Name______________________
Date______________________
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Measuring the Diameter of our star

Introduction
The stars we see in the night sky are incredibly far away from us, but using some very simple math we can determine how big they are! During our activity today we will use the closest star to us, the Sun. In order to find out how large the Sun is, we need to know the average distance from the Earth to the Sun. This distance is equal to 1.5×10^8 km (150,000,000 km) and is also known as one **AU** or astronomical unit.

Problem
What is the diameter of the sun and how can we find it?

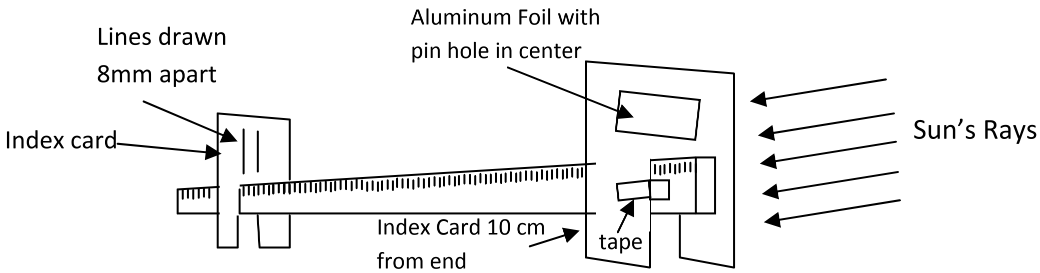
Materials
meterstick, 2 large index cards, tape, aluminum foil, pin, scissors, calculator.

Procedure
1. Look at the diagram below. Cut two slits (about 4 cm deep) in the short side of each index card. The slits should be cut at the center of the short side leaving a gap about the thickness of your meterstick (see diagram below).

2. About 3 cm above the slit that you cut in one index card, cut out a 2 cm square hole. Tape a piece of aluminum foil over the cutout hole. In the center of the foil make a single **SMALL** hole with the pin.

3. Place this card on the meter stick at a distance of **10 cm** from the end, check to be sure that the card is at right angles to the ruler and tape it in place.

4. Using the second card, draw 2 vertical lines exactly 8 mm apart, directly above the slit. This card will slide freely as you move it along the meter stick.



5. Take the completed equipment outside into the sunlight. Point the aluminum foil end toward the sun.

6. Move the meter stick until the first card's shadow covers the second card.

7. Move the second card along the meter stick until the image of the sun **exactly** fills the space between the two parallel lines on it. For best results the two cards must be perpendicular to the meter stick.

8. Determine the distance between the two cards to the closest millimeter. Record the distance in the data table.

Data

Distance between the two cards	Diameter of image on second card.
__________________ cm	___________________ cm

Conclusions

1. Use the formula below to calculate the diameter of the sun.

$$\text{diameter of the sun (km)} = \text{distance to the sun (km)} \times \left(\frac{\text{diameter of the sun's image (cm)}}{\text{distance (in cm) between the two cards}}\right)$$

Diameter of the sun is __________________________________ km

2. Collect data from all other groups and enter it in the table below along with the data from your group.

Group #	Calculated diameter of the sun (km)

3. Using the above table, cross out the largest and the smallest diameter. Add the remaining diameters and divide the total number used.

The diameter of the sun as an average of class data is _______________________km.

4. Compare this to the known diameter of the Sun by finding the percent error.

$$\%\ \text{error} = \frac{|\text{known diameter of the sun (km)} - \text{experimental diameter of the sun}|}{\text{known diameter of the sun}} \times 100\%$$

$$\%\ \text{error} = \frac{|1,392,000\ \text{km} - \qquad\qquad\qquad\qquad\qquad |}{1,392,000\ \text{km}} \times 100\%$$

The percent error of our data is ______%