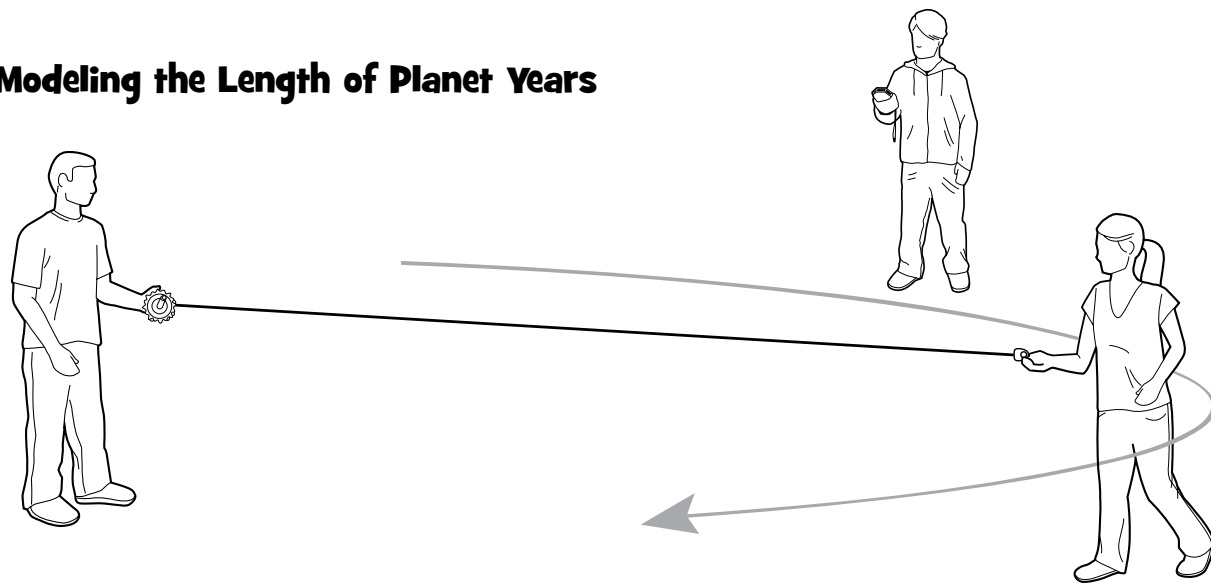


Modeling the Length of Planet Years



This is a great way to show students why planets have different lengths for a year (revolution) around the sun.

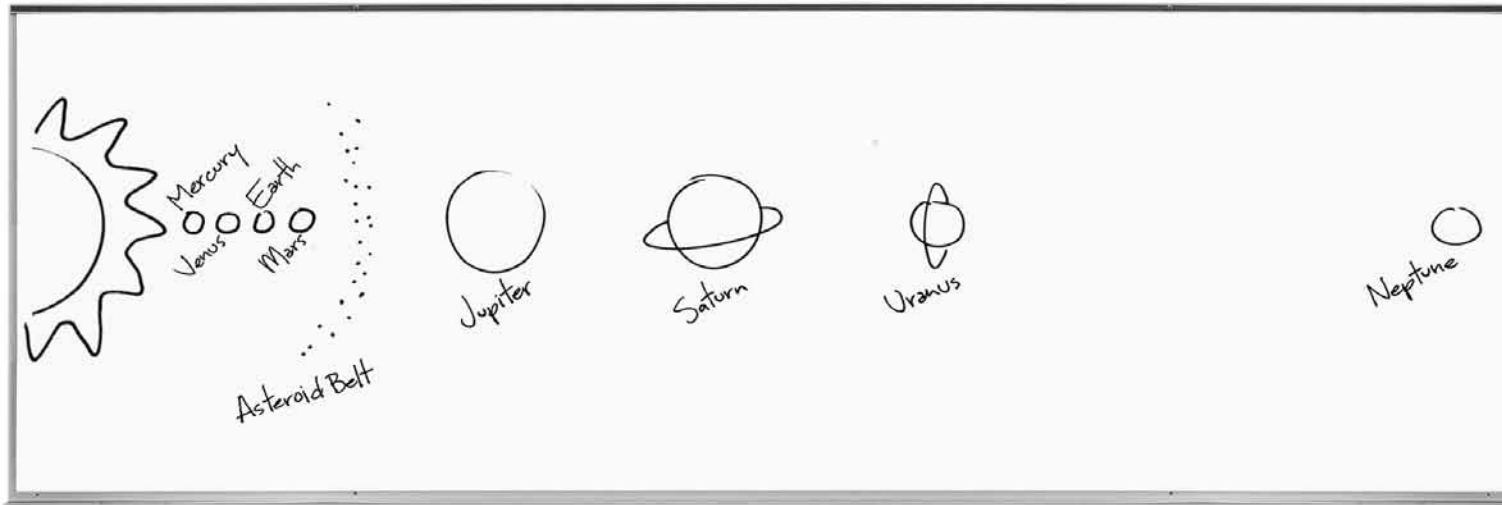
1. Provide a stopwatch, pencil and paper for this activity.
2. Ask only the two students who are the sun and Neptune to stand at their positions on the tape.
3. Give a third student a stopwatch. Instruct that student to begin timing as Neptune walks all the way around the sun while holding the end of the measuring tape. Record how long it takes Neptune to make one complete revolution.
4. Next, ask Mercury to take the tape at the proper distance from the sun. Ask Mercury to bunch up excess tape in one hand, so that excess tape doesn't drag behind as she or he walks. Time how long it takes Mercury to make one revolution around the sun and record that information.

Students will see that it only takes Mercury about 5-10 seconds to walk the short distance around the sun whereas it takes Neptune about 1½ minutes to make its revolution!

As a comparison, explain to students that the real length of Mercury's year is 88 Earth *days* whereas Neptune's year is 165 Earth *years*!

Redraw the Solar System

Come back inside with your class. Ask students to correct the drawing on the board. Students should show the inner planets bunched close to the sun and the outer planets spaced out.



Far Out!™ Solar System Mapping Tool

EI-5255
Grades 2+/Ages 7+

Guide

Contents

- 61-Foot, sun-shaped mapping tool with 8 planets, the asteroid belt, and astronomical units (au) marked at scaled distances on the tape

Show students the relative distances of the planets in our solar system with this easy-to-use scaled tape!

Preparation

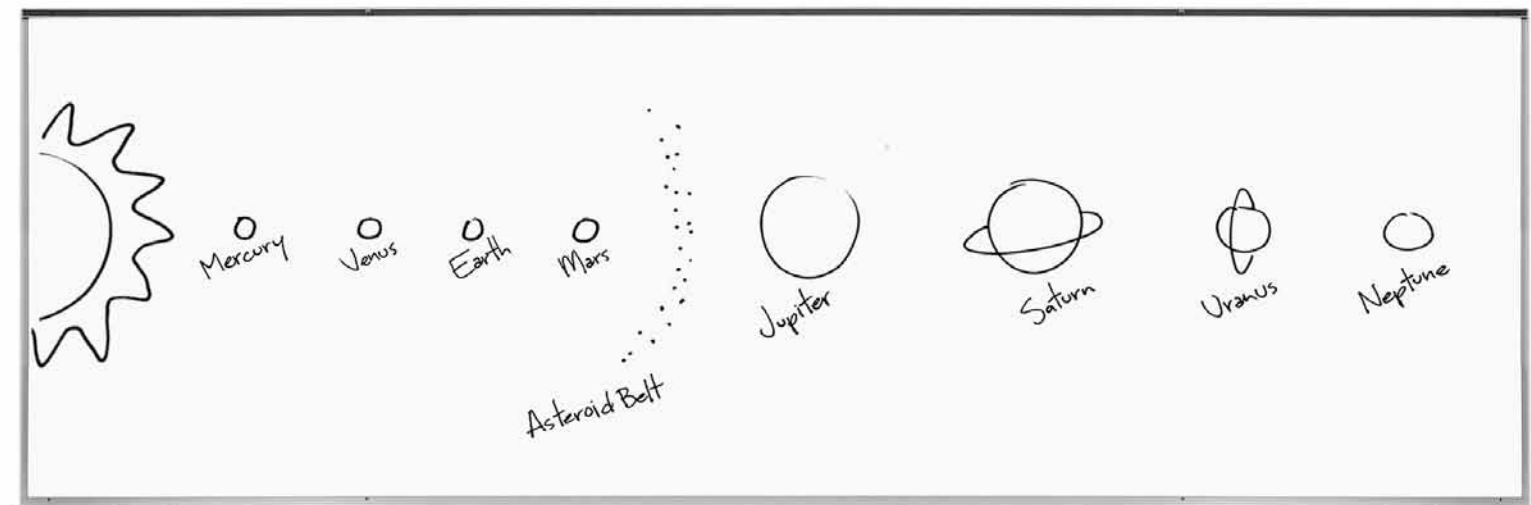
Before beginning this activity, find an area on your school grounds on which you can model the solar system. At a minimum, the area must be at least 61 feet long in one direction. To model the length of planet years (see activity in this guide), you'll need an area in which a student can walk in a circle with a radius of 61 feet. The school playing field, such as a soccer field, is an ideal location.

Print out one copy each of the planet, sun and asteroid belt signs. Find them on our website at www.educationalinsights.com/downloads. Or, ask your students to make their own signs.

Draw the Solar System

In this activity, you will ask students to draw the solar system on the board. After they have modeled the solar system using the tape, they will correct errors they may make in this initial drawing of the relative distances from the sun.

1. Ask students, "What is the largest item in our solar system?" (answer: sun)
2. On the board, draw a large circle and label it *sun*.
3. Ask the class, "What are the planets in our solar system in order from the sun?" As students name the planets, call them to the board to draw each planet as a circle and write its name below. A student should also draw the asteroid belt.



Most students will draw the planets about evenly spaced apart. Allow students to draw them this way for now; they can correct their work after the activity is complete.

4. Below Mercury, Earth and Neptune, write down their respective distances from the sun. These large numbers tend to be meaningless to students, so it is not necessary to list all the planet distances. Listing a few will give students a general idea.

- Mercury is 36 million miles from the sun.
- Earth is 93 million miles from the sun. Earth is considered to be 1 astronomical unit (au) from the sun.
- Neptune is 2.7 billion miles from the sun.

5. To help students understand these huge distances, explain that if they could travel as astronauts in one of our rockets in a straight line starting from the sun (at the same speed that rockets orbit Earth), it would take the following amount of time to get to these places:

- 2.7 months to Mercury
- 7 months to Earth
- 18 years to Neptune
- As an interesting fact, you can also explain that it would take 157,000 years to get to Alpha Centauri—the closest star to our sun!

Of course, you may want to point out to your class that it is impossible to travel in straight-line distances because the planets are moving in circular orbits and are not arranged in a straight line! Also, the gravitational pull of the sun will keep any rocket in orbit around the sun even as it travels to other planets.

Modeling the Solar System with the Measuring Tape

Tell your class that they are going to create a scale model of the solar system. Explain that models are often used in science to represent very large or very small things that are hard to see. A scale model shows things in proportional sizes. This model will show the planets in distances proportional to each other, similar to a map.

What About the Planet Sizes?

Unfortunately, it is impossible to show the proportional sizes of the planets on the same scale as this measuring tape uses to represent distances. If we used the same scale to represent the planet sizes, the sun would be a quarter of an inch in diameter, and giant Jupiter's diameter would only be 1/50 of an inch. Mercury would be 0.0007 inches in diameter—you'd need a microscope to see it!

Assign 10 students to be the planets, sun and asteroid belt. Hand them their respective signs. The signs show actual NASA images of the planets, but as explained on the previous page, the images are not to scale.

Take the students outside to an area that is at least 61 feet long.

Ask the sun to hold the sun-shaped measuring tape housing. Have Neptune pull on the tape and begin walking slowly away from the sun. The sun should call out when a planet appears on the tape. The student assigned to that planet finds his or her spot along the tape. Once the tape is pulled all the way out, students hold up their planet signs. Ask the class what they notice about the relative distances of the planets. The students should immediately see that the inner planets are bunched together close to the sun, but the outer planets are spread far apart.

Students will notice that astronomical units (au) are shown on the tape. One au is the distance from the sun to Earth. Students can see that Neptune is more than 30 au from the sun, which means that Neptune is more than 30 times farther from the sun than Earth.

It's useful to explain to students that every foot on the tape represents 47 million miles!

You can ask students to name the nearest star to our sun (Alpha Centauri) and explain that on our measuring tape, Alpha Centauri would be 101 miles away! You might want to put this in a geographical context for your students depending on where you live. For example, if you are standing in Los Angeles, this measuring tape would have to stretch all the way to San Diego in order to include Alpha Centauri! If you are standing in New York City, Alpha Centauri would be in Philadelphia.

About the Distances on the Tape

At various times, planets are closer or farther from the sun. The distances listed on the tape are an average distance from the sun. The distance given for the Asteroid Belt is the average distance of Ceres, the largest asteroid, from the sun.

You may wish to have your students write out the distances as numbers. For example, 36 million miles would be written out as 36,000,000. This is a good exercise to practice place value.

