

Adam, wake up now. The clouds are gone. We can now see many stars.

Yes, father.



Wow, it's so beautiful! Look at that, father. What is that dim band of light in the sky?



That's the object that I wanted to record.

That band of light consists of many stars. It's the Milky Way galaxy. Earth is also located in this galaxy.



Isn't Earth situated in the Solar System?

Have you ever seen a galaxy like the one in the picture above?
The Milky Way galaxy can only be seen at night and only in very dark areas.
What is a galaxy?

Getting to Know Galaxies

Chua and his father are observing a galaxy using a telescope.



What's that object?

That's a galaxy.
Try to observe it carefully.
What can you see?



What's a galaxy?

A galaxy is a system made up of millions of stars, gases, dust, and other types of matter. There are billions of galaxies of various shapes and sizes in the universe. The size of galaxies consists of several million to several trillion stars. These stars revolve around the centre of their galaxies.



How do we know that there are many galaxies in the universe?



I'm the Hubble Space Telescope.



I can see many stars in that galaxy. Its centre is also very bright.



We can see the galaxy clearly because the size of the galaxy is very big. It is the nearest to our galaxy. There are many more galaxies in this universe. Some of the little dots in the sky are also galaxies.



Let's look at this picture. This picture was taken by the Hubble Space Telescope showing thousands of little dots. Each of these little dots is actually a galaxy.



SCIENCE INFO

The Andromeda galaxy is a large spiral galaxy. It is also the nearest to Earth. It can be seen with our naked eyes from the northern hemisphere during a very dark night.



What are the types of galaxy found in this universe?

Did you know that there are several types of galaxies?
Let's learn about a few types of galaxies.



spiral-shaped
galaxy



elliptical-shaped
galaxy



irregular-shaped
galaxy



FUN ACTIVITY

Sketches of Galaxies



Apparatus and materials: computer, Internet access, coloured pencils, white paper

Steps:

1. Find pictures of galaxies and their shapes using the Internet.
2. Sketch the shapes of those galaxies.
3. Exhibit your sketch in the class.

Questions:

1. What are the galaxies that you have sketched?
2. What do you understand about galaxies?



The Milky Way Galaxy

Try looking at the sky from a very dark area at night. You may be able to see a band of stars with their dim light as shown in the picture below.



Astronomers identified that band of stars as the Milky Way galaxy. The Milky Way is a galaxy. We can see the huge Milky Way galaxy in the night sky because Earth is located in this galaxy. The stars we see in the night sky are mostly found in the Milky Way galaxy.



That band of stars is called the Milky Way because the ancient Romans imagined it as spilled milk in the night sky.

11.1.2
11.1.3

Why is it called the Milky Way?



Earth is part of the Solar System. Do you still remember about the Solar System? Do you know where our Solar System is located in this universe?



Let's look at this picture. The Milky Way galaxy is one of the billions of galaxies in the universe. The centre of the Milky Way is surrounded by billions of stars.



The Solar System consists of the Sun, Earth, and seven other planets. It is part of the Milky Way galaxy.

The Milky Way is a barred spiral galaxy with two main arms. This galaxy also has a bright and thick centre. Thus, this galaxy resembles a thin disc that bulges at the centre if it is observed from the side view.





Solar System

Our Solar System is at the edge of one of the spiral arms of the Milky Way galaxy.



The Sun is one of the stars found in the Milky Way galaxy.



Earth

I see. No wonder we're only able to see a part of the Milky Way galaxy from Earth. It's because Earth is at the edge of this galaxy.



side view of the Milky Way galaxy



Activity 1

Apparatus and materials: computer, Internet access, marker pen, manila card

**Steps:**

1. Find information on the Milky Way galaxy.
2. Each member takes a turn to write at least one fact about the Milky Way galaxy on a manila card.
3. Present the work of your group.

Questions:

1. Describe the Milky Way galaxy based on the above activity.
2. Are asteroids, meteoroids, and comets also found in the Milky Way galaxy? Why?

Activity 2

Apparatus and materials: scissors, pencil, string, glue, cardboard, white paper



 Be careful when using scissors.

Steps:

Cut the cardboard and white paper into round-shaped discs.



Paste the white disc on top of the cardboard disc.



Draw the Milky Way galaxy on the white disc. Mark the location of the Solar System.



Make two holes at the centre of the disc.



Insert a string through the two holes. Tie both ends of the string together.



Turn the disc to spin the string. Then, pull the string.

Question:

Explain the position of Earth in the Milky Way galaxy.

Size of the Solar System in the Milky Way Galaxy

How big is the size of the Solar System in the Milky Way galaxy?

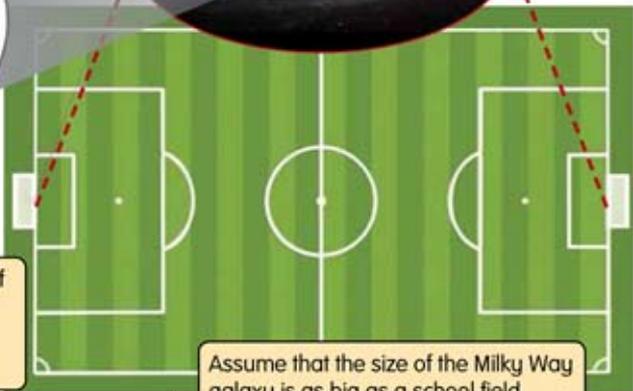
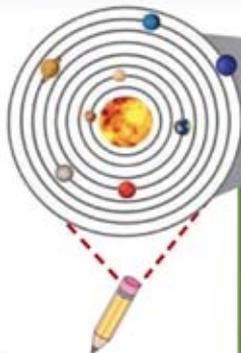


Let's imagine that the size of the Solar System is as big as the diameter of a pencil.

Like this pencil, Mr Hadi?



Yes, Alia. See the difference in the size of the Solar System and the Milky Way galaxy as shown in the picture below.



Assume that the size of the Solar System is as big as the diameter of a pencil.

Assume that the size of the Milky Way galaxy is as big as a school field.



Based on this comparison, the size of the Milky Way galaxy is as big as the whole area of the school field if the size of Solar System is as big as the diameter of a pencil.

Wow, the size of the Milky Way galaxy is so big!



Based on the comparison above, what is your conclusion on the size of the Solar System in the Milky Way galaxy?





LET'S TEST

Simulation on the Size of the Solar System and the Milky Way Galaxy



Aim: To run a simulation that represents the size of the Solar System in the Milky Way galaxy

Apparatus and materials: measuring tape, hockey ball, flour

Steps:

1. Conduct this activity at the school field.



2. Place pupil A in the middle of the school field as the centre of the Milky Way galaxy.
3. Measure a distance of 30 m from the position of pupil A to the position of pupil B.
4. By keeping a distance of 30 m, pupil B walks around pupil A while sprinkling flour along the path to form a circle on the field.
5. Place the pupils at positions C, D and E as the marked boundaries of the area that represent the Milky Way galaxy.
6. Place the hockey ball at position F to represent the position of the Solar System in the Milky Way galaxy.
7. Sketch the simulation above and discuss.

Questions:

1. Based on the simulation above, compare the size of the Solar System to the size of the Milky Way galaxy.
2. Predict the size of the Milky Way galaxy, in metre, if the size of the Solar System is three times the size of the hockey ball.



- The simulation above is not according to the actual scale and shape.
- Teachers may use other suitable location.

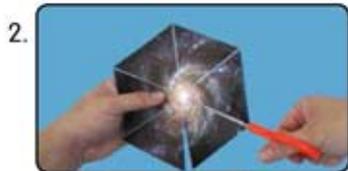


Make a galaxy windmill using a computer, Internet access, printer, scissors, hole punch, pencil, iron wire.

Steps:

Be careful when using scissors and iron wire.

1. Download a picture of a galaxy from the Internet. Print it out.



2. Cut the picture into the shape of a hexagon and along the white lines as shown in the picture.



3. Make six holes at the sides and make one hole in the middle of the hexagon using a hole punch.



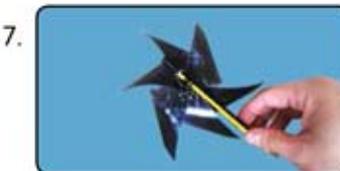
4. Flip the hexagon and insert the iron wire into the middle hole of the hexagon.



5. Fold each flap of the hexagon. Insert the iron wire into the hole at the side of each flap.



6. Tie the iron wire at the front part of the windmill.



7. Tie the back end of the iron wire to a pencil. Do not tie it too tightly.

8. Point the galaxy windmill towards the direction of the blowing wind.



MIND REFLECTION

1. A galaxy consists of millions of stars, gases, dust, and other types of matter.
2. The universe contains billions of galaxies of various sizes and shapes.
3. The size of galaxies consists of several million to several trillion stars. These stars revolve around the centre of their galaxies.
4. The Milky Way is a barred spiral galaxy with two main arms.
5. The Milky Way galaxy resembles a thin disc that bulges at the centre if it is observed from the side view.
6. The Solar System that consists of the Sun, Earth, and seven other planets are part of the Milky Way galaxy.
7. The size of the Solar System is very small compared to the Milky Way galaxy.



MIND TEST

Answer all questions in the Science exercise book.



1. The picture above shows a galaxy taken by a space telescope.
 - (a) What is the definition of a galaxy?
 - (b) What is the type of the galaxy shown in the picture above?

2. Fill in the blanks below with the correct answers.

(a) The Milky Way is a _____ with a _____ shape.

(b) The Solar System consists of the _____, Earth, and _____ other planets that are located in the _____ galaxy.

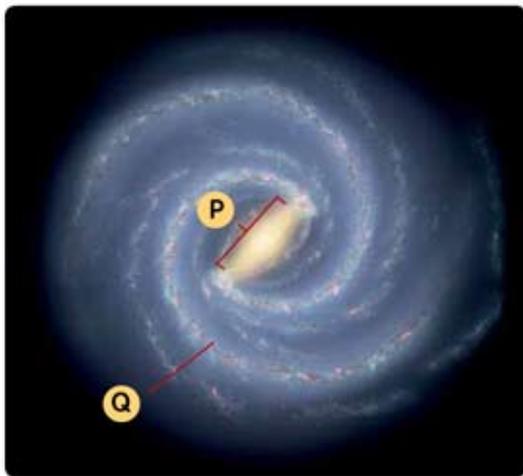
(c) The universe contains billions of galaxies that have various _____ and _____.

Object X appears like a band of stars stretching across the sky and glowing dimly when it is viewed from Earth. The ancient Romans imagine it as spilled milk in the night sky.

3. Based on the statement above, answer the following questions.

(a) What is object X?

(b) What is the type of object X?

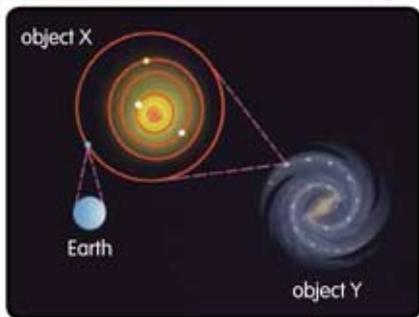


4. State the parts marked as P and Q as shown in the picture above.

P: _____

Q: _____

5. The picture shows object X as part of object Y in the universe
- Name object X and Y.
 - What is the name of the star in object X?



6. Tick (✓) the correct statements about the size of the Milky Way galaxy.

- The size of the Milky Way galaxy is the same as the Solar System.
- The size of the Milky Way galaxy is very small compared to the Solar System.
- The size of the Milky Way galaxy is very big compared to the Solar System.
- If the size of the Solar System is imagined to be as big as the diameter of a pencil, then the size of the Milky Way galaxy could cover the size of a school field.



7. The picture above shows the side view of galaxy Q that contains the Sun.
- Name galaxy Q.
 - Give two facts about galaxy Q.
8. The Milky Way galaxy resembles a _____ that _____ at the centre if it is observed from the side view.