

Scientific Notation and Astronomical Distances

Introduction

Astronomers work with very large numbers in calculating distances in the universe. Light from our sun takes 8 minutes to reach Earth. Light emitted by the next closest star, Alpha Centauri, takes 4.3 years. How far is Alpha Centauri? The distance light travels in one year is about 9×10^{12} miles. The distance to Alpha Centauri is about 3.87×10^{13} miles. Can you imagine how far this distance is? Making a model is a good way to start.

Objectives

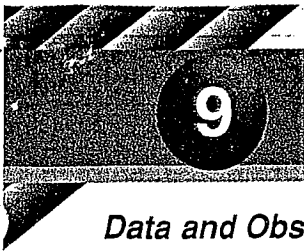
- Use scientific notation to express the distances in the solar system.
- Choose a scale to represent the distances in the solar system.
- Make a model to visually illustrate the distances between the sun and each of the planets.

Materials

- adding machine tape
- meter stick (1)
- felt tip pen (1)
- scissors

Procedure

1. Convert into scientific notation the distances between each planet and the sun. Add your answers to the Data Table.
2. Choose a scale to use in your model of the distances between the planets and the sun. (By expressing the distances in scientific notation, you will make it easier to decide on a scale.) Determine the scale distance for each planet. Record your answers in the Data Table.
3. Place a dot at one end of the adding machine tape to represent the sun. Figure out how long your piece of tape needs to be to fit the planets to scale. Cut the correct amount of adding machine tape from the roll.
4. Use the scale distance to find the position of each planet on the adding machine tape. Place a dot along the tape for each planet. Label each dot with the name of the planet it represents.

**Data and Observations**

Data Table

Planet	Average distance from sun (km)	Average distance from sun (km) expressed in scientific notation	Scale distance from sun (cm)
Mercury	58 000 000		
Venus	108 000 000		
Earth	150 000 000		
Mars	229 000 000		
Jupiter	777 000 000		
Saturn	1 426 000 000		
Uranus	2 876 000 000		
Neptune	4 490 000 000		
Pluto	5 914 000 000		
Scale of distances			

Analysis

6. How did converting the distances into scientific notation help you make your model?

7. What can your model show about distances in space? What doesn't your model show?

8. What scale did you choose? Why did you choose this scale?

9. A round trip to the moon requires about one week of Earth time. The moon is about 3.86×10^5 km away. At this rate, how long would it take to get to Alpha Centauri from Earth?