Purpose: This experiment is to help you estimate the diameter of the sun.

Materials: Two index cards, a pen, and a meter stick

Introduction: The diameter of a sun spot depends on its distance from the small opening that produces it. Large sunspots, several centimeters in diameter, are cast by openings relatively high above the ground, while small spots are made by pinholes closer to the ground. The interesting point is that the ratio of the diameter of the spot to its distance from the pinhole that creates it is the same as the ratio of the Sun's diameter to the Sun's distance from the pinhole in the leaf. This ratio is demonstrated in figure 1, found to the righ

Because the Sun is approximately 150,000,000 km above any pinhole, careful measurement of this ratio tells us the diameter of the Sun. That is what this experiment is all about. Instead of finding sun spots under trees, you will make your own spots using an index card.

Figu

150,000,000 km = distance from sun to Earth
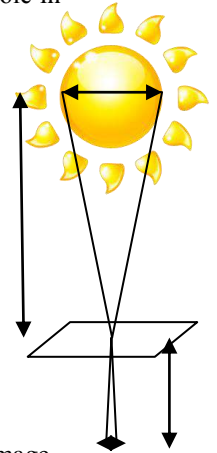
Procedure:
1. Poke a small hole in an index card using a hole- punch.
2. Hold the card in the sunlight and note the circular image that is cast on the ground note that the solar image size depends on distance from the pinhole to the ground: the greater the distance between the ground and the card, the larger the spot.
3. Place a piece of paper on the ground and position the index so a sun spot can be seen.
4. Trace the sun spot on the paper and carefully measure the distance between the sun spot and the index card (measure in meters and convert to kilometers).
5. Measure the diameter of the traced sun spot (measure in centimeters and convert to kilometers).
6. ***Place your measurements in the table below (refer to your notes for Distance from Sun to card)***

Measurement	Meters	kilometers
Diameter of sun spot		
Distance from card to sun spot		
Distance from Sun to card	n/a	
Diameter of Sun		

Because this is the same ratio as the diameter of the sun to its distance, then

$$\frac{\text{Diameter of Sun}}{\text{Distance from Sun to card}} = \frac{\text{Diameter of sun spot}}{\text{Distance from card to sun spot}}$$

Use the information above, stating how far the sun is from the Earth (notecard) to solve for the sun's diameter

$$\underline{\hspace{4cm}} = \underline{\hspace{4cm}}$$

You can calculate the diameter of the Sun – it should be the only unknown value in the equation above. (If you are unsure of how to set up the ratio, or complete the calculations, please ask the teacher.)

Diameter of the Sun = _____ (Round to two sig figs)

Questions:
1. Suggest two ways this lab could provide more accurate or more precise results? (Hint: focus on data collection.)