**SS Modeling Lab Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period:\_\_\_\_\_\_**

**A. Purpose: to determine planet distances and mark off a solar system model, determine a scale factor, and understand the use of scale factors.**

1. Your teacher will assign a ball or you may choose the ball you will use as the Sun in your model.

Describe the ball you are using as the Sun in your solar system model:

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

2. Measure the diameter of the ball you were given: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **cm**

3. Set this diameter as the diameter of the sun (actually about 860,000,000 mi or 1,376,000 km).

4. Determine Earth's distance from the sun using the diameter of your ball.

The Earth is actually 93,000,000 miles or 149,000,000 km from our sun. This distance is called an Astronomical Unit (AU). An AU is 108 times the sun's diameter. Scientists often use AU's to describe distances in the solar system. To calculate an AU in your model (the actual distance on the ground that the Earth model would be from the ball you have as your sun) follow the math below. Your answer should be rounded to the nearest 0.1 meter.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_cm\_ x 108 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

Your sun's diameter **Distance Earth** will be from your sun which is 1 AU (Astronomical Unit)

**Enter the Earth's distance in meters in the Modeling Lab Table**.

5. Set Mercury's distance from the sun based on AU's: (Use the Planet Distances Table to find the planet's AU from the model sun)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 0.39 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

Earth's distance (1 AU) **Distance Mercury** will be from your sun

**Enter this information in the Modeling Lab Table**.

6. Set Venus's distance from the sun based on AU's

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 0.72 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m

Earth's distance (1 AU) **Distance Venus** will be from your sun

**Enter this information in the Modeling Lab Table**.

7. Set Mars's distance from the sun based on AU's:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 1.5 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

Earth's distance (1 AU) **Distance Mars** will be from your sun

**Enter this information in the Modeling Lab Table**.

8. Set Jupiter's distance from the sun based on AU's:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 5.2 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m

Earth's distance (1 AU) **Distance Jupiter** will be from your sun

**Enter this information in the Modeling Lab Table**.

9. Set Saturn's distance from the sun based on AU's:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 9.5 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m

Earth's distance (1 AU) **Distance Saturn** will be from your sun

**Enter this information in the Modeling Lab Table**.

10. Set Uranus's distance from the sun based on AU's:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 19.2 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ m

Earth's distance (1 AU) **Distance Uranus** will be from your sun

**Enter this information in the Modeling Lab Table**.

11. Set Neptune's distance from the sun based on AU's:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m x 3 0 AU = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_m

Earth's distance (1 AU) **Distance Neptune** will be from your sun

**Enter this information in the Modeling Lab Table**.

**SS Modeling Lab Table** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Your Scale Factor:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Item** | **AU's (Astronomical Units)****From the sun** | **Model Distance Measurement (m)** |
| **Describe Your Ball:** |  |  |
| **Earth from the ball** |  |  |
| **Mercury from the ball** |  |  |
| **Venus from the ball** |  |  |
| **Mars from the ball** |  |  |
| **Jupiter from the ball** |  |  |
| **Saturn from the ball** |  |  |
| **Uranus from the ball** |  |  |
| **Neptune from the ball** |  |  |



**B. To determine your scale factor.**

A scale factor is a number that describes how much larger or smaller one item is compared to another item. A 1:4 scale means that perhaps 1 cm of one item is representing 4 cm of another item. The second item is 4 times larger than the first item. A scale of 1:40 could mean that 1 cm of Item 1 represents 40 cm of Item 2. In this example, the actual item is 40 times larger than the model.

Now, it is time to find out the scale factor that you are using in your Solar System Model. Take into account the diameter of your sun ball and the actual diameter of the Sun. You will then set up a ratio and this will give you the ratio of your model sun ball diameter compared to the Sun's diameter.

Let's say your sun model was 30 cm or 0.30 m and the actual diameter of the Sun is 1,376,000 km or 1,376,000,000 m . Use the same units for both diameters.

Then,

The diameter of your model sun = 0.30 m\_\_\_\_

The actual diameter of the sun 1,376,000,000 m

It's best to put this into a scale factor notation by simplifying the fraction above (In this case, divide both numerator and denominator by 0.30). Enter your final Scale Factor into your Modeling Lab Table.

This now becomes 1 : 4,587,766,666,667 or about 1 : 4.6 trillion ! !

In the sample model above, 1 cm represents 4.6 trillion cm or 1 m represents 4.6 trillion m.

**C. Prepare your Planet Flags and stake out Your Model:**

Mars

1. Choose a colored paper that is different from the other groups working on this activity.

2. Make a flag for each Planet by putting the planet's name on the paper so you can easily see which model it belongs to you. Attach the flag to a pencil, or short dowel rod, or something that will easily stick into the ground or will sit on the ground so you can see where your planet flag is located from a distance.

3. **You need: Your Flags, Modeling Lab Table, and a 50 m tape measure.**

4. Go outside and use the information in the Modeling Lab Table to determine where to put your flags for your model. You may not have the time or the room to set your model for all the planets. Set the flags in the straightest line possible to make the model easy to follow. Of course, the planets do NOT actually orbit the sun so that they are lined up, but this will help you compare your model with another group's model for this activity.

5. Compare where your planet flags are located with your model to another group's model. Take a look at the size of their model sun. Compare and contrast what you see.

**D. Questions:**

1. What do you notice about the different models?

2. Could you come up with a rule about the different models you see and scale factors?

3. Why is it important to use scaled models?

4. Why is it important to sometimes use different sized scales of the same subject matter?