



Lesson 1

Topic: Discovering the solar system

Introducing the solar system

Learning alerts and misconceptions

Be aware of students thinking that planets orbit around Earth.

Suggested next steps for learning

Highlight that Earth is part of the solar system (solar means 'sun') and that all planets in the solar system orbit the sun. Demonstrate this with models or animations.

Lesson answers

1. For example: Ideas about the universe, planets orbiting the sun, stars, meteoroids, asteroids, comets, Milky Way, solar system, moons, the names of the planets – Mercury, Venus, Earth, Mars, Jupiter, Saturn, Neptune, Uranus.
2. The sun, Mercury, Venus, Earth and its moon, Mars, Jupiter, Saturn, Neptune, Uranus, asteroid belt, lines indicating orbit, Saturn's rings and a comet.
3. No answer required.

a:

Science words		Definitions	
galaxy	1	2	Everything in space including planets, stars, galaxies, solar systems and moons
universe	2	3	A ball of gas in space that gives off light
star	3	1	A large group of stars and planets
sun	4	4	The star that Earth orbits



- No answer required.
- a:** Jupiter
b: Mercury
c: Venus
- Sheet 1 – Planetary data recording sheet** (attached).
- Students create a word list.

Lesson 2

Topic: Discovering the solar system

Investigating distant planets

Learning alerts and misconceptions

Be aware of students thinking that scientists know everything there is to know about the solar system.

Suggested next steps for learning

Inform students that as technology advances, scientists are able to make new discoveries and learn new things about the solar system.

Lesson notes

Students will be exploring the distance of each planet from the sun and recording this data on **Sheet 1 – Planetary data recording sheet** (from Lesson 1). Sheet 1 should be saved.

Lesson answers

- Students should be explaining their understanding of the Earth's rotation and orbiting. They could be using the terms elliptical, they might add info about how long it takes to orbit the sun etc
- No answer required.
- No answer required.
- a:** Mercury
b: Earth and Venus
c: Uranus and Neptune
- Sheet 1 – Planetary data recording sheet** (attached).
- For example: I predict Mercury is the hottest because it is closest to the sun. (Note: Venus is actually the hottest; this will be explained to students in future lessons. They do not need to have the correct answer; they just need to be able to justify their answer.)
- Words that could be added to the word list include: orbit, scale, model.



Lesson 3

Topic: Discovering the solar system

Focusing on planetary data

Learning alerts and misconceptions

Be aware of students thinking that a particular planet such as Jupiter is the largest object in the solar system.

Suggested next steps for learning

Inform students that the largest object in the solar system is the sun.

Lesson notes

In this lesson, students complete **Sheet 1 – Planetary data recording sheet** (attached).

There are many definitions to be read in this lesson. Students may require assistance in reading the definitions and information contained in data tables.

Lesson answers

Recap question:

Students should be adding their own thinking to this box answering what they found most interesting.

1.

Mercury	8	Earth	5	Jupiter	1	Uranus	3
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Venus	6	Mars	7	Saturn	2	Neptune	4
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All planet sizes (Lunar and Planetary Institute) <https://solarsystem.nasa.gov/resources/686/solar-system-sizes/>

2. Mercury is closest to the sun, Neptune is the farthest away.



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3. No answer required.
 - a: Jupiter
 - b: Mercury and Venus
 - c: Earth
4. **Sheet 1 – Planetary data recording sheet** (attached).
5. No answer required.
6. No answer required.
7.
 - a: Neptune
 - b: Neptune takes the greatest amount of time to orbit the sun because it is the farthest away from the sun in our solar system so it has the longest distance to travel.
8. **Sheet 1 – Planetary data recording sheet** (attached).
9. No answer required.
10.
 - a. Jupiter
 - b. Venus
 - c. It takes Earth approximately one day to rotate on its axis.
 - d. Venus and Uranus.
11. **Sheet 1 – Planetary data recording sheet** (attached).
12. No answer required.
13.
 - a. Venus
 - b. Uranus and Neptune
 - c. Uranus and Neptune are the coldest planets in our solar system because they are the farthest away from the sun and do not receive as much of the sun's heat as planets in the solar system that are closer to the sun.
14. **Sheet 1 – Planetary data recording sheet** (attached).
15.
 - a. No answer required.
 - b. **Sheet 1 – Planetary data recording sheet** (attached).
 - c. **Sheet 1 – Planetary data recording sheet** (attached).
 - d. **Sheet 1 – Planetary data recording sheet** (attached).
16. For example: Earth and Venus. Difference: Earth rotates anticlockwise, but Venus rotates clockwise. Similar: Both are similar in size.
17. Words that could be added to the word list include: atmosphere, satellite, orbit, rotation, surface composition.



Lesson 4

Topic: Discovering the solar system

Exploring celestial bodies within the solar system

Learning alerts and misconceptions

Be aware of students thinking that meteors, meteoroids, meteorites and asteroids are the same thing.

Suggested next steps for learning

Inform students that a meteoroid is a small piece of space debris. A meteor is the light we see when a meteoroid enters the Earth's atmosphere from space and starts to burn. A meteorite is any debris that is left from the object if it lands on Earth. An asteroid is a much larger object.

Lesson notes

In this lesson, students will understand the definitions of different celestial bodies within our solar system. Students may need assistance in reading some of the definitions and information contained in this lesson.

Lesson answers

Recap question:

Students provide their own justification as to why gathering planetary data is important.

1. No answer required.
 - a. Pluto is different because:
 - it is smaller than any other planet — even smaller than the Earth's moon
 - its orbit is irregular. Its orbit is exceptionally oval and crosses Neptune's orbit.
 - one of its moons, Charon, is about half Pluto's size.
 - b. When astronomers discovered a new object beyond Pluto they thought they had found a new planet.
 - c. Pluto has not cleared its orbital path so it does not meet the criteria.
 - d. The telescope allowed astronomers to see further than they could using just their eyes.
 - e. More advanced telescopes helped scientists to see that Pluto was quite small and that its orbit crossed Neptune's.
2. For example: asteroids, meteoroids, comets, satellites, space debris.
3. No answer required.
4.
 - a. Meteor showers are caused by comets.
 - b. Comets are made of rock and ice.
 - c. Comets begin to melt when they reach the sun's warmth.
 - d. As a comet melts tiny rocks are loosened forming a tail of debris. These tiny rocks called meteorites get left behind as the comet moves away from the sun.
 - e. A meteoroid is small, rocky space debris traveling through space. If it enters Earth's atmosphere, friction can cause it to begin to burn up and the light we see on Earth is the meteor.
5. Words that could be added to the word list include:
asteroid, comet, dwarf planet, meteor, meteorite, meteoroid.

Planetary data recording sheet

4. Record data about the planets below.

	Size of planet (diameter rounded to nearest hundred kilometres)	Average distance from the sun (rounded to the nearest million kilometres)	Number of moons (if any)	Time to orbit the sun (in Earth days)	Time for one rotation (in Earth days)	Average temperature (°Celsius)	Atmosphere (main constituents)	Any other information
Mercury	4 900 km	58 000 000 km	0	88 Earth days	1407.6 hours (58 Earth days, 16 hours)	167	hydrogen, helium, oxygen, sodium, potassium	Average of 176 Earth days between sunrises. The next transit of Mercury will be in May 2016.
Venus	12 100 km	108 000 000 km	0	224.7 Earth days	-5832.5 hours (-243 Earth days)	462	carbon dioxide, nitrogen sulfuric acid clouds	Venus spins slowly in an opposite direction from most of the planets so that the sun rises in the west and sets in the east. It has clouds of sulfuric acid.
Earth	12 800 km	150 000 000 km	1	365.26 Earth days	23.9 Earth hours	15	nitrogen and oxygen	The only planet known to support life.
Mars	6 800 km	228 000 000 km	2	687 Earth days	24.6 Earth hours	-65	carbon dioxide, nitrogen and argon	Mars is known as the Red Planet because oxidised iron makes the soil and the atmosphere look red.
Jupiter	143 000 km	778 000 000 km	67	4332 Earth days	9.9 Earth hours	-148	hydrogen and helium	The Great Red Spot on Jupiter is a massive storm. While Jupiter could not support life, some of its moons might be able to.

Planetary data recording sheet

4. Record data about the planets below (continued).

	Size of planet (diameter rounded to nearest hundred kilometres)	Average distance from the sun (rounded to the nearest million kilometres)	Number of moons (if any)	Time to orbit the sun (in Earth days)	Time for one rotation (in Earth days)	Average temperature (°Celsius)	Atmosphere (main constituents)	Any other information
Saturn	120 000 km	1 424 000 000 km	62	10 756 Earth days	10.7 Earth hours	-178	hydrogen and helium	Saturn has 7 rings made from ice and dust particles. Saturn has a very low density. It would be able to float in water.
Uranus	51 200 km	2 867 000 000 km	27	30 687 Earth days	-17.2 Earth hours	-216	hydrogen, helium, some methane	Methane in its atmosphere makes Uranus appear blue. It rotates, like Venus, from east to west.
Neptune	48 600 km	4 448 000 000 km	13	60 190 Earth days	16.1 Earth hours	-214	hydrogen, helium, some methane	Neptune is blue because of the methane in its atmosphere. Pluto moves into Neptune's orbit every 248 years.

5. Compare and contrast two planets.

For example:

- Earth and Venus are both rocky and similar in size.
- They both have thick atmospheres.
- Earth rotates anticlockwise but Venus rotates clockwise.
- Venus is very hot but Earth is not. Earth has a moon, but Venus does not.