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

Family:­­ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mission Breakthrough: Explore the Solar System

Today you will travel through the solar system. The sun is represented by the giant green and black soccer ball. The rest of the planets’ sizes are correctly adjusted to the soccer ball.

While doing this activity think about how much space is between each planet. Think about how big you are compared to the size of Earth. After doing this activity you should be able to tell your teacher why outer space is called outer space [hint: there is *a lot* of space beyond Earth!]

Your mission today is to explore the solar system that is setup on the Olympics field. At each station there will be activities for your to perform and questions for you to answer. Good luck on your mission!

**Sun**

* The sun is 100 times wider than Earth.
* It is a burning ball of gas – mainly hydrogen gas and helium gas.
* 1 billion suns could fit inside of the largest star known, Mu Cephei.

**Mercury**

An **orbit** is a loop that a planet or a comet makes around the sun. Orbits get longer as planets get farther away from the sun. Today you will compare Mercury’s orbit with Earth’s orbit to see which one is longer.

Instructions:

1. pick a person from your group to act as the planet in the activity (if you have already visited Earth then the same person must be used as the walker)
2. pick another person to be the group’s timer
3. The walker takes *1 step every second* while following the circular orbit path.
4. Time one complete orbit.

Time of 1 orbit for Mercury: \_\_\_\_\_\_\_\_\_\_\_\_

See “Wrap-up” questions at the end.

**Venus**

Venus is the hottest planet in the solar system, with temperatures reaching 890ºF. Do you think you could live on Venus? Why or why not? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

There are 243 days that pass on Earth only 1 day passes on Venus. What does this mean about the speed of Venus’ rotation? Is it faster or slower than Earth’s rotation? Why? \_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Earth**

Instructions:

1. pick a person from your group to act as the planet in the activity (if you’ve already been to Mercury then the same person must be the walker)
2. pick another person to be the group’s timer
3. The walker takes *1 step every second* while following the circular orbit path.
4. Time one complete orbit.

Time of 1 orbit for Earth: \_\_\_\_\_\_\_\_\_\_\_\_

See “Wrap-up” questions at the end

**Mars**

Because space is such a huge place scientists don’t measure distances in miles or kilometers. Instead they use lightyears and Astronomical Units (AU’s). Today we will be using Astronomical Units. An Astronomical Unit is the distance from the Earth to the Sun. Also,

1 Astronomical Unit = ~150,000,000 km.

In today’s activity, every 10 meters from the sun is equal to 1 Astronomical Unit.

Question: If Mars is 15 meters from the sun (in today’s activity) then how far is Mars from the Sun in real life?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Astronomical Units (AU)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kilometers (km)

**Asteroid Belt**

The asteroid belt separates the inner planets from the outer planets. It is 10 AUs wide. How wide is that in kilometers? [Hint: see **Mars**.]

Work Space:

The four biggest asteroids in the asteroid belt make up more than half the asteroid belt’s weight. Some of them are so big that astronomers call them “dwarf planets.” What are the names of the four biggest asteroids in the asteroid belt?

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Jupiter**

* Jupiter, Saturn, Uranus and Neptune are made of gas.
* Jupiter is the largest planet in the solar system.
* Jupiter’s mass is two and a half times the mass of all the other planets combined.
* It was thought for many years that Jupiter has 16 moons. In the past decade, however, 33 new moons have been discovered, which makes a total of \_\_\_\_\_\_\_\_\_ moons. There are also 14 “unofficial” moons on the waiting list. Many of Jupiter’s moons are asteroids that were sucked into orbit because of Jupiter’s huge gravity.

See “Wrap-up Questions” at the end.

**Saturn**

* Saturn has 9 rings composed of ice, rocky debris and dust.
* It has 62 moons.
* It’s largest moon, Titan, is bigger than Mercury and has its own atmosphere.
* Even though Saturn is made of gas it is so big that it weighs 95 times more than Earth does.

See “Wrap-up Questions” at the end.

**Uranus**

All planets have axial tilt – that is, they are spinning at an angle in space. Think about if you have ever seen a tilted globe. That tilt is the Earth’s axial tilt. Earth has an axial tilt of 27.2º. Uranus has a tilt of 97.77º.

1. Use your body to model the central axis and rotation of Earth. Now use your body to model the rotation of Uranus. What must you do? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Your friend tells you, “Uranus is the solar system’s bowling ball.” What does she mean?

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1. Calculate the temperature on Uranus: (600 + 114) / {4 – [(3/4) x 8]} (PEMDAS practice, yay!) Is it hot or cold? What do you think you would need to wear?

Uranus’ Temperature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Work Space:

**Neptune**

* Neptune has an extremely long orbit. It takes 165 Earth Years for Neptune to completely revolve around the sun.
* Even though this field’s setup is accurate, it is shrunk down 10 times. That means that if we used the same sized sun and planets then the planets should be 10 times farther apart. If we had done that, this station would be on Hampden Avenue.

Instructions:

1. Think about what Neptune’s orbit would like if it was traced on the grass. How wide would it be?
2. Try to run the path that you are thinking of in your mind.

**Comets**

* A comet is a ball of ice and rock that is flying through space with an elliptical orbit around the sun.
* When comets get into the inner solar system and close to the sun they display tails.
* The ball of ice and rock can be anywhere from hundreds of meters wide to tens of miles wide.
* The orbit of Halley’s comet stretches to Neptune.
* Some comets’ orbits stretch out of the solar system and are called long-period comets.

**Wrap-up Questions**

1. What was Mercury’s orbit time? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What was Earth’s orbit time? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which planet, Mercury or Earth, do you think has a longer orbit around the sun? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

In general, as you get *farther* away from the sun, your orbit gets *longer / shorter.* (Circle one.)

1. Which planets are made of solid materials? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which planets are made of gas? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What is the biggest planet in the solar system? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How many moons does this planet officially have? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What planet has 9 rings that are filled with ice, rocks and dust? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_