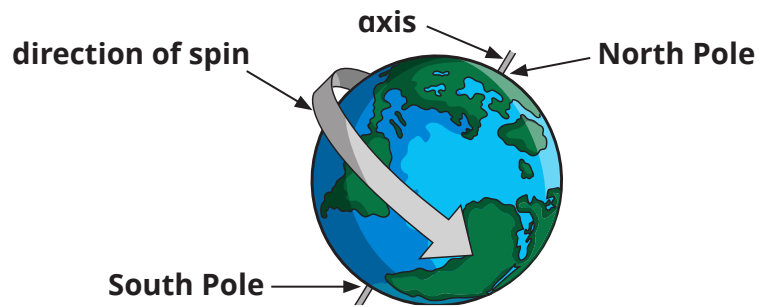
National curriculum links

- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.
- **Working scientifically** – Identifying scientific evidence that has been used to support or refute ideas or arguments.

Night and day

Key vocabulary

- **Axis** – An imaginary line that runs from the North Pole to the South Pole. The Earth’s axis is slightly tilted.
- **Rotation** – The spinning of the Earth around its axis. The Earth rotates once every 24 hours.



- **Night** – When part of the Earth is facing away from the Sun.
- **Day** – When part of the Earth is facing towards the Sun.

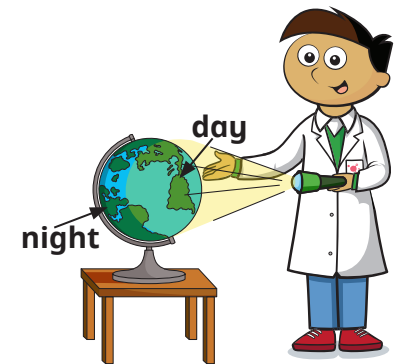


Practical ideas

- Use a torch to represent the Sun and a globe that rotates to represent the Earth. Shine the torch onto the globe and rotate the globe to demonstrate night and day. The torch should not move.

Ask children what they notice and why they think night and day occur.

- Ask children to name and identify which countries would experience night and day, depending on the Earth’s rotation around its axis. Ask them to explain their reasoning with reference to the rotation of the Earth.



Factual knowledge

- The Earth spins on its axis.
- It takes 24 hours for it to spin on its axis and complete one full rotation. This is why one day is 24 hours long.
- When part of the Earth faces the Sun, it is day.
- When part of the Earth faces away from the Sun, it is night.

The Moon

Notes and guidance

In the final small step, children explore the Moon and its features. This includes what the Moon looks like, its surface and how long it takes to orbit the Earth.

It is important that children understand that the Moon orbits the Earth and stays in orbit due to the Earth's gravitational pull. They will also learn that other planets have their own moons and some have multiple moons.

By the end of this step, children should demonstrate their understanding through both written and verbal responses.

Things to look out for

- Children may believe that the Moon can only be seen during the night.
- They may think that the Moon emits its own light. Clarify to them that the Moon reflects light from the Sun.
- Children may believe that the Earth's Moon is the only moon in the Solar System. Explain that different planets have their own moons. Highlight to children that other planets have their own moons because they have their own gravitational pull, just like Earth.

Key questions

- What is a satellite?
- What does the Moon orbit?
- How long does the Moon take to orbit the Earth?
- How is the Moon able to orbit the Earth?
- What is "gravitational pull"?
- Is the Moon's gravitational pull weaker than the Earth's?
How do you know?
- What would happen to the Moon if the Earth did not have a gravitational pull?
- Is Earth the only planet with a moon?

National curriculum links

- Describe the movement of the Moon relative to the Earth.
- **Working scientifically** – Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

The Moon

Key vocabulary

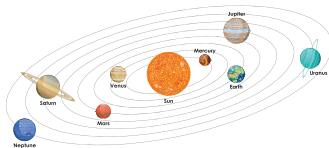
- **Satellite** – An object that orbits a planet or a star.
- **Moon** – A natural satellite that orbits the Earth and reflects light from the Sun.



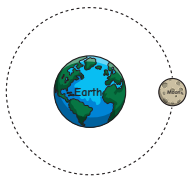
- **Gravity** – An invisible force that pulls things to the centre of the Earth (or other bodies such as planets or the Sun).



- **Gravitational pull** – The force of attraction towards the centre of a planet or the Sun.



- **Orbit** – The path an object takes around another object, for example the Moon orbits the Earth.



Practical ideas

- Ask the children to go into the playground and give them different sized balls.

Place the children in groups, and ask them which size balls they would select for the Sun, Earth and Moon and why.

Using the balls, ask them to explain the movement of the Earth around the Sun and the Moon around the Earth, with reference to gravitational pull.

- Ask them to create a video or a vlog which they can then present to another class or year group.



- In groups, ask children to create a presentation on the Moon, describing what it is, its features, how long it takes to orbit the Earth and why.

Factual knowledge

- The Earth has one Moon, and it takes approximately 27 days for the Moon to orbit the Earth.
- Without the Earth's gravitational pull, the Moon would float into space.
- The Moon is not a light source, it reflects light from the Sun.
- Light from the Sun is reflected from the Moon onto Earth.