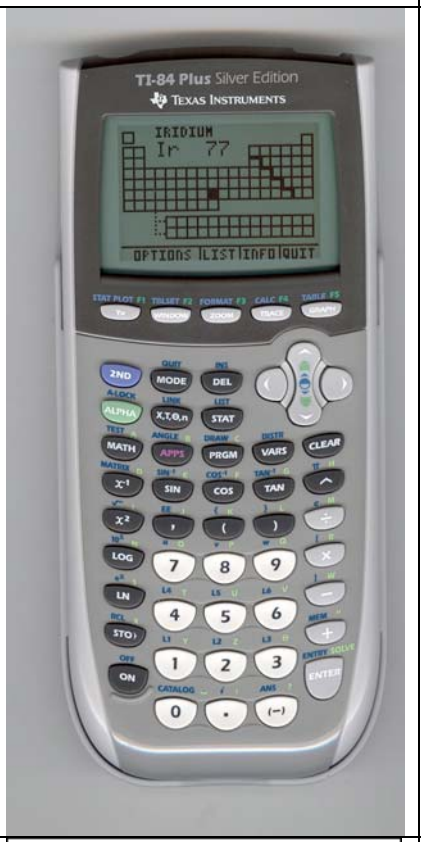
NSES Content Standards:

- Unifying concepts and processes in science.
- Science as inquiry.
- Physical science.
- Earth and space science.
- Science and technology.
- Science in personal and social perspectives.
- History and nature of science.

Activity 8: Scaling Our Solar System

In this activity we will:

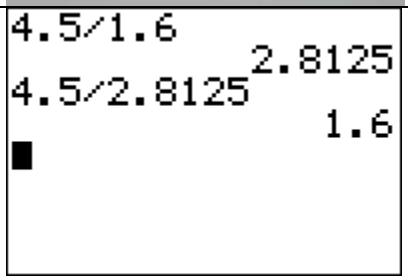
- Learn to determine a scale given the real and scaled object.
- Collect data on the size and distances for the planets in our Solar System.
- Create a scale that will allow the modeling of our Solar System in the classroom or at school.
- Enter data in lists and manipulate complete lists.
- Plot the data.
- Submit a plan for scaling the Solar System to the class for evaluation.
- Create a scaled model of the Solar System.



In this investigation your team will propose a method to model our Solar System in the classroom or on the school ground.

To help learning how to scale we will determine the scale of image of your handheld above. Measure the width of your real screen and of the scaled screen in the image. What number would you use to reduce the width of the real screen to the scaled screen? This will be your scale factor. That is, you will divide the real measure by the factor.

In the example at the right we have the real size as 4.5



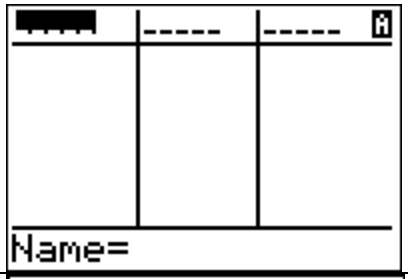
cm and the scale size is 1.6 cm. The scale factor is 2.8125. This means that you could divide the real measure by 2.8125 and you would get the scaled size. Test your scale factor with a measure of another part of the handheld. If you think you have it, then report the factor to the class when the teacher calls for it. All students should have discovered the same value for the factor.
The scale would be:
1 cm = 2.8125 cm

Visit a resource to get the data for the Diameter of each planet and the distance it is from the Sun. Place this data in your lab notebook and site your reference. Recall that Pluto is no longer considered a planet.

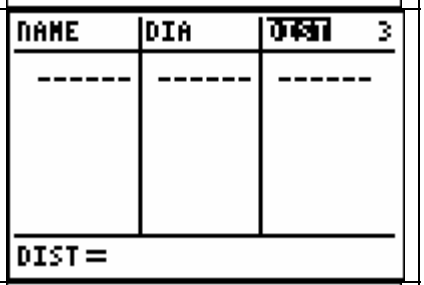
Since the Sun is so much larger that any of the planets, we will not put it in our model Solar System, except as a point of reference.

Planet	Diameter	Orbit

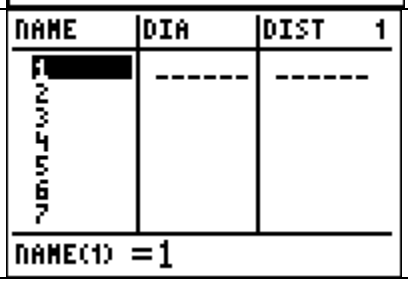
Place this data in your handheld. Press Se to access the List Editor and then move the cursor to the header of the 1st column. Press DEL until you get tired.



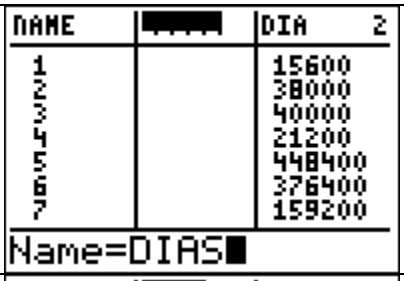
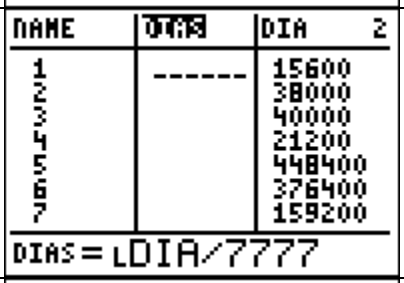
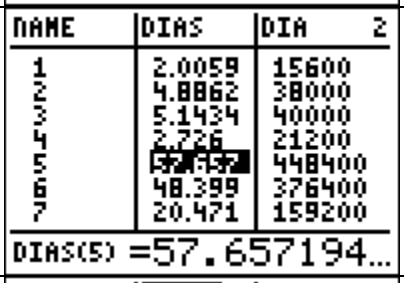
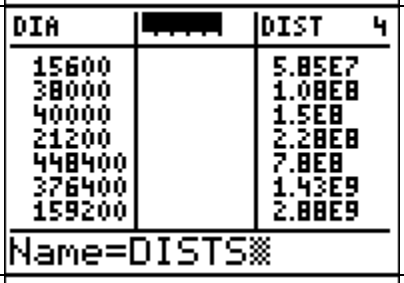
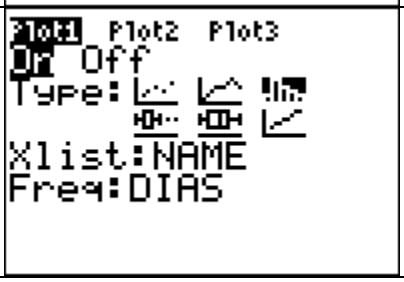
Now name the lists to hold the names of the planets (L**NAME**), the diameter of the planet (L**DIA**) and the average distance from the Sun (L**DIST**).
To do this press just key in the names. Notice that you are in the Alpha Mode while in the header of an unnamed list. Move to the next column for the next list and name it in the same way.

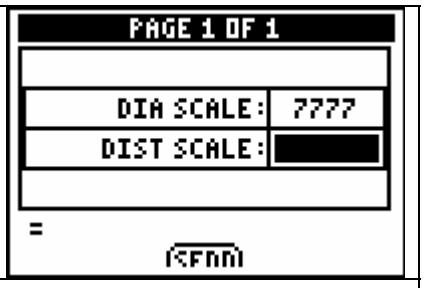


Enter your data for the planets. For the names you will need to code the data. For example Mercury would be 1, Venus is 2, etc.
Make sure that you use the same units of length for all the diameters and the same unit of length for all of the orbit distances. The units used for diameter and distance need not be the same.



Now that you have the data, we want to determine a factor to use in making the distances small enough to make the Solar System model in the classroom or on the school grounds. Check with your teacher about where you will build your model.

Determine the greatest distance you have available for you to put the planet in its scaled orbit. Also you will need to think of the largest sphere you could obtain/use to model the planet. Your scale can be in two parts, one for the planet and a different one for the orbit. This may be a factor in the selection of which team's scale factor(s) will be used. For example you could have a scale of 1 cm = 1 000 000 km for the orbit and 1 m = 40 000 km for the diameter.	
Depending on which measure you want to experiment with first, you will need to insert a list to hold the scaled values. Place your cursor in the header of the list you want to experiment with and press 2nd[INS] to add a new list. Name it with an S on the end so we can know it is the scaled value. So we would have (**$_L$DIAS**) and (**$_L$DISTS**).	
In the header of the list divide the real list by some factor to create a list of measures to use in the scale model. Access the list name by pressing `S.	
In the example to the right, using the factor of 7777 we would need spheres ranging from 2 cm to 58 cm to model the planets. **Note**: Notice the values used for the diameters may not be correct. Repeat the process for the diameters until you are satisfied.	
Continue the determination of a scale for the orbit distances.	
Using the list make a plot showing the relationships for the planet and the diameter or distance. Press `! to access the Plot Editor. Set up a plot as you feel appropriate. Report the plot to your teacher.	

When you have determined your scale factors report them to the class. This can be done through a Quick Poll or in the Form on the Activity Center, or using a WhiteBoard.	
Look at the factor used by other teams and see how close you are to their picks. Vote on the scale team that has the scale you want to use to build your model Solar System and then when the results are in, as a class – build it!	