

Solar System is how big?

It's very hard for us to understand just how large the solar system is. Scientists tell us that the largest number our minds can really comprehend, or grasp, is about a hundred thousand (100,000). When you begin talking about the distances between planets, which are measured in millions, or billions, of miles, our minds just don't keep up very well. What we are going to try to do here is explain the size of the solar system in a way that you can understand it, as well as get some idea of how far apart our planetary neighbors are.



In addition to our walk through the solar system, we will also tell you how long it would take to drive to the planets in your car at seventy miles per hour, as well as fly there in a jet plane going 600 miles per hour. Remember, the planets are not in a straight line going out from the Sun. They are always moving around the Sun, so they are hardly ever lined up in a row. This is because the planets orbit the Sun at different speeds. The distances we use are from the Sun to the planets' average distance from the Sun.

Mercury

The first stop on our walk will be Mercury, which is the closest planet to the Sun. Mercury is about 35 million miles from the Sun. In our bead model it was 4 cm from the Sun. If you got on a jet and flew at 600 miles per hour from the Sun to Mercury, it would take seven years! Driving the same distance in a car would take 57 years. Because Mercury is so close to the sun, people on Earth never get a good view of Mercury. Mercury has many flat plains and many craters on its surface.

Mercury has a very thin atmosphere. This causes Mercury to be a planet of extremes. It is so close to the sun that during the day, the side facing the sun reaches temperatures of 430°C. At night all the heat escapes into space. The temperature drops to -170°C.

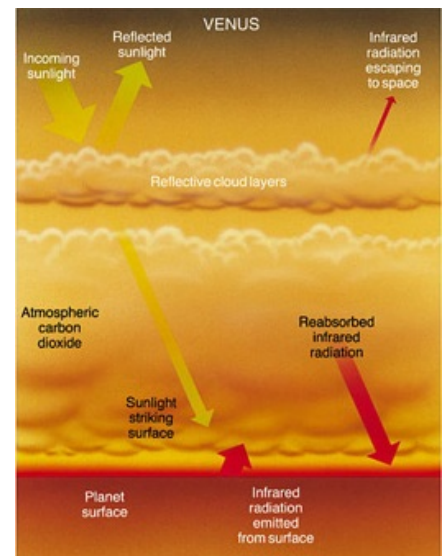
Venus

The second stop on our trip through the planets is Venus. The planet named for the Roman goddess of love and beauty is about 65 million miles from the Sun. In our bead model Venus was 7 cm from the Sun. If you got on a jet and flew at 600 miles per hour from the Sun to Venus, it would take twelve years. If you could drive the same distance, it would take 106 years.

Whenever you see a bright object into west after sunset, it is probably Venus, also known as the “evening star,” though it is not a star. When you see Venus rise before sun in the morning it is called the ‘morning star.’ Stars shine with their own light, while Venus shines because it is reflecting light from the Sun just as the other planets and moons in the solar system do.

Venus is similar in size to Earth, and this is why it is sometimes called Earth’s twin. Venus takes about 7.5 Earth months to revolve around the sun. It takes about 8 months for Venus to rotate on its axis. Venus rotates so slowly that its day is longer than its year. Venus rotates from East to West, the opposite direction from most other planets and moons. This type of rotation on Venus is called retrograde rotation.

Venus gets more solar energy than Earth does. Ordinary light from the sun can’t penetrate, get through, Venus’s atmosphere and hit its surface. The surface heats up and then gives off heat. Carbon dioxide traps this heat in the atmosphere. So Venus’s surface becomes hotter and hotter, until it is about 460°C, hot enough to melt lead. Thus making Venus the hottest planet in our solar system because of its thick atmosphere.



Earth

The third stop on our trip through the solar system is our home planet of Earth. Earth's average distance from the Sun is 93 million miles, which means in our bead model the Earth is 10 cm from the Sun. By the way, scientists use the Earth's distance from the Sun as a type of shorthand to show distance. This distance is called an astronomical unit. If you got on a jet and flew at 600 miles per hour from the Sun to Earth, it would take 18 years. If you could drive the same distance, it would take 152 years.

Most of Earth, about 70%, is covered with water. Perhaps the planet should be named “water” instead of Earth! No other planet in our solar system has oceans like earth.

Mars

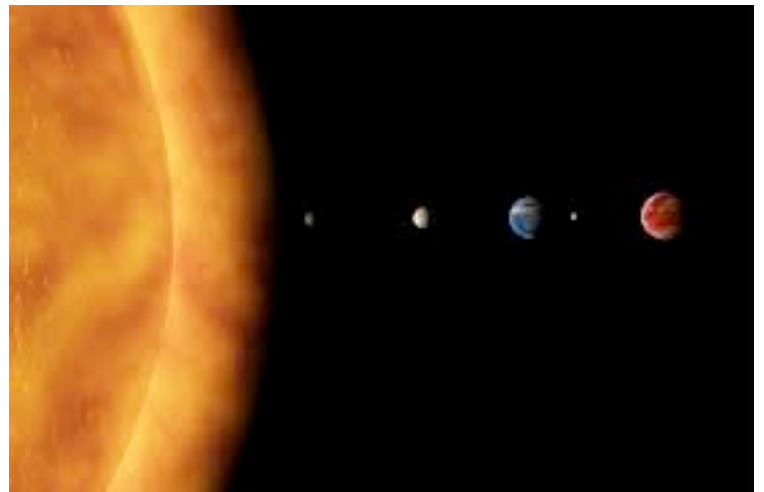
The fourth stop on our stroll through the solar system is Mars, the Red Planet. Mars' average distance from the Sun is about 137 million miles, or 15 cm from the Sun, in our bead model, If you got on a jet and flew at 600 miles per hour from the Sun to Mars, it would take 26 years. If you could drive the same distance, it would take 223 years.

Mars is called the “red planet” because it has a slightly reddish color, this is because of the high amount of iron oxide in the soil, which on Earth we call rust. Astronomers have found that some water remains on Mars in the form of ice at its north pole. Olympus Mons is the solar systems largest volcano. Olympus Mons rises 3 times higher than Mount Everest and is wider than the entire state of Arizona.

Jupiter

Jupiter, the largest planet, is the fifth planet from the Sun, and is the first of what are called the Outer Planets. Its average distance from the Sun is almost 467 million miles, or 50 cm in our bead model. If you got on a jet and flew at 600 miles per hour from the Sun to Jupiter, it would take 89 years. If you could drive the same distance, it would take 762 years.

Jupiter is the most massive planet; it is more than 300 times as massive as Earth. An interesting feature in Jupiter’s atmosphere is its Great Red Spot, a giant area of swirling clouds four times bigger than the entire planet Earth. The Great Red Spot appears to be an ongoing storm, similar to a hurricane on Earth, which has been going on for at least 400 years!



Saturn

Saturn, the ringed planet, is the sixth planet from the Sun. This giant planet is over nine times as far away from the Sun as Earth. Its average distance is over 850 million miles away from the Sun, which was 100 cm from the Sun in our bead model. If you got on a jet and flew at 600 miles per hour from the Sun to Saturn, it would take 163 years. If you could drive the same distance, it would take 1,396 years.

Saturn is the only planet less dense than water, meaning if you put it in a pool of water it would float to the top like a fishing bobber. When Galileo first look at Saturn with a telescope, he could see 4 moons and something sticking out the sides. A few decades later, another astronomer using a better telescope discovered that Saturn had rings around it. Astronomers later found that these rings are made of chunks of ice and rock, each traveling in its own orbit around Saturn.

Uranus

Uranus, the mysterious blue-green planet, is the seventh planet from the Sun. From Uranus outward to the edge of the solar system, the distances are truly great. Uranus' average distance from the Sun is 1.7 billion (1,700,000,000) miles, or 190 cm in our model. If you got on a jet and flew at 600 miles

per hour from the Sun to Uranus, it would take 328 years. If you could drive the same distance, it would take 2,809 years.

In 1781, Uranus became the first new planet discovered since ancient times. Astronomer William Herschel, in England, found an object in the sky that did not look like a star. At first he thought it might be a comet. But other astronomers soon calculated its orbit and realized that it was a planet beyond Saturn. Strangely, Uranus's axis is tilted at an angle of about 98° . Viewed from Earth, Uranus is rotating from top to bottom instead of from side to side. Astronomers think that billions of years ago Uranus was hit by an object, the size of Earth, that knocked it on its side.

Neptune

Neptune, the eighth and last planet from the Sun, is almost 2.7 billion (2,700,000,000) miles away from the center of the solar system. So in our model this was 300 cm from the Sun. It is a very long distance. If you got on a jet and flew at 600 miles per hour from the Sun to Neptune, it would take 513 years. If you could drive the same distance, it would take 4,400 years.

The ancients did not know of Neptune. It is not visible to the naked eye and was first discovered in 1846 because mathematics showed that some object in space was pulling on Uranus other than the Sun.

The Birth of the Solar System

Our planet, the Earth, is part of a much larger community. This family of planets, moons, asteroids, comets, and one star probably began the same way many other planetary systems are forming, which we can observe through telescopes.

About 5 billion years ago our Solar System did not exist at all. Instead, there was in its place a large cloud of gas and dust called a nebula. Over many millions of years, the immense gravity of this large cloud caused the dust and gas to slowly fall inward towards its center.

As matter in the cloud fell towards the center it began to spin. This spinning was caused by the basic laws of motion. Objects in space do not speed up or slow down unless their speed is changed by something else. Also, all objects move in the same direction until their path is changed by something else. As the dust and gas fell into the center of the cloud, each particle resisted slowing down or changing directions. However, the gravity of the growing matter in the center tried to pull the particles directly to the center. The strength of the gravity was not enough to pull the particles directly in, but it was strong enough to bend their paths around into a circle. As the cloud began to swirl it also flattened out, much like spinning a lump of dough on your hand causes it to flatten out like a pizza crust.

Now we have a flat spinning cloud of dust and gas.

The center continued to collect more and more matter, growing larger and larger. At the same time, smaller clumps of matter began to form throughout the disk. These smaller clumps would eventually become planets, moons, asteroids and comets. As matter collects into clumps it heats up. The more matter that collects, the hotter an object becomes. The Earth is still very hot in its core, this heat is left over from when the Earth originally formed. Eventually the Sun became so hot in its core that it ignited, turning hydrogen into helium. Once the Sun ignited, the formation of the Solar System quickly ended. The new star's intense radiation and solar winds blew away the remaining dust and gas in the cloud so that the Sun and its planets could not grow any larger.

The planets closest to the Sun, (Mercury, Venus, Earth and Mars) are called the terrestrial planets. They are small, dense, rocky planets. The outer planets (Jupiter, Saturn, Uranus and Neptune) are called the Jovian Planets, or gas giants. They are large and made up of gas. Pluto is closer to a comet than a planet, since it is a great big ball of ice.

