

- Repeat step 5 three more times, recording each measurement in the data table (BLM 1.1). Then take the average of the four measurements and record this as well.
- The following equation uses proportions to find the diameter of the plate. Your teacher will show you how **similar triangles**—triangles with the same angles (congruent angles)—have sides of proportional lengths. Use the equation to calculate the diameter of the plate and record it in the data table (BLM 1.1). Even though the notch and plate are different sizes, you moved the index card so that the notch had the same angular diameter as the plate.

$$\frac{\text{Diameter of the plate}}{\text{Width of the notch}} = \frac{\text{distance to the plate}}{\text{average distance to card}}$$

$$\text{Diameter of the plate} = \frac{400 \text{ cm}}{\text{average distance to card}} \times 1 \text{ cm}$$

- Measure the true diameter of the plate and record it.

Questions and Conclusions

- Compare the true diameter of the plate with the diameter you calculated. How do the two compare?
- If the true and calculated diameters are not the same, what could explain the difference?
- Would this method of determining diameters be helpful in working with the planets in the solar system? Why or why not?
- The full Moon appears to be bigger when it is on the horizon than when it is high up in the sky. How could you use the angular diameter method shown in this Activity to determine whether this effect is real or an illusion?
- Write a procedure for using the instrument in this Activity to measure some tall object on the school grounds. You might choose a flagpole, a bus, or the school building. Be sure your procedure is specific enough that others reading it could do the measurement themselves.

Vocabulary

Similar triangles: Two triangles that have equal angles but sides of unequal lengths.

Fast Fact

Aristarchus of Samos published the measurement of Moon's diameter sometime between 310 and 230 BC. He used clever geometry and measurements during lunar eclipses and first and last quarter moons. Archimedes (287–212 BC) reported that Aristarchus measured the diameter to be $\frac{1}{2}^\circ$. Not bad for a measurement made 2,200 years ago!

What Can I Do?

Try this Activity at night when the Moon is full and the sky is clear. You will do everything the same way, except that you will measure the diameter of the Moon instead of a plate. You will probably need a flashlight to illuminate your paper, and someone to help you. You will also need to know the average distance to the Moon: 38,440,100,000 cm. This distance will replace the 4 m measurement in the paper plate Activity.