

Exercise 5

Due Tuesday, February 17, 5:00 pm

Your task in this exercise is to design a **scale model of the solar system**. Your model should include the sun, the eight major planets, and earth's moon. Feel free to include additional objects if you like. You needn't actually *build* your model, but you will describe it in enough detail for someone else to build it without further calculation.

Look up the actual sizes (diameters) of the sun, planets, and moon, and think about how their sizes compare to each other. Then pick a familiar spherical object (such as a basketball or a golf ball or a pea) to represent one of the objects. Write down your choice (and what it corresponds to) here:

From the size of this object, determine the *scale* for your model. You may already be familiar with scale factors on maps, such as "one inch [on the map] equals ten miles [on the ground]". Please express the scale of your model in a similar way:

Now use this scale factor to calculate the scaled diameters of the remaining objects. Please do your calculations on scratch paper, and round off all numbers to two significant figures. For example, if in your model the planet Klingon turns out to have a diameter of 7.2112693 centimeters, you should round this off to 7.2 centimeters. Try to think of familiar objects (a grain of sand? a hot air balloon?) to represent as many of the objects as you can. Then fill in the table below:

Object	Scaled diameter	Familiar object
Sun		
Mercury		
Venus		
Earth		
Moon		
Mars		
Jupiter		
Saturn		
Uranus		
Neptune		

In the space below, show in detail how you calculated *one* of the results in the preceding table:

Next, look up the size (average radius or “semimajor axis”) of the *orbit* of each of the planets, and of the moon around the earth. Calculate a scaled version of each of these distances, to see how far apart you should put the objects in your scale model. Be sure to use the same scale for the distances that you used for the sizes. Again, round all results to two significant figures. Try to express these distances in familiar terms that a person can easily visualize (the length of your arm? two Ogden blocks?), and write your results below:

Separation between	Scaled distance	Familiar example
Earth-Moon		
Sun-Mercury		
Sun-Venus		
Sun-Earth		
Sun-Mars		
Sun-Jupiter		
Sun-Saturn		
Sun-Uranus		
Sun-Neptune		

Again, please show in detail how you calculated *one* of the results in the preceding table:

What source(s) did you use to look up the actual diameters and distances?