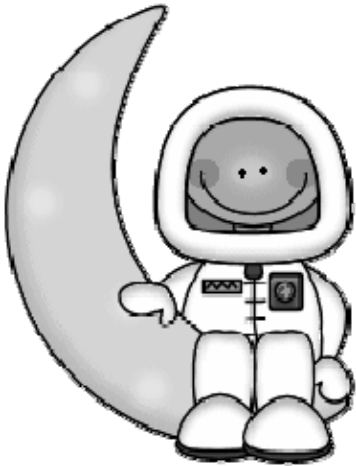




Out of This World



Name _____

Homeroom Teacher _____



Discovery Lab
Science Notebook



The Solar System

Our solar system has 9 planets that orbit a big star called the Sun. (An orbit is the path that a planet moves through.) All the planets orbit the Sun in elliptical paths. (An ellipse is just a stretched out circle.)

Circle

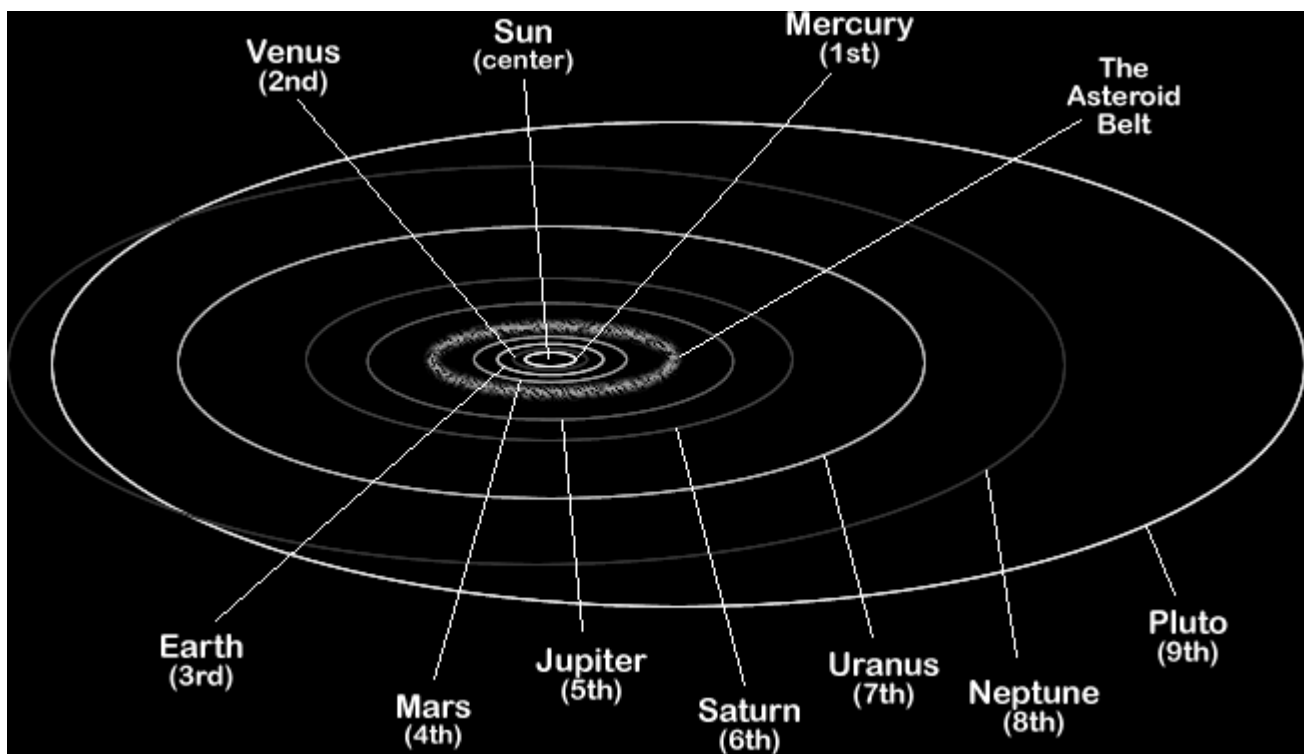
Ellipse

All the planets take different amounts of time to get all the way around the Sun. Our Earth takes a year to make one complete orbit. In fact, that's how we decided how long a year should be - it's the length of time it takes us to get all the way around the Sun!

Also, all the planets spin while they move around the Sun... Just like tops!

There is other stuff that orbits the Sun... We call it the Asteroid Belt and it is just a bunch of really big rocks.

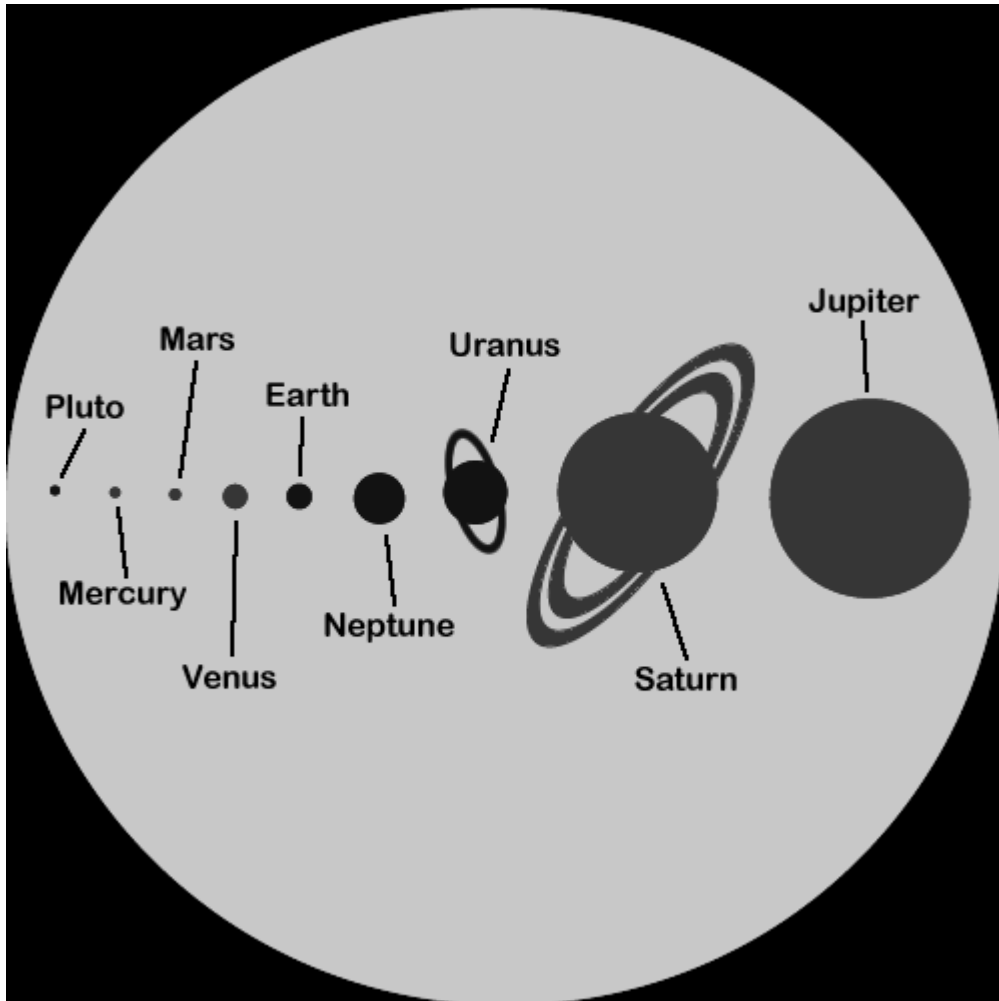
Here's a picture of all the orbits:



If you need to remember the order of the planets, here's a trick: Just look at the first letters of each planet in order, starting with Mercury and working your way out... M, V, E, M, J, S, U, N, P and make up a funny sentence that uses these letters. Here's one:

My very eager mother jogged south under nine planets.

How do all their sizes compare? The big circle is the Sun's size and all the others are arranged from smallest to largest. (Man, look how little the Earth is compared to the Sun!)



The inner planets, Mercury, Venus, Earth and Mars are called terrestrial planets. This means that they have a hard surface (rock) to stand on.

Jupiter, Saturn, Uranus and Neptune are called the Jovian planets, since they are all a lot like Jupiter. (Jove was another name for the Roman god, Jupiter). They are also called gas giants. This is because they are made of gas and liquid (but not water). There's no hard surface to stand on!

(Poor little Pluto doesn't get to fit into either of these categories.)



Research!

You are going to begin your journey into outer space by researching the planets, the sun, comets and asteroids. It is very important that we understand these objects in order to really learn about the Universe in which we live. You will be guided throughout the activity to fill in the charts below.

3, 2, 1 blastoff.....

Mercury

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Venus

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Earth

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Mars

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Jupiter

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Saturn

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Research!

Uranus

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Neptune

1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Pluto

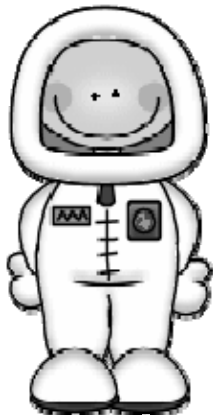
1 Orbit Around the Sun	
1 Rotation	
Average Temperature	
Diameter	
Atmosphere	

Comets

What are comets made out of?	
Where do they come from?	

Asteroids

What is an asteroid?	
The inner belt of asteroids are made of	
The outer belt of asteroids are rich in	
Where do asteroids come from?	



Modeling Planet Sizes

Objectives:

1. Calculate the radii for scale models of the planets
2. Make a scale model of each planet
3. Compare the relative sizes of the planets
4. Place the planets in order based on distance from the sun

Background Information:

The enormity of the objects that make up our Solar System is difficult to imagine. The diameter of the Sun is 1,392,000 km. The diameter of Pluto is 2,400 km. To create a model of our Solar System to show relative sizes of the Sun and the planets requires the use of a scale.

1. Using the information you gathered during your laptop research fill in the actual diameter (km) for the planets and the sun.
2. Now we will use a scale model for our diameter (cm). **Scale = 1cm:5000km**
3. Using your calculator divide the diameters for each of the planets and sun by 5000. Record your answers in the Diameter block below.
4. Now we are going to find the radius of each. To find the radius of the diameter, you will divide the diameter by 2. Record your answers in the Radius block below.

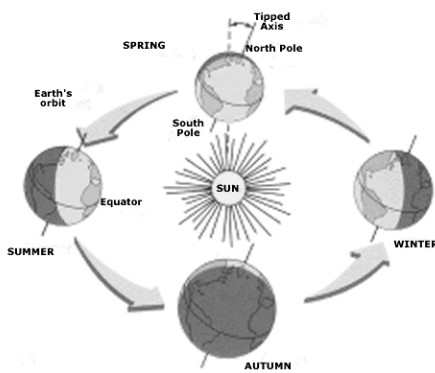
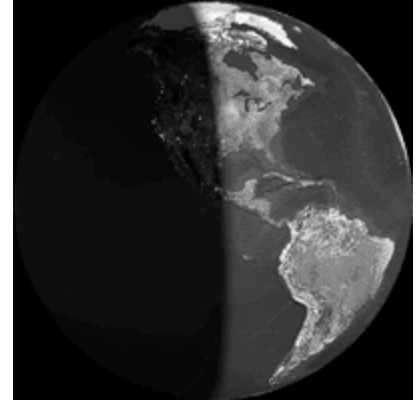
Name	Actual Diameter (km)	Scale Model Diameter (cm)	Scale Model Radius (cm)
Sun	1, 392, 000	278.4	139.2
Mercury			
Venus			
Earth			
Mars			
Jupiter			
Saturn			
Uranus			
Neptune			
Pluto			

5. Using the radius that you calculated and a compass draw the nine planets. On the smaller circles it may be easier just to free hand them.
6. Place the planets in order from the sun. Glue them to your large paper and label each of them. Draw examples of asteroids and comets as well.
7. Label the top of your paper: THE SOLAR SYSTEM

The Reason for the Season

Rotation vs. Revolution

Viewed from above, the Earth makes a complete counterclockwise rotation (spins on its axis) once in each 24-hour period. This is why the sun appears to rise in the east and set in the west. But this daily rotation has nothing to do with seasons. The Earth also revolves counterclockwise around the sun once every 365 1/4 days. This yearly revolution, combined with the earth's tilt (see below) gives us seasons.

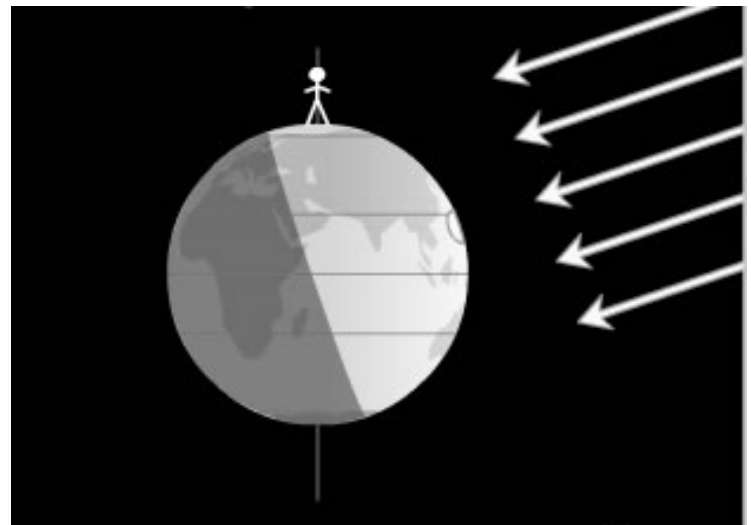


Tilt and Revolution

The Earth's axis is not oriented vertically, but is tilted by 23.5 degrees. The north end of the axis is always pointed toward the North Star as the Earth revolves around the sun. This tilt, combined with its revolution around the sun, causes seasonal changes. (When it's summer in the northern hemisphere, it's winter in the southern, and vice versa.) If the axis was not tilted, our year-round climate would be rather boring and many places on earth wouldn't receive much light!

During our summer, the Northern Hemisphere leans toward the sun in its revolution, there are more daylight hours, and the sun's angle is more perpendicular to us than at other times of year. The longer days and more concentrated sunlight and results in more heating. (Shadows are shorter in the summer because the sun strikes Earth more directly.)

During winter, the Northern Hemisphere leans away from the sun, there are fewer daylight hours, and the sun hits us at an angle; this makes it appear lower in the sky. There is less heating because the angled sun's rays are "spread out" rather than direct. (Shadows are longer because of the lower angle of the sun.)



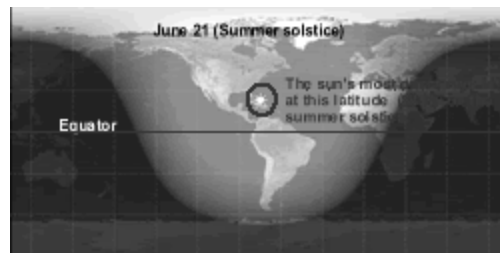
The Reason for the Season, cont'd

In equatorial regions, the length of days and the directness of sunlight don't change as much. The further you get from the equator, the more dramatic the seasonal changes.

During the spring and fall, the Earth leans neither toward nor away from the sun; daylight and nighttime hours are more equal and temperatures are moderate. (The shadow of an object is similar during these seasons.)

Solstice vs. Equinox

Solstice refers to the two times each year when the sun's strongest rays are furthest from the equator (north of it during our summer solstice and south during the winter). For the northern hemisphere, summer solstice occurs around June 21st; we have the maximum number of daylight hours at that time. Winter solstice is around December 21st when we have the fewest daylight hours.



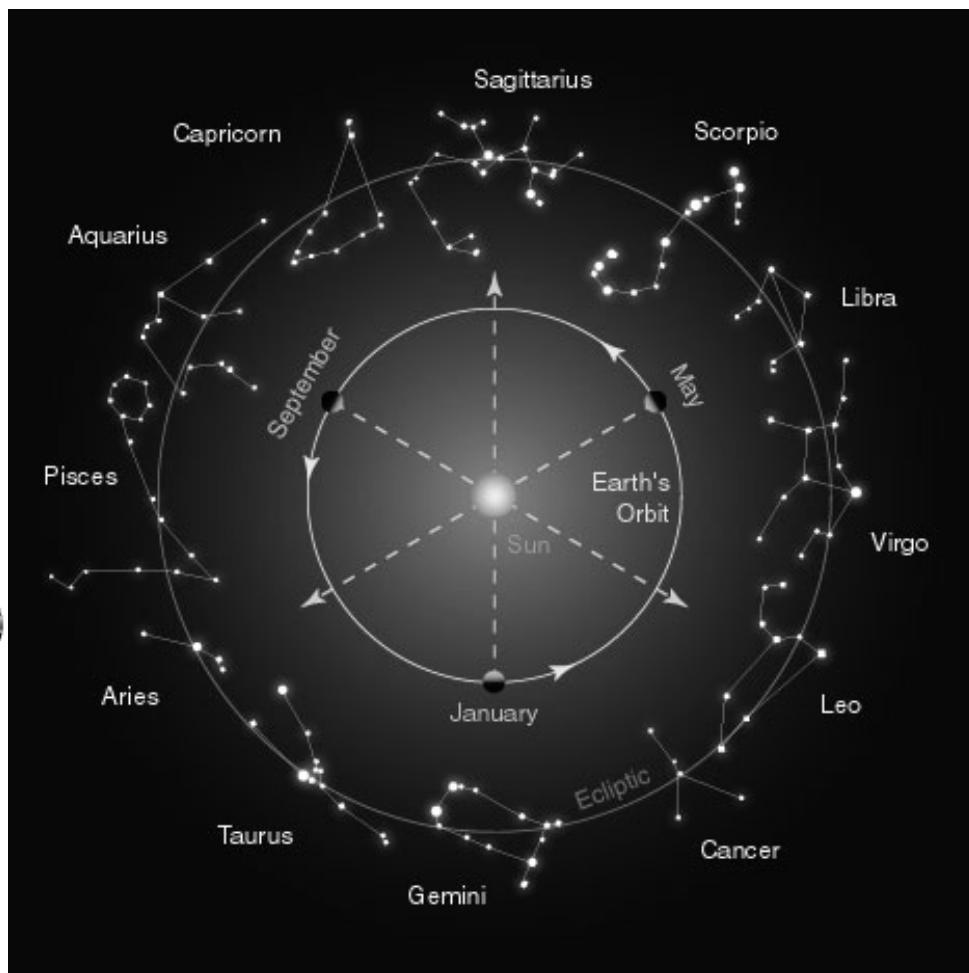
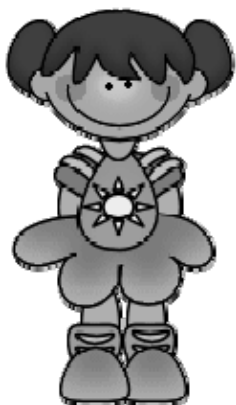
Equinox refers to the two times each year when the sun's strongest rays are directly hitting the equator. Everywhere on earth has 12 hours of daylight on the spring and fall equinoxes. In the northern hemisphere, spring equinox occurs around March 21st and autumnal equinox around September 21st.



Constellations

Constellations are groupings of stars that form easily recognized and remembered patterns, such as Orion and the Big Dipper. The Big Dipper is actually an asterism, not a constellation, because it is only part of the constellation Ursa Major (the Big Bear). Actually, the stars in the majority of all constellations do not "belong together." Usually they are at greatly varying distances from Earth and just happen to lie more or less in the same line of sight as seen from our solar system. But in a few cases, the stars of a constellation are actually associated; most of the bright stars of the Big Dipper travel together and form what astronomers call an *open cluster*. If you observe a planet, say Mars, for one complete revolution, you will see that it passes successively through 12 constellations. All planets (except Pluto at certain times) can be observed only in these 12 constellations, which form the so-called zodiac, and the Sun also moves through the zodiacal signs, though the Sun's apparent movement is actually caused by the movement of Earth.

Although the constellations are due mainly to the optical accident of line of sight and have no real significance, astronomers have retained them as reference areas. It is much easier to speak of a star in Orion than to give its geometrical position in the sky. During the Astronomical Congress of 1928, it was decided to recognize 88 constellations. A description of their agreed-upon boundaries was published in Cambridge, England, in 1930, under the title *Atlas Celeste*.



The Moon's Phases

The lunar month is the 29.53 days it takes to go from one new moon to the next. During the lunar month, the Moon goes through all its phases. You can see the phases drawn in the image below. Just like the Earth, half of the Moon is lit by the Sun while the other half is in darkness. The phases we see result from the angle the Moon makes with the Sun as viewed from Earth.

At **new moon**, the Moon is lined up between the Earth and the Sun. We see the side of the Moon that is not being lit by the Sun (in other words, **we see no Moon at all**, because the brightness of the Sun outshines the dim Moon!) When the Moon is exactly lined up with the Sun (as viewed from Earth), we experience an **eclipse**.

As the Moon moves eastward away from the Sun in the sky, we see a bit more of the sunlit side of the Moon each night. A few days after new moon, we see a **thin crescent** in the western evening sky. The crescent Moon **waxes**, or **appears to grow fatter**, each night. When **half of the Moon's disc is illuminated**, we call it the **first quarter moon**. This name comes from the fact that the Moon is **now one-quarter of the way through the lunar month**. From Earth, we are now looking at the sunlit side of the Moon from off to the side.

The Moon continues to wax. Once more than half of the disc is illuminated, it has a shape we call **gibbous**. The gibbous moon **appears to grow fatter** each night until we see the full sunlit face of the Moon. We call this phase **the full moon**. It rises almost exactly as the Sun sets and sets just as the Sun rises the next day. The Moon has now completed one half of the lunar month.

During the **second half of the lunar month**, the Moon grows thinner each night. We call this **waning**. Its shape is still gibbous at this point, but **grows a little thinner** each night. As it reaches **the three-quarter point in its month**, the Moon once again shows us one side of its disc illuminated and the other side in darkness. However, the side that we saw dark at the first quarter phase is now the lit side. As it completes its journey and **approaches new moon again**, the Moon is a **waning crescent**.

