Science Program — Key Stage 2

Set 5. Earth Sciences (The Solar System): *The Planets*

Notes to Teacher

Many students are interested in space study. This section explores the major parts of our solar system, like the Sun and the nine planets. It also addresses the smaller objects in our solar system such as asteroids and comets. Students are reminded throughout this section (and often throughout the text) that science is always changing. One of the prime places for new information to be constantly uncovered is in space. In August 2006 the International Astonomical Union (IAU) passed resolutions 5a and 6a, resulting in Pluto being defined as a dwarf planet.

Key Words:

These words are introduced to the student in the context of this section. Students should be encouraged to add these words to their "Personal Word Glossary", their journals, and to the word wall.

Planet – a large body in space that orbits around a sun.

A mnemonic is shared with the students later in the text to help them remember the order in which the planets orbit the Sun.

Moon – a small body in space that orbits around a planet.

Students will learn that many of the planets in our solar system have moons. Earth is not unique.

Satellite – another name for moon, a satellite orbits around a planet (satellites can be naturally occurring, like a moon, or human-made and launched into space).

Students may be familiar with man-made satellites that broadcast TV signals, etc.

Asteroids – pieces of rocks that were left over after the solar system formed. Asteroids are usually found together, orbiting around the Sun between Mars and Jupiter.

Meteoroids (meteors) – rocks from outer space that enter Earth's atmosphere and burn up. If they land on Earth they are called "meteorites".

Students are reminded of the role meteors (and meteorites) may have played in the extinction of the dinosaurs.

Comet – pieces of rock, ice, and frozen gases that were left over after the solar system formed. Comets orbit the Sun in long, long orbits.

Kuiper Belt – an area of icy rock fragments discovered beyond Pluto.

Background Information

There are many places to acquire background information on planets and the solar system. The NASA website is a wonderful resource for students and teachers. Students should be encouraged to use current sources of information as much as possible to increase the likelihood of having accurate data.

The student text in this section has the basic information about planets. Students should use this information for comparison purposes but should not be required to memorize the facts such as distance from the Sun or length of the planetary year. It is more important that they understand how the length of the year relates to the orbit and the distance from the Sun, for example.

Although the distances and times in space study are difficult to comprehend, students may be better able to understand the relationships involved rather than actual dimensions.

In later years, students will revisit space science and will then study galaxies, composition of stars, and astronomical units, including light years. They may be at a developmental stage that will allow better understanding of abstract concepts and use what they have learned in this Topic Pack as a basis for further study.

Learning Strategies and Scaffolding

Through formal and informal pre-assessment students' prior knowledge in space study can be gauged. Many students are very interested in this area and may even wish to pursue a career in space science. Students who come with a knowledge base can serve as mentors or group leaders for students who may be struggling with some of these concepts.

A project suggested in the student topic pages is a study of the feasibility of colonising another planet in our solar system (or, for an Earth-like planet in another solar system!) The basic parameters of the project are laid out in the student text however, the assignment can be modified, to better suit individual classes and students.

As presented, this is a very large project. It would lend itself to cooperative groups in which various students take on specific tasks. The whole group could then organise the final presentation. The type of final presentation should be agreed upon at the beginning of the project.

Methods of assessment should be shared with the students prior to beginning the project. Any scoring rubrics the teacher uses should be explained to the students at the outset so they can evaluate their own progress as they go along.

A related resource for this project or similar ones is the SETI Institute (which is the "Search for Extraterrestrial Intelligence"). The SETI Institute works closely with NASA and the National Science Foundation to do scientific research both in space and on Earth. They provide many resources for students and teachers as part of their mission to educate about the relationships between Earth science and space science. Students could be directed to the SETI Institute's website for further information.

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The Story

There are many solar systems in the universe. There are probably many more solar systems than we even know about right now.

Scientists are always discovering new information so anything we learn could be changed with further investigations. This is especially true when dealing with space science because space might go on forever!

Right now we know a lot of information about our solar system.

We know that it includes:

- The Sun
- 9 planets and their moons (that includes Earth and our Moon)
- Smaller objects like asteroids and comets

Planets have a lot of characteristics in common. They also have a lot of very unique characteristics that make them different from one another. It's all very interesting!

Focus Question

Name some of the bodies that make up our solar system.

9 planets, the Sun, and other objects like asteroids and comets.

Answer

Set 5. Earth Sciences (The Solar System): *The Planets*

Key Words:

Planet — a large body in space that orbits around a sun

Moon — a small body in space that orbits around a planet

Satellite — another name for a moon, a satellite orbits around a planet (satellites can be naturally occurring, like a moon, or human-made and launched into space)

Asteroids — pieces of rocks that were left over after the solar system formed. Asteroids are usually found together, orbiting around the Sun between Mars and Jupiter

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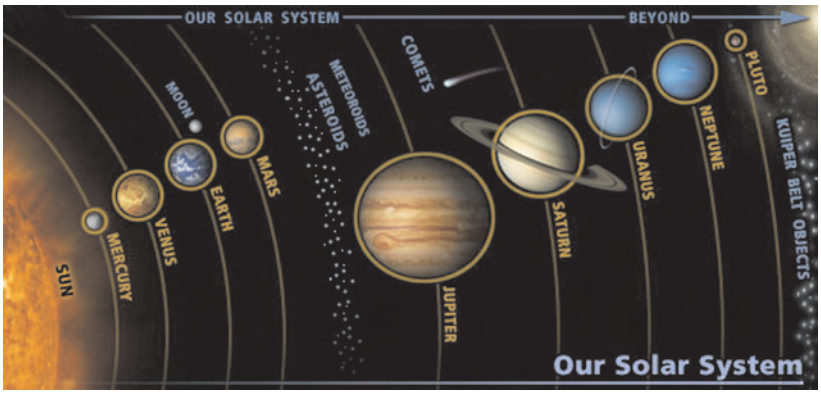
Comet — pieces of rock, ice, and frozen gases that were left over after the solar system formed. Comets orbit the Sun in long, long orbits

Kuiper Belt — an area of icy rock fragments discovered beyond Pluto

The Planets

Many people are interested in studying outer space. A question that has captured people's imaginations for ages is "is there life on other **planets**?"



So far, scientists believe Earth is the only **planet** that can support life. Of course, that's "life" as we know it with plants and animals that we recognise!

"Let's explore each planet and see its characteristics."

Set 5. Earth Sciences (The Solar System): *The Planets*

There are nine **planets** that orbit our Sun. They never vary the order in which they revolve around this star. The order is:

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

An easy way to remember the order is to memorise this sentence:

"My Very Educated Mother Just Sent Us Nine Pizzas!"

Each word begins with the same letter as the planet's name begins with.
"Nine Pizzas" will help you remember that there are nine planets.

Almost all the **planets** were named for Roman gods.

Here is how they got their names:

Planet name	Name origin	
Mercury	Roman god of commerce (messenger between humans and the gods)	
Venus	Roman goddess of love	
Earth	Old German word eorpe	
Mars	Roman god of war	
Jupiter	Roman king of the gods	
Saturn	Roman god of agriculture	
Uranus	Greek god, ruler of the heavens	
Neptune	Roman god of the sea	
Pluto	Roman god of the underworld	

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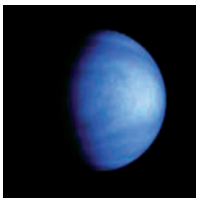
Mercury

Mercury is the closest **planet** to the Sun. It orbits the Sun in 88 days, less than one-quarter the time it takes Earth to make its orbit. Mercury is small and made of rocks. Mercury has no **moons**. It has no atmosphere so there is nothing to hold the heat around the **planet**. During the day, temperatures can reach nearly 500° Celsius, but by night time the temperatures can plunge to almost 200° below zero!

Because sizes and distances in space are so large, it is difficult for us to always understand them. Scientists have to think about how things compare in size to other things. We call that "scale". At NASA (the National Aeronautics and Space Administration) the scientists help us understand the size of **planets** by saying that if Earth was actually the size of a baseball, then Mercury would be about the size of a golf ball.

Venus



Venus is about the same size as Earth and made from the same type of materials (iron and nickel) as Earth. Venus has no oceans like Earth does. It has an atmosphere surrounding it but that atmosphere is not made from nitrogen and oxygen like ours is. It is made from carbon dioxide!

Memory Jiggler

Remember carbon dioxide is the waste material we exhale from our bodies.

It would be hard for us to live on Venus!

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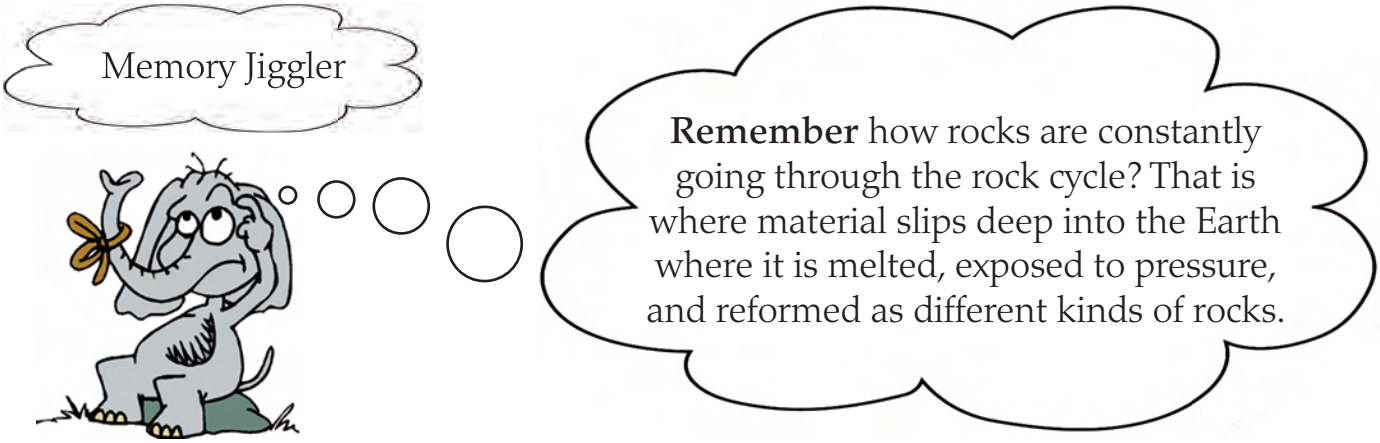
The Sun's heat cannot escape from Venus's thick atmosphere so temperatures there are even hotter than on Mercury, which is closer to the Sun. Venus has a strange way of rotating on it's axis so its day (243 Earth days) is longer than its year (225 Earth days).

Earth

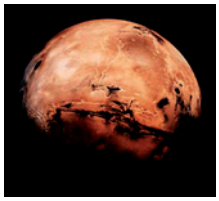
Earth is the only **planet** that has liquid water. In fact, almost three-quarters of Earth's surface is covered with water. Earth is the third **planet** from the Sun so its temperatures don't vary that much. Earth's atmosphere is made of mostly nitrogen and some oxygen. Events in the atmosphere affect our daily weather and our long-term climate.

Earth is made up of rocky materials, mostly iron and nickel. There is a molten (melted) core that allows the land on top of it to move slowly around.



One **moon** orbits Earth every 28 days. The Moon is held in its orbit by its gravitational attraction to Earth.

Mars



Are you expecting a visit from Martians? For a long time people have wondered whether there is life on Mars. Mars is a **planet** that is quite similar to Earth but not similar enough to actually support life. Many of the recent spacecraft landings on Mars have shown that to be true. Investigations about Mars have shown that there is frozen water on the **planet** and Mars has polar ice caps, just like Earth does.

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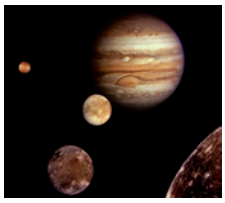
Scientists continue to study Mars to help them answer questions about the origin of the solar system. They believe that Mars once had liquid water. Now it is so cold it only has ice. They are investigating soil and the movements of the **planet's** crust and comparing it to the movements of Earth's crust. Mars is sometimes called "the red planet" because the soil has a rusty colour.

Mars has two little moons that orbit it. The Martian day is about the same length as Earth's day. Because Mars is about 75 million km further from the Sun than Earth is, it takes Mars 687 Earth days to revolve around the Sun.

Jupiter



Jupiter is the first of the Jovian planets. The "Jovian" planets are made up of more gas than rocks (like the terrestrial planets: Mercury, Venus, Earth, and Mars). Jupiter has layers of gas surrounding it. It also has thin rings of dust around it that were discovered in 1979 by NASA's Voyager I spacecraft.

Jove	is from the Latin and means "relating to Jupiter"

Scientists have been studying Jupiter for a long time! In 1610 the famous Italian astronomer, Galileo, discovered four **moons** orbiting the **planet**. As people continue to investigate Jupiter they find more and more **moons**. The latest count is 63! Although some of these "moons" may actually be **asteroids**.

With all these **moons**, the rings around it, and all the gas in its atmosphere (like the Sun), Jupiter is almost like a mini-solar system all by itself! It is the largest **planet** in our solar system.

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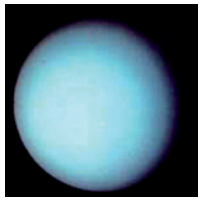
Saturn

Saturn is another **planet** made mostly of hydrogen and helium gas, just like our Sun. Saturn is famous for the rings around it. They are made up of ice crystals. Saturn has 46 **satellites** or **moons** that scientists have discovered so far.

The largest **moon** is called "Titan" and is similar in size to Mercury. The atmosphere around Titan is made up mostly of nitrogen, just like Earth. Astronomers continue to study Titan because they think that they can use what they learn to make some inferences about what Earth was like long ago.

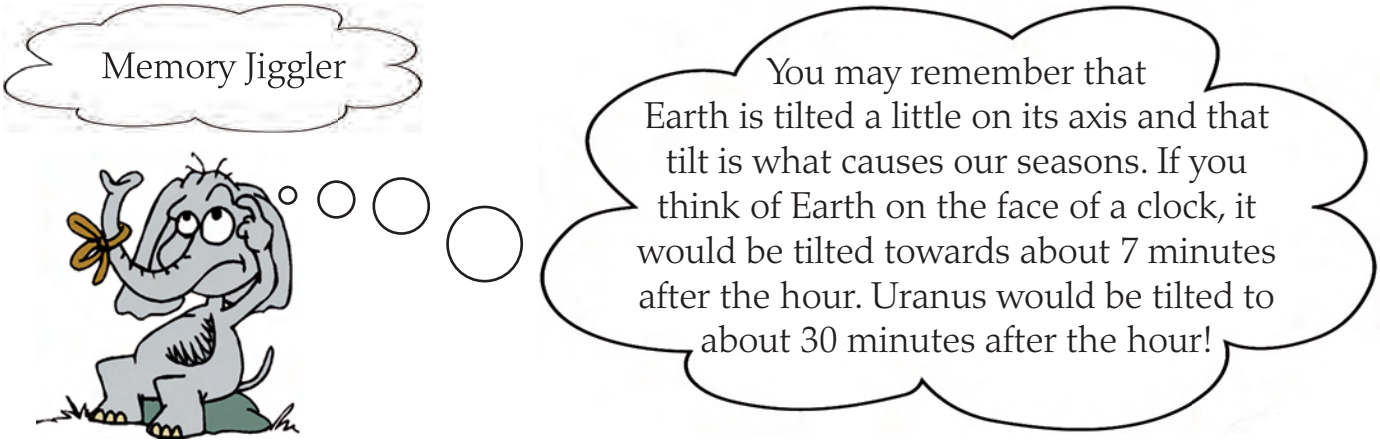
Saturn is about 1.5 billion km from the Sun. It takes 29 years for Saturn to orbit the Sun.

Uranus



Uranus is a beautiful blue-green colour. Its colour is caused by a layer of methane gas, the gas found around Earth's swamps, that reflects blue light. Uranus is another of the Jovian (or gaseous) **planets** made up mostly of hydrogen and helium gas.

There are some strange things about Uranus. It takes 84 years to revolve around the Sun. That isn't so strange, considering it is 2.8 billion km away from the Sun. But, Uranus is tilted so far over on its axis that it is nearly lying down.



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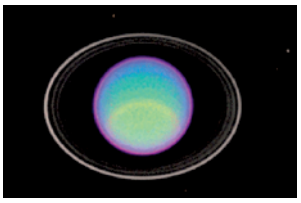
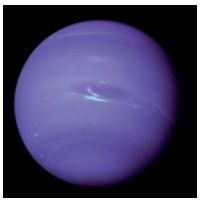


Uranus has 11 rings around it. Saturn's rings surround the equator or the middle of the **planet**. Uranus's rings go over and around the top and bottom of the **planet**. Uranus has some strange moons too, 27 of them!

Neptune

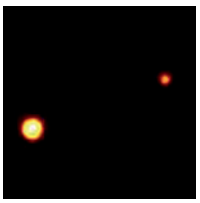


Do you like maths? It was a mathematician who discovered the **planet** Neptune, not an astronomer. Actually, two different mathematicians were trying to figure out why Uranus's orbit was different than astronomers predicted. They hypothesised that there must be another **planet** affecting the orbit and – sure enough – they found Neptune!

Neptune is another giant gas **planet**. Scientists think it has a liquid core that is as large as Earth. Neptune is tilted on its axis more than Earth is. In fact, its seasons last about 41 years, instead of the 3 months that ours last.

So much of what we know about our solar system has come from NASA spacecraft missions. One of these missions proved that Neptune also has rings around it. The spacecraft also discovered that Neptune has 13 moons. Its largest moon, Triton, is on a collision course with the **planet**. When that happens the explosion will create more rings of rock fragments around Neptune than Saturn has around it.

Pluto



Last but not least, is Pluto, now defined as a dwarf planet.
Scientists wonder a lot about Pluto. Sometimes, they aren't even sure if it actually is a **planet**. It is the smallest **planet** and the furthest away from the Sun. It might actually be just another object in the **Kuiper Belt**, which is a part of space over 12 billion km away from the Sun that contains thousands of icy objects.

Pluto has a **moon**, called Charon, which is almost as big as Pluto is. Some scientists consider Charon and Pluto to be two **planets** that just orbit around each other while they are orbiting around the Sun. The orbit around the Sun takes 248 years.

Pluto is smaller than our Moon. It might have a layer of ice around it but no one knows for sure. Pluto is too far away for any spacecraft to have visited it or come very close.

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Accurate Information

Every day scientists are learning more about outer space. They are having their predictions and hypotheses confirmed. They are also having their predictions and hypotheses proven wrong. This happens all the time in scientific investigations. Scientists collect more information, ask more questions, revise their ideas, and collect more information.

Studying space science is fascinating to many people because it is all such a mystery. Everything is so big and so far away it is difficult to experiment in the lab. Scientists must use telescopes, both here on Earth, and on spacecraft and **satellites** they launch into space. They use mathematical models and computer simulations to investigate their questions.

The chart below gives some information about all the planets. Different resources might give different information because new moons, for example, are always being discovered. Sometimes, again, as an example, what astronomers thought was an **asteroid** turns out to be a **comet** or what used to be a **moon** is now a real **planet**.

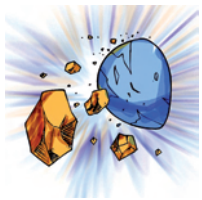
Planet Information

Planet name	Distance from Sun (km)	Diameter at equator (approx. km)	Length of day (rotation)	Revolution around Sun (orbit)	Composition	Number of moons
Mercury	58 million	5,000	176 days	88 days	Rocky	0
Venus	108 million	12,000	243 days	225 days	Rocky (similar to Earth)	0
Earth	150 million	13,000	24 hours	365 days	Rocky (containing nickel and iron)	1
Mars	228 million	7,000	25 hours	687 days	Rocky	2
Jupiter	778 million	144,000	10 hours	12 years	Gas	63
Saturn	1.5 billion	120,000	10 hours	29 years	Gas	46
Uranus	2.8 billion	51,000	17 hours	84 years	Gas	27
Neptune	4.5 billion	49,000	16 hours	165 years	Gas	13
Pluto	6 billion	2,000	6 days	248 years	Rocky	1

Set 5. Earth Sciences (The Solar System): *The Planets*

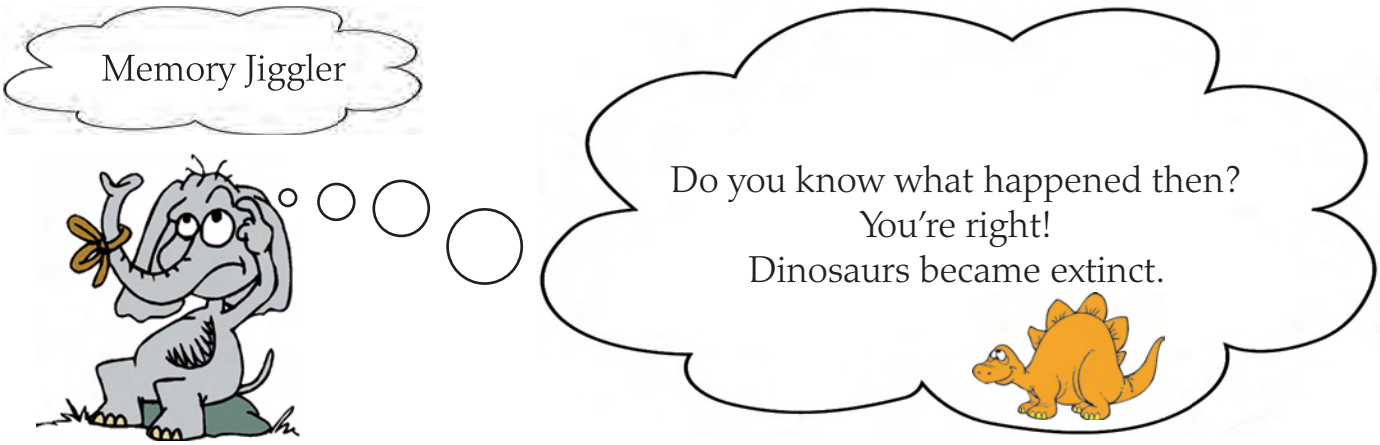
Other Objects in Space

Asteroids



Asteroids are rocky fragments found in a band (or belt) orbiting around the Sun. The "asteroid belt" can be found between Mars and Jupiter. Asteroids vary in size from several hundred km across to the size of a pebble. They are left over from when the solar system formed over 4.5 billion years ago.

As asteroids orbit around the Sun, they can get knocked out of place by the orbits of Jupiter or Mars. This collision causes the asteroid to go hurtling off into space where it might eventually land on a planet. Geologists (who study rocks and Earth's structure) and palaeontologists (who study fossils of plants and animals) think that a giant asteroid may have landed on Earth about 65 million years ago.



This asteroid, which landed in Mexico, created such a cloud of dust that it covered major portions of Earth and stopped sunlight from getting to the plants. You know what happens next: the plants can't photosynthesise without light energy from the Sun. Plants die. Animals die.

Meteoroids

Meteoroids are also rocky fragments of space "left overs". They probably were formed the same way as asteroids. When meteoroids fall through space and enter Earth's atmosphere, the friction of the air causes them to glow. People often call these streaks of light in the sky "shooting stars". The correct, scientific name for them is "meteors".

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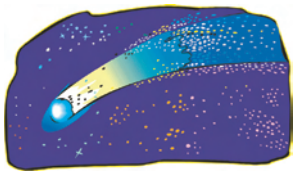
Don't be Tricked

Don't be tricked by the poetic name"shooting stars".
Of course, you know that stars, like the Sun, are huge balls of exploding gases. You wouldn't see them flying across the sky.

Meteors often burn up in the atmosphere before they reach Earth. If they do finally land on Earth they are called"meteorites".

Comets



Comets are also left over objects from the formation of our solar system. They are different from asteroids because they are not rocky fragments but are made of ice with dust and dirt frozen inside. Sometimes people call them"dirty snowballs".

Comets have their own orbits around the Sun. Some of them come from so far away they take millions of years to make one revolution. One of the most famous comets is called Halley's comet. Mark your calendar because that will come past Earth again in 2061!

Kuiper Belt

Icy space objects are found in the Kuiper Belt, a region of space out beyond Pluto. Although, some scientists believe that Pluto is actually part of the Kuiper Belt. Comets may be formed in this region. In 2002 scientists discovered a large object (although only half the size of Pluto) in the Kuiper Belt that may be another planet. They are continuing to study the object named,"2002 LM60".

Focus Question

Name two other types of objects found in outer space besides the Sun and the planets.

Comets, meteors, asteroids, and the objects in the Kuiper Belt.

Answer

Set 5. Earth Sciences (The Solar System): *The Planets*

Investigation — Feasibility Studies

Now that you are an expert on conditions on other planets, you have been asked to write a "feasibility study" on a plan to colonise another planet besides Earth. A "feasibility study" is like a project that takes a lot of information about a certain idea and shows if it would actually work or not.

Feasible is from the French word "faisable" which comes from the verb that means "to do".

Feasible means if something is possible.

Your task is to choose a planet of interest to you and present a feasibility study to show how it could be colonised in your lifetime. In your study you will have to include the following sections (and any others you feel would be especially important for your plan or your planet).

1. Identify the planet you have chosen.
2. Give a short introduction about why you chose that planet.
3. Give a brief summary of the specifics on your planet such as:
   - distance from Sun
   - where it lies in the Solar System (like 3rd from the Sun, etc.)
   - length of planet's day and year
   - some distinguishing characteristics (rings? atmosphere?)
4. Tell something about the people you expect to live there (research scientists, your family, whole civilisations…).
5. Explain how long you expect your colony to remain on the planet (one year research study, indefinitely…).

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Make sure you are always thinking about the characteristics of your planet as you answer these questions. You couldn't pick Pluto and say you are just going to build a log cabin to live in – where would you get the logs and how would you ever keep warm enough?

6. Identify areas you must take into consideration in order to survive and explain how you will address them.
   Some ideas you may use to start you off (but there are many more)
   - how will you get there (and back to Earth?)
   - oxygen supplies (how will you keep enough oxygen for the time you are there?)
   - food supplies (and once those are used up?)
   - water supplies (and once you have drunk all the water?)
   - shelter
   - maintaining temperature (not too hot, not too cold)
   - communication (with each other, with Earth)
   - transportation (around the planet)
   - medical issues
7. Cost considerations (these are always in feasibility studies!).
   - how will the trip be supported?
   - how will you continue to live once there (for example, if you expect deliveries of supplies from nearby planets, who will pay for that?)
8. Presentation of Study.
   - how will you present your information? (handouts, computer presentation, diagrams, panel discussion?)
   - if you are working in a group, who will take each of the roles, how will you make the determination
   - how will you address any questions that an audience might have about your ideas?
9. As a conclusion to this task, write a paragraph to say if you think, after all the research you have done and all the organisation of material, that it would ever be feasible to live on the planet you chose.

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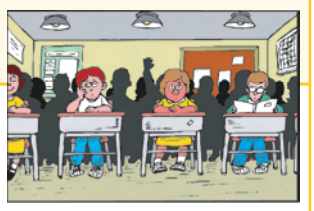
Test Practice Questions



1 Which of the following objects can be found in our solar system?

A. clouds, atmosphere, Sun
B. planets, Sun, comets
C. Pluto, equator, meteorites
D. cloud formations, asteroid belt, ice crystals

Answer: __B__

2. The name of the space object that orbits a planet is called

A. moon
B. comet
C. star
D. asteroid

Answer: __A__

3. The very large planets like Jupiter and Saturn are made from

A. rocks and soil
B. ice and rock
C. liquid water and iron
D. gases like hydrogen and helium

Answer: __D__

4. Two planets that are similar to Earth are

A. Pluto and Neptune
B. Venus and Mars
C. Saturn and Uranus
D. Mercury and Jupiter

Answer: __B__

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Right now we know a lot of information about our solar system.

We know that it includes:

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- 9 planets and their moons (that includes Earth and our Moon)
- Smaller objects like asteroids and comets

Planets have a lot of characteristics in common. They also have a lot of very unique characteristics that make them different from one another. It's all very interesting!

Focus Question

Name some of the bodies that make up our solar system.

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Answer

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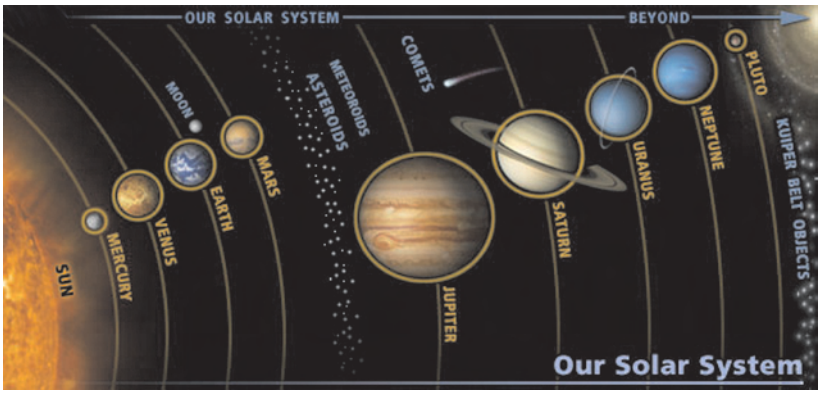
Kuiper Belt — an area of icy rock fragments discovered beyond Pluto

The Planets

Many people are interested in studying outer space. A question that has captured people's imaginations for ages is "is there life on other **planets**?"



So far, scientists believe Earth is the only **planet** that can support life. Of course, that's "life" as we know it with plants and animals that we recognise!

"Let's explore each planet and see its characteristics."

Set 5. Earth Sciences (The Solar System): *The Planets*

There are nine **planets** that orbit our Sun. They never vary the order in which they revolve around this star. The order is:

Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto

An easy way to remember the order is to memorise this sentence:

"My Very Educated Mother Just Sent Us Nine Pizzas!"

Each word begins with the same letter as the planet's name begins with.
"Nine Pizzas" will help you remember that there are nine planets.

Almost all the **planets** were named for Roman gods.

Here is how they got their names:

Planet name	Name origin	
Mercury	Roman god of commerce (messenger between humans and the gods)	
Venus	Roman goddess of love	
Earth	Old German word eorpe	
Mars	Roman god of war	
Jupiter	Roman king of the gods	
Saturn	Roman god of agriculture	
Uranus	Greek god, ruler of the heavens	
Neptune	Roman god of the sea	
Pluto	Roman god of the underworld	

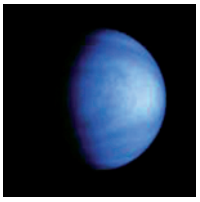
Set 5. Earth Sciences (The Solar System): *The Planets*

Mercury

Mercury is the closest **planet** to the Sun. It orbits the Sun in 88 days, less than one-quarter the time it takes Earth to make its orbit. Mercury is small and made of rocks. Mercury has no **moons**. It has no atmosphere so there is nothing to hold the heat around the **planet**. During the day temperatures can reach nearly 500° Celsius but by night time the temperatures can plunge to almost 200° below zero!

Because sizes and distances in space are so large, it is difficult for us to always understand them. Scientists have to think about how things compare in size to other things. We call that "scale". At NASA (the National Aeronautics and Space Administration) the scientists help us understand the size of **planets** by saying that if Earth was actually the size of a baseball, then Mercury would be about the size of a golf ball.

Venus



Venus is about the same size as Earth and made from the same type of materials (iron and nickel) as Earth. Venus has no oceans like Earth does. It has an atmosphere surrounding it but that atmosphere is not made from nitrogen and oxygen like ours is. It is made from carbon dioxide!

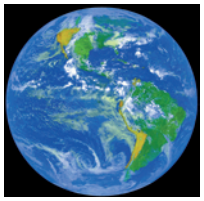
Memory Jiggler

Remember carbon dioxide is the waste material we exhale from our bodies.

It would be hard for us to live on Venus!

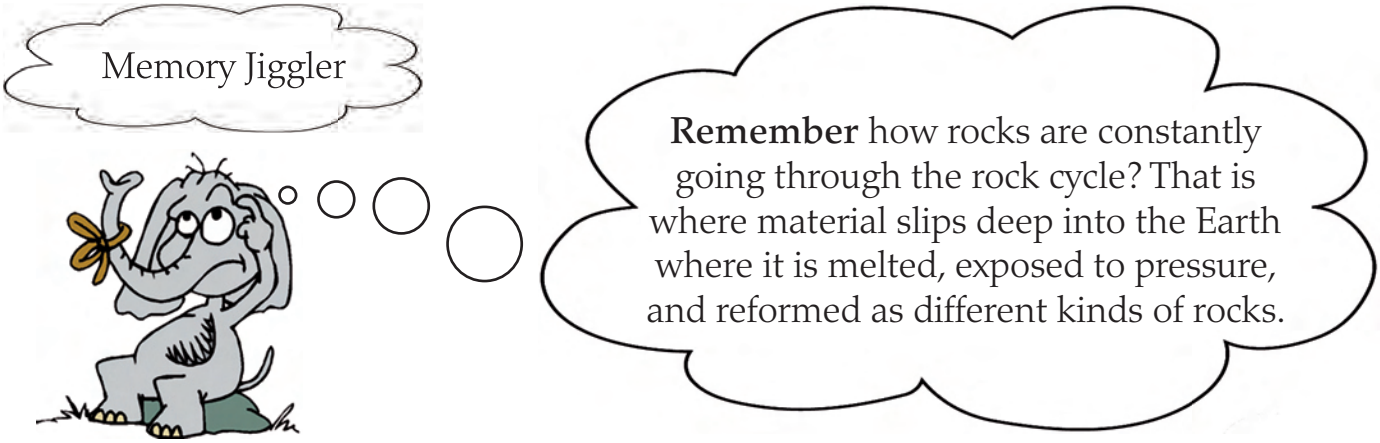
The Sun's heat cannot escape from Venus's thick atmosphere so temperatures there are even hotter than on Mercury, which is closer to the Sun. Venus has a strange way of rotating on it's access so its day (243 Earth days) is longer than its year (225 Earth days).

Earth



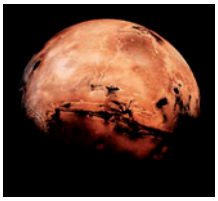
Earth is the only **planet** that has liquid water. In fact, almost three-quarters of Earth's surface is covered with water. Earth is the third **planet** from the Sun so its temperatures don't vary that much. Earth's atmosphere is made of mostly nitrogen and some oxygen. Events in the atmosphere affect our daily weather and our long-term climate.

Earth is made up of rocky materials, mostly iron and nickel. There is a molten (melted) core that allows the land on top of it to move slowly around.



One **moon** orbits Earth every 28 days. The Moon is held in its orbit by its gravitational attraction to Earth.

Mars

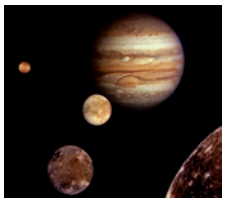


Are you expecting a visit from Martians? For a long time people have wondered whether there is life on Mars. Mars is a **planet** that is quite similar to Earth but not similar enough to actually support life. Many of the recent spacecraft landings on Mars have shown that to be true. Investigations about Mars have shown that there is frozen water on the **planet** and Mars has polar ice caps, just like Earth does.

Scientists continue to study Mars to help them answer questions about the origin of the solar system. They believe that Mars once had liquid water. Now it is so cold it only has ice. They are investigating soil and the movements of the **planet's** crust and comparing it to the movements of Earth's crust. Mars is sometimes called "the red planet" because the soil has a rusty colour.

Mars has two little moons that orbit it. The Martian day is about the same length as Earth's day. Because Mars is about 75 million km further from the Sun than Earth is, it takes Mars 687 Earth days to revolve around the Sun.

Jupiter



Jupiter is the first of the Jovian planets. The "Jovian" planets are made up of more gas than rocks (like the terrestrial planets: Mercury, Venus, Earth, and Mars). Jupiter has layers of gas surrounding it. It also has thin rings of dust around it that were discovered in 1979 by NASA's Voyager I spacecraft.

Jove	is from the Latin and means "relating to Jupiter"

Scientists have been studying Jupiter for a long time! In 1610 the famous Italian astronomer, Galileo, discovered four **moons** orbiting the **planet**. As people continue to investigate Jupiter they find more and more **moons**. The latest count is 63! Although some of these "moons" may actually be **asteroids**.

With all these **moons**, the rings around it, and all the gas in its atmosphere (like the Sun), Jupiter is almost like a mini-solar system all by itself! It is the largest **planet** in our solar system.

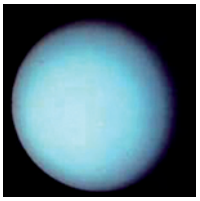
Saturn

Saturn is another **planet** made mostly of hydrogen and helium gas, just like our Sun. Saturn is famous for the rings around it. They are made up of ice crystals. Saturn has 46 **satellites** or **moons** that scientists have discovered so far.

The largest **moon** is called "Titan" and is similar in size to Mercury. The atmosphere around Titan is made up mostly of nitrogen, just like Earth. Astronomers continue to study Titan because they think that they can use what they learn to make some inferences about what Earth was like long ago.

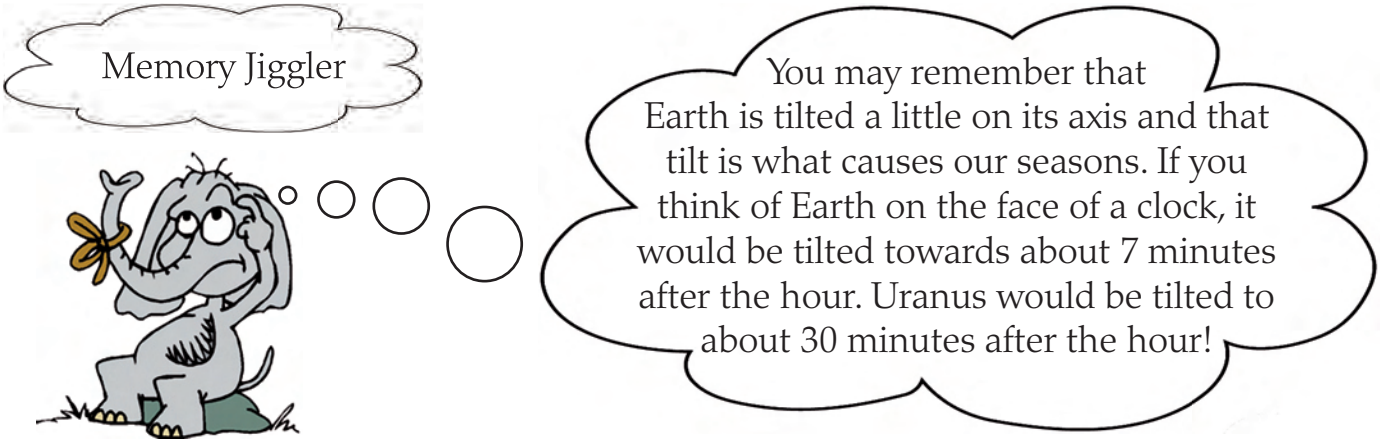
Saturn is about 1.5 billion km from the Sun. It takes 29 years for Saturn to orbit the Sun.

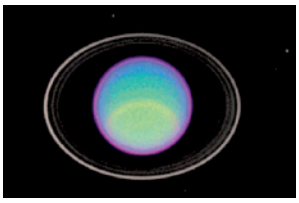
Uranus



Uranus is a beautiful blue-green colour. Its colour is caused by a layer of methane gas, the gas found around Earth's swamps, that reflects blue light. Uranus is another of the Jovian (or gaseous) **planets** made up mostly of hydrogen and helium gas.

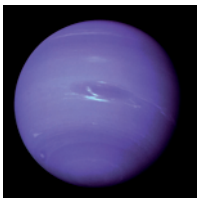
There are some strange things about Uranus. It takes 84 years to revolve around the Sun. That isn't so strange, considering it is 2.8 billion km away from the Sun. But, Uranus is tilted so far over on its axis that it is nearly lying down.





Uranus has 11 rings around it. Saturn's rings surround the equator or the middle of the **planet**. Uranus's rings go over and around the top and bottom of the **planet**. Uranus has some strange moons too, 27 of them!

Neptune

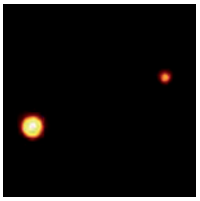


Do you like maths? It was a mathematician who discovered the **planet** Neptune, not an astronomer. Actually, two different mathematicians were trying to figure out why Uranus's orbit was different than astronomers predicted. They hypothesised that there must be another **planet** affecting the orbit and – sure enough – they found Neptune!

Neptune is another giant gas **planet**. Scientists think it has a liquid core that is as large as Earth. Neptune is tilted on its axis more than Earth is. In fact, its seasons last about 41 years, instead of the 3 months that ours last.

So much of what we know about our solar system has come from NASA spacecraft missions. One of these missions proved that Neptune also has rings around it. The spacecraft also discovered that Neptune has 13 moons. Its largest moon, Triton, is on a collision course with the **planet**. When that happens the explosion will create more rings of rock fragments around Neptune than Saturn has around it.

Pluto



Last but not least, is Pluto, now defined as a dwarf planet.
Scientists wonder a lot about Pluto. Sometimes, they aren't even sure if it actually is a **planet**. It is the smallest **planet** and the furthest away from the Sun. It might actually be just another object in the **Kuiper Belt**, which is a part of space over 12 billion km away from the Sun that contains thousands of icy objects.

Pluto has a **moon**, called Charon, which is almost as big as Pluto is. Some scientists consider Charon and Pluto to be two **planets** that just orbit around each other while they are orbiting around the Sun. The orbit around the Sun takes 248 years.

Pluto is smaller than our Moon. It might have a layer of ice around it but no one knows for sure. Pluto is too far away for any spacecraft to have visited it or come very close.

Set 5. Earth Sciences (The Solar System): *The Planets*

Accurate Information

Every day scientists are learning more about outer space. They are having their predictions and hypotheses confirmed. They are also having their predictions and hypotheses proven wrong. This happens all the time in scientific investigations. Scientists collect more information, ask more questions, revise their ideas, and collect more information.

Studying space science is fascinating to many people because it is all such a mystery. Everything is so big and so far away it is difficult to experiment in the lab. Scientists must use telescopes, both here on Earth, and on spacecraft and **satellites** they launch into space. They use mathematical models and computer simulations to investigate their questions.

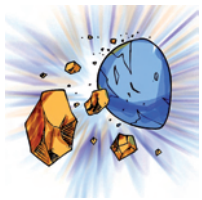
The chart below gives some information about all the planets. Different resources might give different information because new moons, for example, are always being discovered. Sometimes, again, an example, what astronomers thought was an **asteroid** turns out to be a **comet** or what used to be a **moon** is now a real **planet**.

Planet Information

Planet name	Distance from Sun (km)	Diameter at equator (approx. km)	Length of day (rotation)	Revolution around Sun (orbit)	Composition	Number of moons
Mercury	58 million	5,000	176 days	88 days	Rocky	0
Venus	108 million	12,000	243 days	225 days	Rocky (similar to Earth)	0
Earth	150 million	13,000	24 hours	365 days	Rocky (containing nickel and iron)	1
Mars	228 million	7,000	25 hours	687 days	Rocky	2
Jupiter	778 million	144,000	10 hours	12 years	Gas	63
Saturn	1.5 billion	120,000	10 hours	29 years	Gas	46
Uranus	2.8 billion	51,000	17 hours	84 years	Gas	27
Neptune	4.5 billion	49,000	16 hours	165 years	Gas	13
Pluto	6 billion	2,000	6 days	248 years	Rocky	1

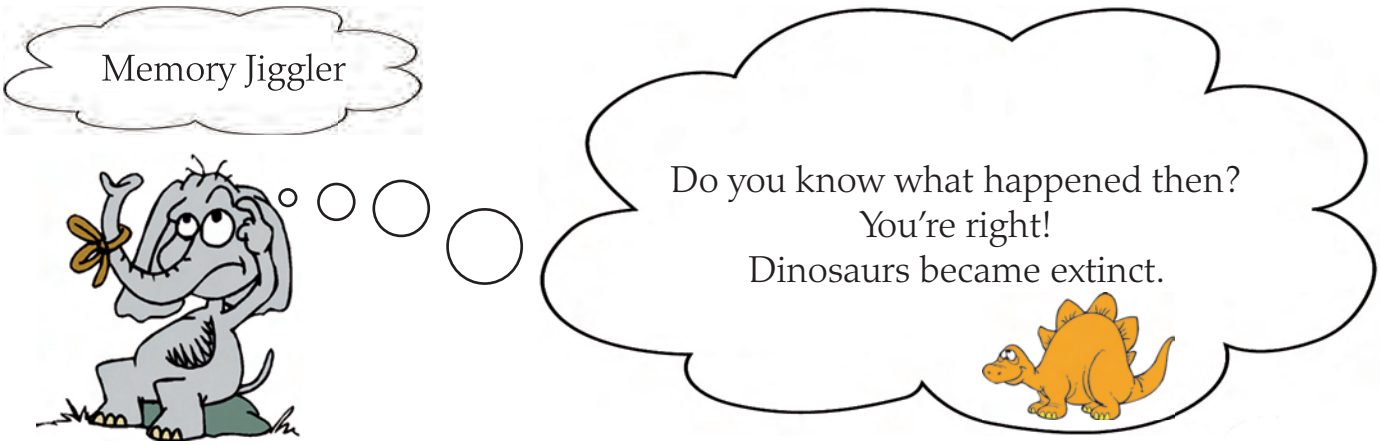
Other Objects in Space

Asteroids



Asteroids are rocky fragments found in a band (or belt) orbiting around the Sun. The "asteroid belt" can be found between Mars and Jupiter. Asteroids vary in size from several hundred km across to the size of a pebble. They are left over from when the solar system formed over 4.5 billion years ago.

As asteroids orbit around the Sun, they can get knocked out of place by the orbits of Jupiter or Mars. This collision causes the asteroid to go hurtling off into space where it might eventually land on a planet. Geologists (who study rocks and Earth's structure) and palaeontologists (who study fossils of plants and animals) think that a giant asteroid may have landed on Earth about 65 million years ago.



This asteroid, which landed in Mexico, created such a cloud of dust that it covered major portions of Earth and stopped sunlight from getting to the plants. You know what happens next: the plants can't photosynthesise without light energy from the Sun. Plants die. Animals die.

Meteoroids

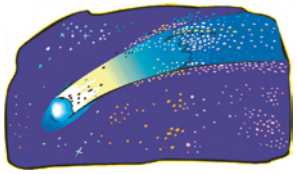
Meteoroids are also rocky fragments of space left overs. They probably were formed the same way as asteroids. When meteoroids fall through space and enter Earth's atmosphere, the friction of the air causes them to glow. People often call these streaks of light in the sky "shooting stars". The correct, scientific name for them is "meteors".

Don't be Tricked

Don't be tricked by the poetic name"shooting stars".
Of course, you know that stars, like the Sun, are huge balls of exploding gases. You wouldn't see them flying across the sky.

Meteors often burn up in the atmosphere before they reach Earth. If they do finally land on Earth they are called"meteorites".

Comets



Comets are also left over objects from the formation of our solar system. They are different from asteroids because they are not rocky fragments but are made of ice with dust and dirt frozen inside. Sometimes people call them"dirty snowballs".

Comets have their own orbits around the Sun. Some of them come from so far away they take millions of years to make one revolution. One of the most famous comets is called Halley's comet. Mark your calendar because that will come past Earth again in 2061!

Kuiper Belt

Icy space objects are found in the Kuiper Belt, a region of space out beyond Pluto. Although, some scientists believe that Pluto is actually part of the Kuiper Belt. Comets may be formed in this region. In 2002 scientists discovered a large object (although only half the size of Pluto) in the Kuiper Belt that may be another planet. They are continuing to study named, "2002 LM60".

Focus Question

Name two other types of objects found in outer space besides the Sun and the planets.

Comets, meteors, asteroids, and the objects in the Kuiper Belt.

Answer

Investigation — Feasibility Studies

Now that you are an expert on conditions on other planets, you have been asked to write a "feasibility study" on a plan to colonise another planet besides Earth. A "feasibility study" is like a project that takes a lot of information about a certain idea and shows if it would actually work or not.

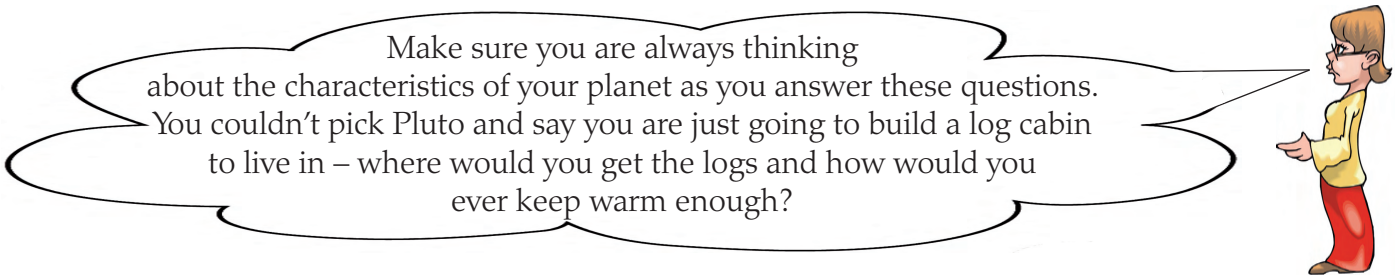
Feasible is from the French word "faisable" which comes from the verb that means "to do".

Feasible means if something is possible.

Your task is to choose a planet of interest to you and present a feasibility study to show how it could be colonised in your lifetime. In your study you will have to include the following sections (and any others you feel would be especially important for your plan or your planet).

1. Identify the planet you have chosen.
2. Give a short introduction about why you chose that planet.
3. Give a brief summary of the specifics on your planet such as:
   - distance from Sun
   - where it lies in the Solar System (like 3rd from the Sun, etc.)
   - length of planet's day and year
   - some distinguishing characteristics (rings? atmosphere?)
4. Tell something about the people you expect to live there (research scientists, your family, whole civilisations…).
5. Explain how long you expect your colony to remain on the planet (one year research study, indefinitely…).

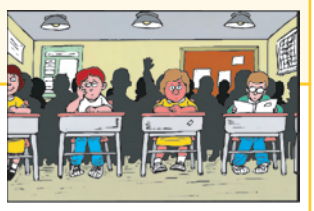
Set 5. Earth Sciences (The Solar System): *The Planets*



6. Identify areas you must take into consideration in order to survive and explain how you will address them.
   Some ideas you may use to start you off (but there are many more)
   - how will you get there (and back to Earth?)
   - oxygen supplies (how will you keep enough oxygen for the time you are there?)
   - food supplies (and once those are used up?)
   - water supplies (and once you have drunk all the water?)
   - shelter
   - maintaining temperature (not too hot, not too cold)
   - communication (with each other, with Earth)
   - transportation (around the planet)
   - medical issues
7. Cost considerations (these are always in feasibility studies!).
   - how will the trip be supported?
   - how will you continue to live once there (for example, if you expect deliveries of supplies from nearby planets, who will pay for that?)
8. Presentation of Study.
   - how will you present your information?
     (handouts, computer presentation, diagrams, panel discussion?)
   - if you are working in a group, who will take each of the roles, how will you make the determination
   - how will you address any questions that an audience might have about your ideas?
9. As a conclusion to this task, write a paragraph to say if you think, after all the research you have done and all the organisation of material, that it would ever be feasible to live on the planet you chose.

Set 5. Earth Sciences (The Solar System): *The Planets*

Test Practice Questions



1 Which of the following objects can be found in our solar system?

A. clouds, atmosphere, Sun
B. planets, Sun, comets
C. Pluto, equator, meteorites
D. cloud formations, asteroid belt, ice crystals

Answer: _____

2. The name of the space object that orbits a planet is called

A. moon
B. comet
C. star
D. asteroid

Answer: _____

3. The very large planets like Jupiter and Saturn are made from

A. rocks and soil
B. ice and rock
C. liquid water and iron
D. gases like hydrogen and helium

Answer: _____

4. Two planets that are similar to Earth are

A. Pluto and Neptune
B. Venus and Mars
C. Saturn and Uranus
D. Mercury and Jupiter

Answer: _____

Science Program — Key Stage 2

Set 5. Earth Sciences (The Solar System): *The Planets*

Science and Literacy Strategies

Literacy Strategy: Comprehension Check: Stop and Draw.

Our Solar System

The Solar System consists of planets and other bodies that orbit the Sun in predictable paths. Orbit refers to the path an object takes when it revolves around another. Predictable means that the paths the bodies take when they go around the Sun are always the same, and can be easily predicted.

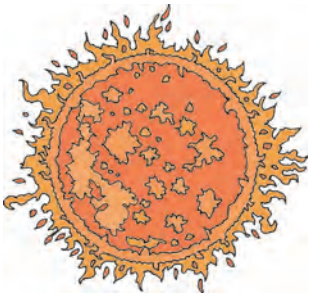
While the Sun always stays in one place, the planets and their moons move. Think of it like this: you are the Sun, standing in the middle of a circle, and spinning around making yourself dizzy. Then nine of your friends are the planets, who are walking and spinning around you. That is exactly how the Sun and the planets are in space.

Comprehension Check: Stop and Draw. Draw a picture of yourself in the middle of nine of your friends and/or family members. While you are in the middle, draw 9 circles around yourself. Put each family member on his/her own line. This is the position of the Sun in relation to the planets. Each planet has its own circle around the Sun, which we call the orbital path.

Other smaller objects called asteroids and meteoroids orbit the Sun as well. Asteroids are made of pieces of rock that were left over when the solar system formed. They are usually found together, orbiting the Sun in a straight line called the"asteroid belt". *Draw an asteroid belt between the fourth and fifth person* in the picture above.

Set 5. Earth Sciences (The Solar System): *The Planets*

Fun Practice Assignment



1. What is the name of a planet that is closer to the Sun than Earth?

_____

2. What is the name of a planet further away from the Sun than Earth ?

_____

3. The table below has the names of the planets mixed up.
Write the names of the planets in the "Straightened out Planet Names" column.

Mixed up planet names	Straightened out Planet Names
rteha	
runasu	
arms	
cyumerr	
svune	
rjtupie	
loptu	
tunpeen	
urtsna	

4. List the "Straightened Out Planet Names" in order from the Sun

_____

_____

Set 5. Earth Sciences (The Solar System): *The Planets*

Planet Information

Planet name	Distance from Sun (km)	Diameter at equator (approx. km)	Length of day (rotation)	Revolution around Sun (orbit)	Composition	Number of moons
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Neptune	4.5 billion	49,000	16 hours	165 years	Gas	13
Pluto	6 billion	2,000	6 days	248 years	Rocky	1

5. Using the information in the table, complete the following paragraph. The words you can use are listed for you.

nine 365 gas
largest Jupiter Pluto revolve

In our solar system there are _____ planets.

The smallest planet is _____ and the _____ planet is Jupiter.

_____ also has the largest number of moons.

It takes _____ days for Earth to _____ or orbit around the Sun.

Earth and the other closest planets to the Sun are rocky.

The rest of the planets are made mostly from _____ .