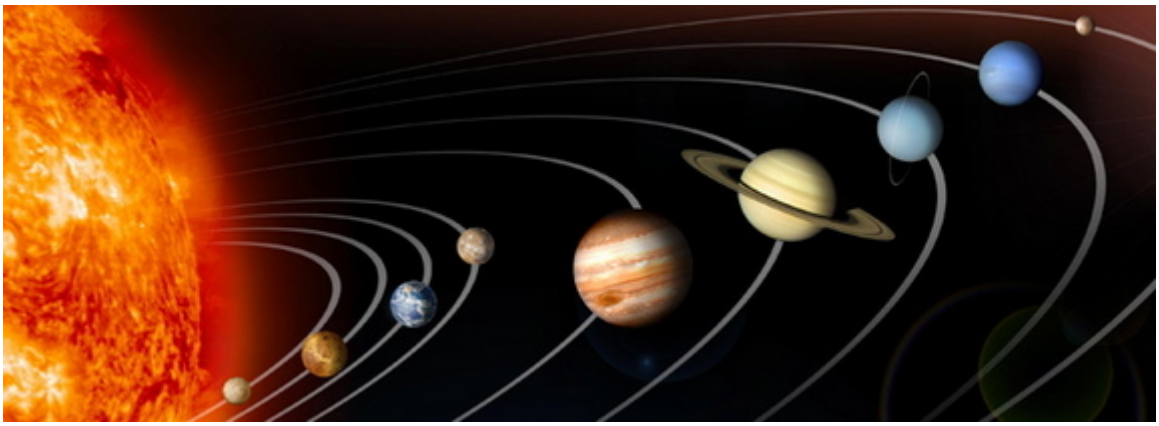
Scaling the Solar System



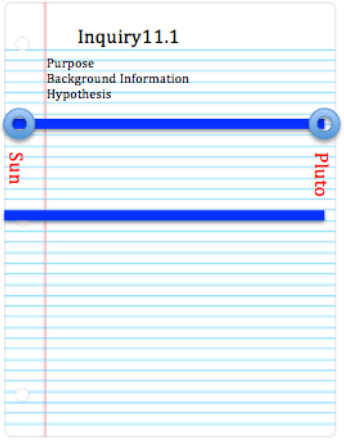
Directions: Write down on a sheet of notebook paper the purpose, background information and answer any questions in the procedures. Make sure to include part of the question in your answer.

Purpose: How much distance is between different celestial bodies in our solar system?

Background Information:

- Astronomical Unit (Au) – the average distance between Earth and the Sun, which is about 93 million miles or 150 million kilometers.

Procedures:



Imagine you are taking a vacation and visiting all of the planets and other cool places in the solar system. When we plan a vacation or trip here on Earth, we have to think about how far away things are, and how long it will take us to get to each place.

1. Write the word "Hypothesis" after your background information.

2. Using a ruler draw a 20 cm line across your paper like the image to the right.

3. Draw another 20 cm line across you paper 5 lines below the original line. You will use this line at the end of the inquiry.

4. On the far left of the line write the word "Sun," and at the far right side of the line write the word "Pluto".

5. Now make a prediction (hypothesis) of how far you think each of the following object are from the Sun by making a circle on the line for where you think each celestial body is located. **Mercury, Venus, Earth, Mars, Asteroid Belt, Jupiter, Saturn, Uranus, Neptune.**

6. You will construct a distance model of the Solar System to scale, using colored beads as planets. The chart below shows the planets, Pluto and asteroid belt in order, along with their distances from the Sun in astronomical units (AU).

7. Copy the **RED** data table below:

Planet	Distance in million Km	Porportion Distance	Color
Sun	0.0		Yellow
Mercury (Me)	57		Purple
Venus (V)	108		White
Earth (E)	149		Blue
Mars (Ma)	228		Red
Asteroid Belt (AB)	417.2		Brown
Jupiter (J)	780		Pink
Saturn (S)	1437		Lime Green
Uranus (U)	2871		Tan
Neptune (N)	4530		Orange
Pluto (Ice World)	5811		Gold

8. Complete the table above using the proportion 149 million km = 10 AU

9. You will need the new distances (in cm) to construct a scale model of our Solar System.

10. Use the distances the new calculations above to measure the distance from the Sun (on the string) to the appropriate celestial body and tie the correct colored bead in place.

11. When you have finished, show your model and data table to the teacher.

12. Copy a second **(yellow)** data table (below) onto your paper.

Planet	AU	Proportions (cm)
Sun	0.0	
Mercury (Me)	0.4	
Venus (V)	0.7	
Earth (E)	1.0	
Mars (Ma)	1.5	
Asteroid Belt (AB)	2.8	
Jupiter (J)	5.0	
Saturn (S)	10.0	
Uranus (U)	19.0	
Neptune (N)	30.0	
Pluto (Ice World)	39.0	

13. Fill in the above using a scale factor of **1AU = 0. 5cm.** Round your numbers to 1 decimal place (example .35 = .4)

14. On the second line you draw on the paper, and using a metric ruler, draw in where each celestial body would be located using the new scale value for comparing to your hypothesis.

Analyzing the Data:

A. Compare your second line model to your hypothesis prediction that you made. Were you correct or incorrect **and** why?

B. How close was your prediction to the actual distances on the second line model?

C. What are the differences between the spacing between all planets in the model and your prediction space?

D. What do you notice about the distance between the first 4 planets?

E. What do you notice about the distance between the last 4 planets?

F. Why do you think that last 4 planets have so much more distance between them than the first 4?

G. Do you think that all of the planets are aligned in a straight line?

H. Explain your answer to question above (Letter G) as to why you think they are a straight line or not in a straight line?

I. Why do you think that most posters and images (that were created for classrooms) have the distances between each of the celestial bodies wrong?