

# What Is the Solar System?

When you and your family travel on vacation, the world can seem very big. But to scientists who send probes into space or fly on space shuttles, these distances are actually very small. Earth is just one of a family of planets that circles our local star, the sun. The sun is at the center of our solar system. Although the most important objects in the solar system are the planets, it also includes smaller bodies. Most planets have natural satellites (moons) of their own. There are several dwarf planets, millions of “minor planets” called asteroids, meteoroids, billions of comets, and more. Even the space between bodies is not empty—comets leave tiny grains of dust and hot gases behind.

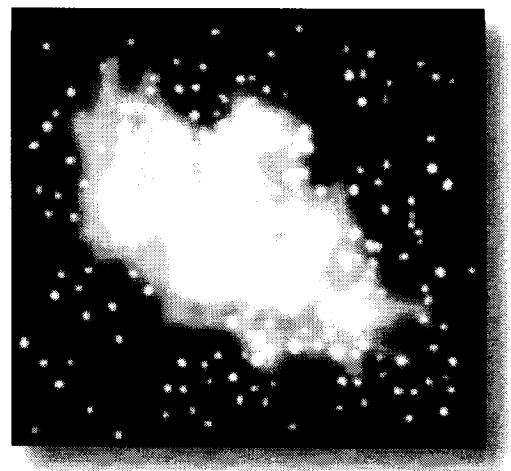
In order of distance from the sun, the planets are: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and the dwarf planet Pluto. The first four are the small, “rocky” inner planets. The next four are the giant “gaseous” outer planets. Pluto is included with the outer planets, even though it is small and rocky like the inner planets. In 2006 the International Astronomical Union officially downgraded Pluto to a dwarf planet. The inner and outer planets are separated by the asteroid belt, which contains billions of smaller rocks. Because the planets seemed to wander across the earth’s sky, ancient Greeks called them *planets*, which comes from the Greek word meaning “wanderer.” The planets **orbit** (move in a curved path) around the sun. The solar system is actually made up of the sun and everything that moves around it. It’s a small part of a larger system known as the Milky Way galaxy; there are billions of galaxies beyond the Milky Way.

## Distance in Space

Objects in space are very far apart. Scientists had to come up with a unit suitable for measuring such large distances in space. Scientists decided to use a unit called the “light-year” to try and make sense of the distances between objects in space. Light travels at a rate of 186,282 miles per second. A **light-year** is the distance light travels in one year, which is about 5.88 trillion miles. In space terms, our solar system is very small. It is only one “light-day” across. A light-day is the distance light travels in a day. In comparison, scientists have calculated the Milky Way galaxy to be 100,000 light-years across.

## Origin

Scientists believe that the solar system formed from a spinning cloud of gas and dust called a **nebula**. Their theory is that gravity caused the nebula to shrink, or contract, to form the sun. After the sun formed, the leftover gas and dust in the nebula formed the other objects in our solar system. The sun, so big and extremely hot, is most of the mass (99%) of our solar system. Now that we know what the solar system is, let’s continue our journey and get to know all of its other inhabitants.



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## What Is the Solar System?: Reinforcement Activity

**To the student explorer:** How many planets make up our solar system? Name them.

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**Analyze:** Why do you think the planets are called wanderers? \_\_\_\_\_

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**Directions:** Show what you have learned by answering the questions below.

1. What is a nebula? \_\_\_\_\_

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2. Which planets are the inner planets? \_\_\_\_\_

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3. Which planets are the outer planets? \_\_\_\_\_

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4. How are the inner and outer planets different? \_\_\_\_\_

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**Completion:** Fill in the sentences below.

5. The \_\_\_\_\_ separates the inner planets from the outer planets.

6. Scientists believe our solar system may have formed from a \_\_\_\_\_.

7. A planet's \_\_\_\_\_ is the curved path of the planet around the sun.

8. The sun is at the \_\_\_\_\_ of our solar system.

9. Objects in space are measured in a unit called a \_\_\_\_\_.

10. Our solar system includes the sun, eight planets, several dwarf planets, millions of minor planets called \_\_\_\_\_, and billions of \_\_\_\_\_.

## What Is the Sun?

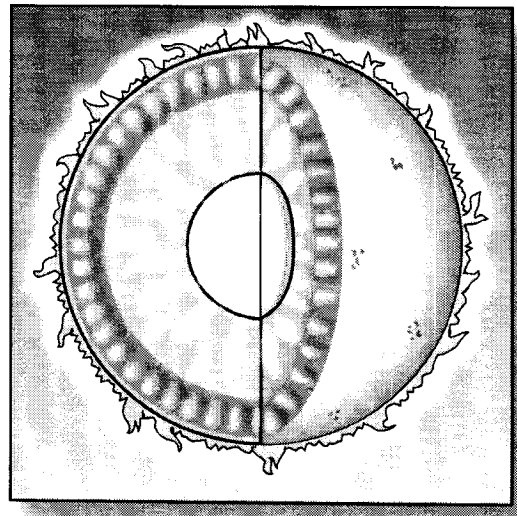
The sun is one of billions of stars in our part of the universe. That's right, explorers, I said the **sun** is a star. It is our local star; it is the center of our solar system. People used to believe that the earth was the center of the solar system and that the planets revolved around it. The sun is a gigantic, spinning ball of extremely hot gases, mostly hydrogen and helium. The sun is an average star in size, mass, and temperature; however, it is the largest object in our solar system. It is constantly in motion. It rotates once every 25 days, and it will revolve around our galaxy (the Milky Way) in about 230 million years. Because it is so huge, the sun's gravity exerts enough power to hold on to everything around it. It is the sun's gravity that keeps all of the planets **orbiting** (moving) around it in a regular orbital pathway. The sun is the only star close enough for us to study in detail.

### The Sun's Energy

The sun is a huge solar furnace giving us just the right amount of light, heat, and energy, so that we can live comfortably here on Earth. It produces energy by nuclear reactions. The nucleus is the center of an atom. In a nuclear reaction, the nuclei of atoms are changed. Deep inside the sun, the temperature is so hot that the nuclei of hydrogen atoms combine, or fuse. This reaction, called **hydrogen fusion**, occurs when four hydrogen atoms fuse together to create one helium atom. Energy is released during the reaction from the leftover mass.

### The Structure of the Sun

The sun is many layers of burning gas. It has two main parts: the core and the atmosphere. The **core** is deep within the sun's center. This is the hottest part of the sun where the sun's energy is created. Surrounding the core is the **radiative zone**. The temperatures in the radiative zone are highest at the core and coolest far away from the core. **Radiation** is the movement of energy from the hot core to cooler areas. The next area surrounding the core and radiative zone is the **convective zone**. The violent movements of gases in this layer carry energy to the sun's surface. The surface area of the sun is made up of three thin, **atmospheric layers**. The first layer is the **photosphere**, or light layer. It is the visible surface of the sun. The second layer is the **chromosphere**, or color sphere. It gives off a soft, red glow, usually seen during a solar eclipse. The last layer, the **corona**, gives a soft glow about half as bright as the moon and is usually seen during an eclipse. On the sun's surface are dark patches called **sunspots**. These areas are cooler than the areas around them and appear dark as a result. Sunspots move in groups in the same direction across the sun. Atoms of gases that carry electrically charged particles create them. The average life span of a sunspot is two weeks. Just remember, explorers, the bright light of the sun can be harmful to your eyes. You should never look directly at the sun.



Name: \_\_\_\_\_ Date: \_\_\_\_\_

## What Is the Sun?: Reinforcement Activity

**To the student explorer:** What kind of star is the sun? \_\_\_\_\_

**Analyze:** Why does the sun appear to be so huge? \_\_\_\_\_

**Directions:** Prove what you have learned so far about the sun by answering the questions below.

1. Of what is the sun mostly made? \_\_\_\_\_
2. What are the two main parts of the sun? \_\_\_\_\_
3. What is at the center of the sun? \_\_\_\_\_
4. What are the layers of the sun's atmosphere? \_\_\_\_\_  
\_\_\_\_\_
5. Which layers are only seen during a solar eclipse? \_\_\_\_\_  
\_\_\_\_\_

**Directions:** Solve the clues below. The first letter of each word has been provided.

6. A \_\_\_\_\_ One of the main parts of the sun
7. S \_\_\_\_\_ The center of our solar system
8. P \_\_\_\_\_ These orbit the sun due to gravity.
9. E \_\_\_\_\_ The corona is usually visible during this.
10. C \_\_\_\_\_ Hottest part of the sun
11. I \_\_\_\_\_ The sun is constantly \_\_\_\_\_ motion.
12. A \_\_\_\_\_ These are changed during a nuclear reaction.
13. L \_\_\_\_\_ The sun is the \_\_\_\_\_ object in our solar system.
14. S \_\_\_\_\_ Dark patches on the sun's surface
15. T \_\_\_\_\_ The sun has \_\_\_\_\_ thin, atmospheric layers.
16. A \_\_\_\_\_ The sun is an \_\_\_\_\_ -sized star.
17. R \_\_\_\_\_ Nuclear \_\_\_\_\_ produce energy.