

The Sun—Ruler of the Solar System

Student Worksheet

Read the following

This activity lets you measure the distance to the Sun from the schoolyard. All you need is the pinhole tube, you will make.

Materials

cardboard paper towel tube

aluminum foil square

thin graph paper square or some tracing paper

2 rubber bands

thumbtack or push pin

metric ruler

sharp pencil

yard stick or meter stick

masking tape

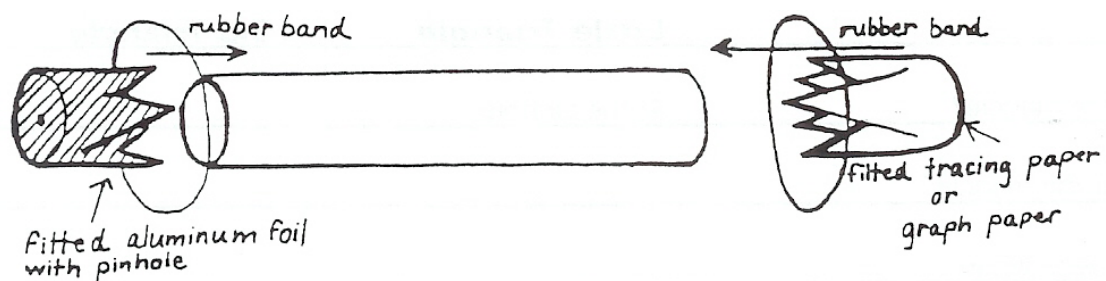
calculator

markers, stickers, other materials to decorate your pinhole tube

Procedures

Part 1: Building Your Pinhole Tube

1. Decorate your paper towel tube with your partner.
2. Place the aluminum foil over one end of the tube and secure with a rubber band.



3. Place the graph paper over the end and secure.
4. Use your push pin to carefully poke a small hole in the center of the aluminum foil. The foil rips easily so be careful. If it

The Sun—Ruler of the Solar System (cont'd)

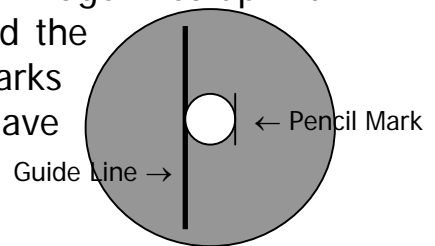
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does rip, get a new square of foil and try again. If your hole is not perfectly round, your pinhole tube will not work.

5. On the graph paper, gently mark one of the centerlines with your pencil to use as a guide. If using tracing paper, draw a guide line with a ruler and sharp pencil before attaching it to the tube.

Part II: Using Your Pinhole Tube

1. On a sunny day, go outside with your partner. Take the pinhole tube, pencil, masking tape, and a yardstick or meter stick with you.
2. One student should hold the yardstick like a pole. Ask your partner to sit on the ground and aim the foil end of the tube at the sun. **WARNING: DO NOT LOOK DIRECTLY AT THE SUN OR USE THE PINHOLE TUBE LIKE A TELESCOPE!!**
3. Move the tube until you see a small image of the Sun on the graph paper. It looks like a circle of light, but it is really a model of the Sun!
4. Tape the tube to the yardstick to stabilize it.
5. Adjust the tube until one side of the Sun's image lines up with your guide line on the graph paper. Hold the tube steady while your partner gently marks the other side of the Sun's image. Have patience! It is not easy to hold the pinhole tube still and keep the Sun lined up with the guide line.



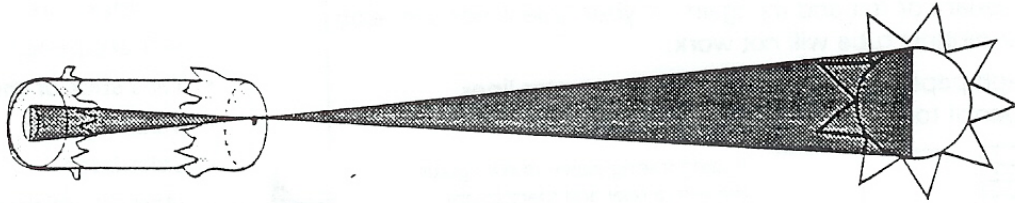
Part III: Measuring the Distance to the Sun

1. Use your ruler to measure the distance between your guide line and the pencil mark using millimeters. How big is the model Sun? _____ mm
2. Measure the length of your pinhole tube in millimeters. How long is your tube? _____ mm

The Sun—Ruler of the Solar System (cont'd)

Student Worksheet

- Use the model Sun as a ruler. How many model Suns span the length of the tube? (Hint: Divide the length of the tube by the width of the image.) _____ mm
- Look at the diagram below and find the triangles. Imagine that the little triangle is a model of the big triangle. These two triangles are similar triangles.



- Fill in the table. Since we have similar triangles and the little triangle is a model of the big triangle, can you fill in the table for the big triangle? (Hint: We did the first one for you. Remember, a model is proportional to the real object.)

Questions	Little Triangle	Big Triangle
Where is the point of the triangle?	At the pinhole.	
What forms the base of the triangle?		
What is the length of the triangle?		
How many bases fit along the length of the triangle?		
What did you figure out?		
What did you use as a ruler?		

- Congratulations! You have now used the real Sun as a ruler. So how many Suns fit between the pinhole tube and the Sun?
