

THE EARTH IN THE SOLAR SYSTEM

How wonderful it is to watch the sky after sunset! One would first notice one or two bright dots shining in the sky. Soon you would see the number increasing. You cannot count them any more. The whole sky is filled with tiny shining objects – some are bright, others dim. It seems as if the sky is studded with diamonds. They all appear to be twinkling. But if you look at them carefully you will notice that some of them do not twinkle as others do. They simply glow without any flicker just as the moon shines.

Along with these bright objects, you may also see the moon on most of the days. It may, however, appear at different times, in different shapes and at different positions. You can see the full moon only once in about a month's time. It is **Full moon** night or *Poornima*. A fortnight later, you cannot see it at all. It is a **New moon** night or *Amavasya*. On this day, you can watch the night sky best, provided it is a clear night.

Do you wonder why can't we see the moon and all those bright tiny objects during day time? It is because the very bright light of the sun does not allow us to see all these bright objects of the night sky.

The sun, the moon and all those objects shining in the night sky are called **celestial bodies**.

Some celestial bodies are very big and hot. They are made up of gases. They have their own heat and light, which they emit in large amounts. These celestial bodies are called **stars**. The sun is a star.

Countless twinkling stars in the night sky are similar to the sun. But we do not feel their heat or light, and they look so tiny because they are very very far from us.

Let's Do

 You'll need : 1 torch, 1 sheet of plain paper, pencil and a needle.

Step :

1. Place the torch in the centre of the paper with its glass front touching the paper.
2. Now draw a circle around the torch.
3. Perforate the paper with the needle within the circled area.
4. Now place the perforated circle part of the paper on the glass front and wrap the paper around the torch with a rubber band.
5. Take care that the switch of the torch is not covered.
6. In a dark room, stand at some distance facing a plain wall. Switch off all other lights. Now flash the torch light on the wall. You will see numerous dots of light on the wall, like stars shine in the night.
7. Switch on all the lights in the room. All dots of light will be almost invisible.
8. You may now compare the situation with what happens to the bright objects of the night sky after the sun rises in the morning.

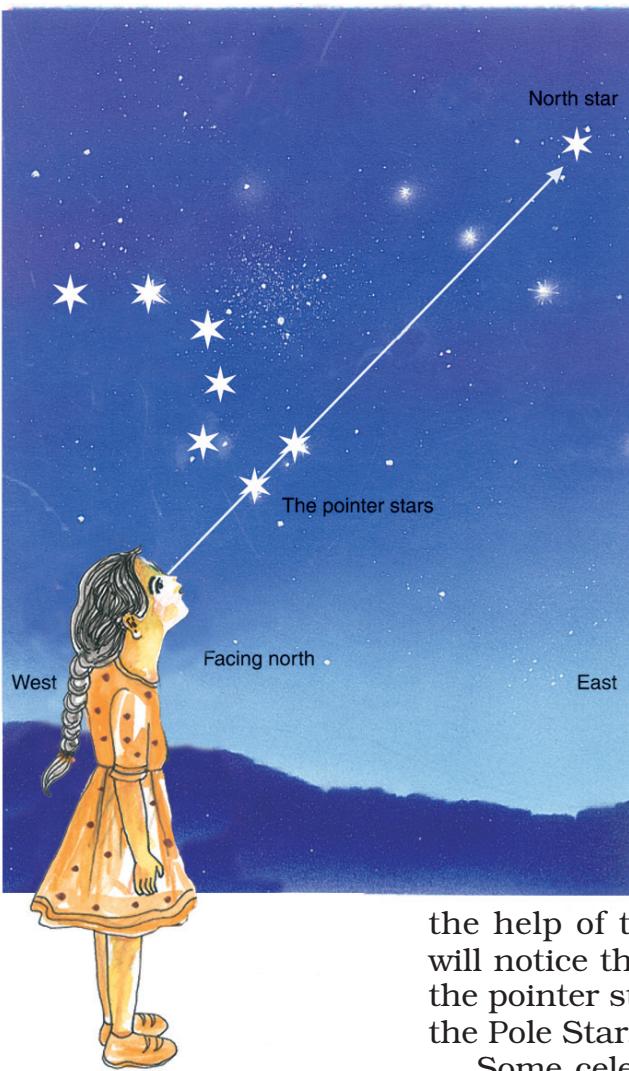


Figure 1.1 : Saptarishi and the North Star



Interesting Fact

Jupiter, Saturn and Uranus have rings around them. These are belts of small debris. These rings may be seen from the earth with the help of powerful telescopes.

You must have noticed that all objects look smaller when seen from a distance. How small an aeroplane looks when it is flying at a great height!

While watching the night sky, you may notice various patterns formed by different groups of stars. These are called **constellations**. Ursa Major or Big Bear is one such constellation. One of the most easily recognisable constellation is the small bear or *Saptarishi* (*Sapta*-seven, *rishi*-sages). It is a group of seven stars (Figure 1.1) that forms a part of the large Ursa Major Constellation. Ask someone elder in your family or neighbourhood to show you more stars, planets and constellations in the sky.

In ancient times, people used to determine directions during the night with the help of stars. The North star indicates the north direction. It is also called the **Pole Star**. It always remains in the same position in the sky. We can locate the position of the Pole Star with

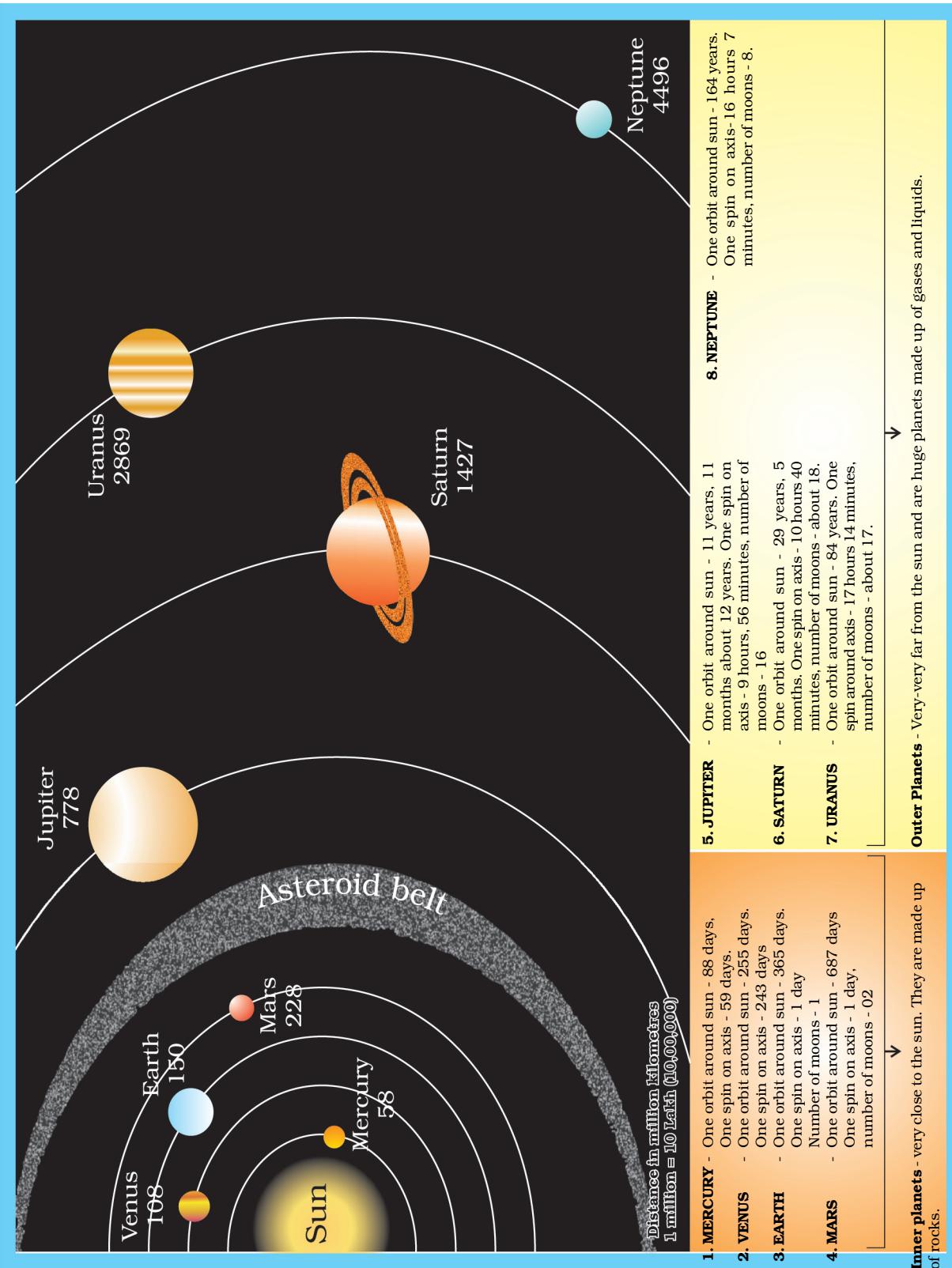
the help of the Saptarishi. Look at Figure 1.1. You will notice that, if an imaginary line is drawn joining the pointer stars and extended further, it will point to the Pole Star.

Some celestial bodies do not have their own heat and light. They are lit by the light of the stars. Such bodies are called **planets**. The word ‘planet’ comes from the Greek word “Planetai” which means ‘wanderers’. The earth on which we live is a planet. It gets all its heat and light from the sun, which is our nearest star. If we look at the earth from a great distance, say the moon, it will appear to be shining just as the moon.

The moon that we see in the sky is a satellite. It is a companion of our earth and moves round it. Like our earth, there are eight other planets that get heat and light from the sun. Some of them have their moons too.

THE SOLAR SYSTEM

The sun, eight planets, satellites and some other celestial bodies known as asteroids and meteoroids



THE EARTH IN THE SOLAR SYSTEM

Figure 1.2 : The Solar System



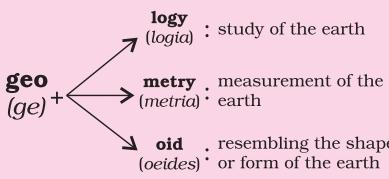
Do you know?

'Sol' in Roman mythology is the 'Sungod'. 'Solar' means 'related to the sun'. The family of the sun is, therefore, called the solar system. Write down as many words using the word solar on your own as you can.



Word Origin

Many words used in a language may have been taken from some other language. Geography, for example, is an English word. It has its origin in Greek, which relates to the description of the earth. It is made of two Greek words, 'ge' meaning 'earth' and 'graphia' meaning 'writing'. Find out more about the earth.



Do you know?

Humans have always been fascinated gazing at the night sky. Those who study the celestial bodies and their movements are called astronomers. Aryabhatta was a famous astronomer of ancient India. Today, astronomers all over the world are busy exploring the universe.

form the solar system. We often call it a solar family, with the sun as its Head.

The Sun

The sun is in the centre of the solar system. It is huge and made up of extremely hot gases. It provides the pulling force that binds the solar system. The sun is the ultimate source of heat and light for the solar system. But that tremendous heat is not felt so much by us because despite being our nearest star, it is far away from us. The sun is about 150 million km away from the earth.

Planets

There are eight planets in our solar system. In order of their distance from the sun, they are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune.

An easy way to memorise the name of the planets in order of their distance from the sun is:

MY VERY EFFICIENT MOTHER JUST SERVED US NUTS.

All the eight planets of the solar system move around the sun in fixed paths. These paths are elongated. They are called **orbits**. Mercury is nearest to the sun. It takes only about 88 days to complete one round along its orbit. Venus is considered as 'Earth's-twin' because its size and shape are very much similar to that of the earth.

Till recently (August 2006), Pluto was also considered a planet. However, in a meeting of the International Astronomical Union, a decision was taken that Pluto like other celestial objects (Ceres, 2003 UB₃₁₃) discovered in recent past may be called 'dwarf planets.'

The Earth

The earth is the third nearest planet to the sun. In size, it is the fifth largest planet. It is slightly flattened at the poles. That is why, its shape is described as a **Geoid**. Geoid means an earth-like shape.

Conditions favourable to support life are probably found only on the earth. The earth is neither too hot nor too cold. It has water and air, which are very essential for our survival. The air has life-supporting gases like oxygen. Because of these reasons, the earth is a unique planet in the solar system.

From the outer space, the earth appears blue because its two-thirds surface is covered by water. It is, therefore, called a *blue planet*.

The Moon

Our earth has only one satellite, that is, the moon. Its diameter is only one-quarter that of the earth. It appears so big because it is nearer to our planet than other celestial bodies. It is about 3,84,400 km away from us. Now you can compare the distance of the earth from the sun and that from the moon.

The moon moves around the earth in about 27 days. It takes exactly the same time to complete one spin. As a result, only one side of the moon is visible to us on the earth.

The moon does not have conditions favourable for life. It has neither water nor air. It has mountains,



Figure 1.3 : The moon as seen from the space

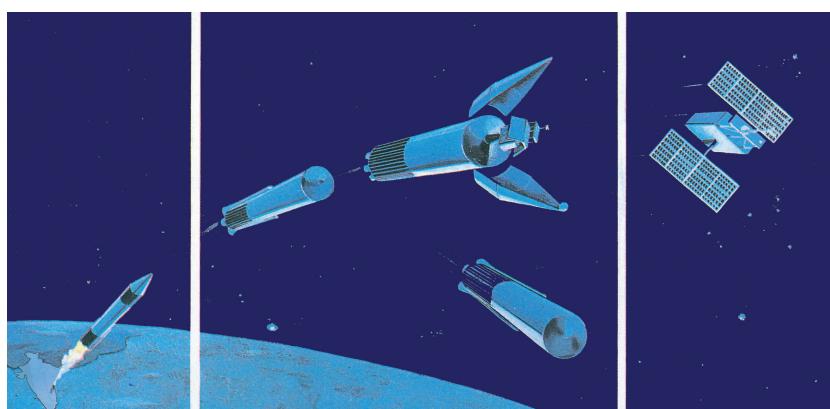
Do you know?

 Light travels at the speed of about 300,000 km per second. Yet, even with this speed, the light of the sun takes about eight minutes to reach the earth.



Interesting Fact

Neil Armstrong was the first man to step on the surface of the moon on 21 July 1969. Find out whether any Indian has landed on the moon?



Rocket launch Rocket falls back to the Earth

Satellite enters orbit

Figure 1.4 : Human-made Satellite

A Satellite is a celestial body that moves around the planets in the same way as the planets move around the sun.

A Human-made Satellite is an artificial body. It is designed by scientists to gather information about the universe or for communication. It is carried by a rocket and placed in the orbit around the earth.

Some of the Indian satellites in space are INSAT, IRS, EDUSAT, etc.



What do animals and plants require in order to grow and survive?



Figure 1.5 : Asteroid

plains and depressions on its surface. These cast shadows on the moon's surface. Look at the full moon and observe these shadows.

Asteroids

Apart from the stars, planets and satellites, there are numerous tiny bodies which also move around the sun. These bodies are called **asteroids**. They are found between the orbits of Mars and Jupiter (Figure 1.2). Scientists are of the view that asteroids are parts of a planet which exploded many years back.

Meteoroids

The small pieces of rocks which move around the sun are called **meteoroids**. Sometimes these meteoroids come near the earth and tend to drop upon it. During this process due to friction with the air they get heated up and burn. It causes a flash of light. Sometimes, a meteor without being completely burnt, falls on the earth and creates a hollow.

Do you see a whitish broad band, like a white glowing path across the sky on a clear starry night? It is a cluster of millions of stars. This band is the *Milky Way* galaxy (Figure 1.6). Our solar system is a part of this galaxy. In ancient India, it was imagined to be a river of light flowing in the sky. Thus, it was named *Akash Ganga*. A **galaxy** is a huge system of billions of stars, and clouds of dust and gases. There are millions of such galaxies that make the **Universe**. It is difficult to imagine how big the universe is. Scientists are still trying to find out more and more about it. We are not certain about its size but we know that all of us – you and I belong to this universe.

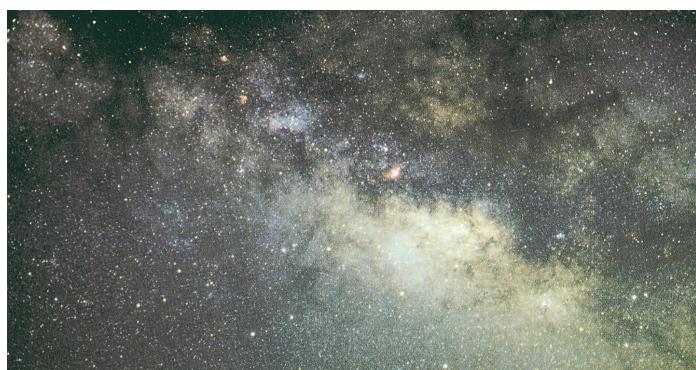
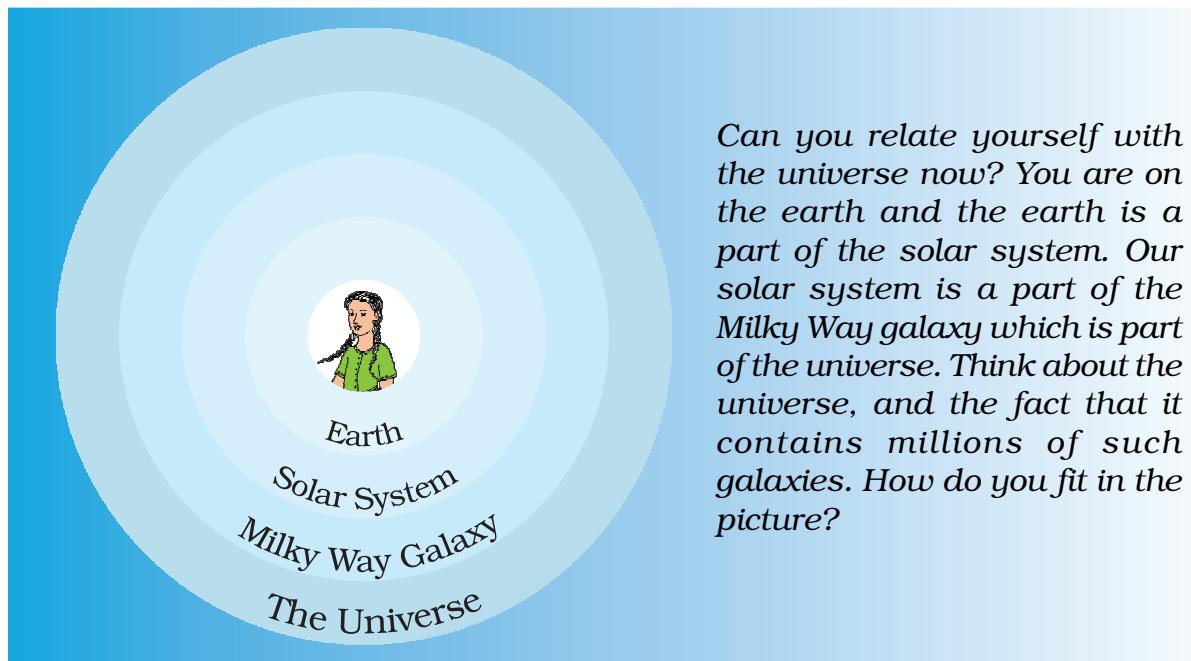


Figure 1.6 : Milky Way



Can you relate yourself with the universe now? You are on the earth and the earth is a part of the solar system. Our solar system is a part of the Milky Way galaxy which is part of the universe. Think about the universe, and the fact that it contains millions of such galaxies. How do you fit in the picture?

EXERCISES

1. Answer the following questions briefly.

- (a) How does a planet differ from a star?
- (b) What is meant by the ‘Solar System’?
- (c) Name all the planets according to their distance from the sun.
- (d) Why is the Earth called a unique planet?
- (e) Why do we see only one side of the moon always?
- (f) What is the Universe ?

2. Tick the correct answer.

- (a) The planet known as the “Earth’s Twin” is
 - (i) Jupiter
 - (ii) Saturn
 - (iii) Venus
- (b) Which is the third nearest planet to the sun ?
 - (i) Venus
 - (ii) Earth
 - (iii) Mercury
- (c) All the planets move around the sun in a
 - (i) Circular path
 - (ii) Rectangular path
 - (iii) Elongated path
- (d) The Pole Star indicates the direction to the
 - (i) South
 - (ii) North
 - (iii) East

- (e) Asteroids are found between the orbits of
(i) Saturn and Jupiter (ii) Mars and Jupiter (iii) The Earth and Mars

3. Fill in the blanks.

- (a) A group of _____ forming various patterns is called a _____.
(b) A huge system of stars is called _____.
(c) _____ is the closest celestial body to our earth.
(d) _____ is the third nearest planet to the sun.
(e) Planets do not have their own _____ and _____.



THINGS To Do

1. Prepare a chart of the solar system.
2. During a vacation visit a planetarium and describe your experience in the class.
3. Organise a quiz contest on the earth and the solar system.



FOR FUN

1. The sun is commonly known as *Soorya* or *Sooraj* in Hindi. Find out its name in different languages of our country. Take help of your friends, teachers and neighbours.
2. You might have heard that people make human chains and run for world peace etc. You can also make a human solar system and run for fun.

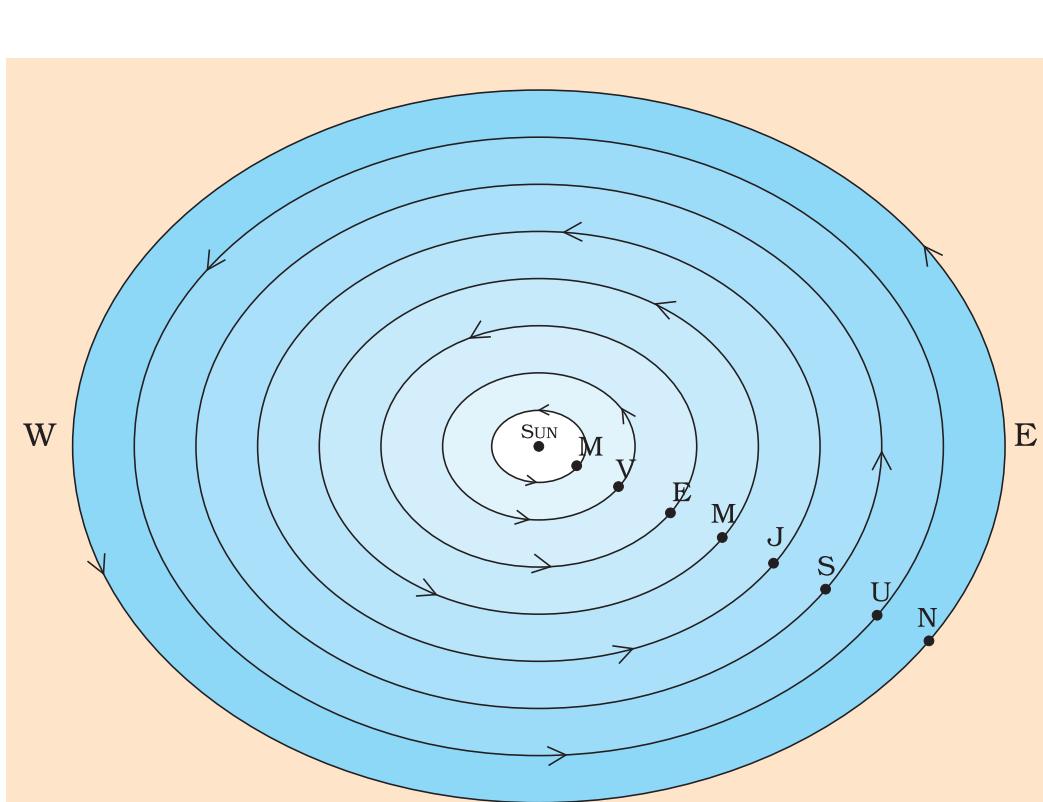
Step 1: All children of your class can play this game. Assemble in a big hall or on a playground.

Step 2: Now draw 8 circles on the ground as shown in the figure drawn on the opposite page.

Use a 5-metre long rope. Mark at every half a metre with a chalk or ink. Place a small nail to mark the centre. Now hold one end of the rope at the central position. Ask your friend to hold a chalk at the $\frac{1}{2}$ metre mark and move around the nail holding rope and chalk together on the ground.

You have drawn one circle just as you do on paper using a compass and a pencil. Draw other circles in the same manner.

Step 3: Prepare 10 placards. Name them as Sun., Moon, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune.



Step 4: Select 10 children in the following order and give each one of them a placard.

Order of placard distribution

The Sun - tallest, The moon - smallest; Mercury, Mars, Venus and Earth (almost equal heights); Neptune, Uranus, Saturn and Jupiter taller than the earlier four planets but smaller than the Sun.

Now ask the children holding placards to take their places with the Sun in the centre in their orbits. Ask the child holding the moon placard to keep the hand of the child holding the earth placard always.

Now your Solar System is almost ready to go into action.

Now make everybody move slowly in the anti-clockwise direction. Your class has turned into a small human replica of the solar system.

While moving on your orbit you can also turn around. For everybody the spin should be anti-clock wise except for Venus and Uranus who will make the spin in the clock-wise direction.

