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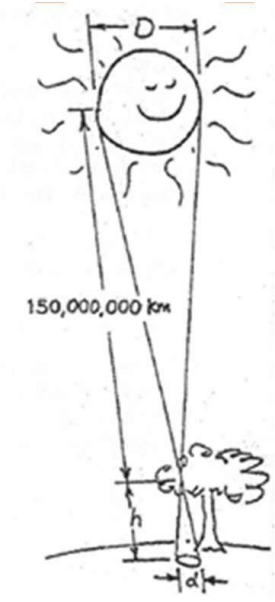
Applied Science – Activity 3

Estimating the size of the Sun

"Physics is all about understanding the patterns of reality. 'How do we know?' is an important question to ask about everything you learn. How do we know how big the Sun is? This exercise will enable you to perform a simple experiment outside and come up with your own figure."

Physics: The Diameter of the Sun – a Practical Investigation

Introduction: Perhaps you have noticed that if you look at the ground under a shady tree on a sunny day there are 'sunballs' formed on the ground. (or on a 'screen' (piece of paper) held there as in the picture on the right. These "sunballs" are images of the sun formed by little gaps between the leaves acting as 'pinholes' like in a pinhole camera.



The Interesting point is that the ratio of the diameter of the sunball to its distance from the pinhole is the same ratio of the Sun's diameter to its distance from the pinhole. We know the Sun is approximately 150,000,000 km (or 150x109 meters, that's 150,000,000,000m) from the pinhole, so careful measurements of the ratio of diameter/distance for a sun ball leads us to the diameter of the Sun.

$$\frac{diameter\ of\ sunball,\ d}{distance\ to\ pinhole,\ h} = \frac{diameter\ of\ sun}{distance\ to\ sun}$$

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What to do:

1. You'll need a sunny day, a coin of known diameter, d, and instead of a tree of unknown height above the ground you'll use a piece of card with a small pinhole poked in it with e.g. a pencil.
2. Put the coin on the ground and hold the card above it until the projected image of the sun is the same size as the coin. Measure the height above the coin of the card, h.
3. Calculate the diameter of the Sun!

Hints:

Diameter of coin, d = _____m Height of card, h = _____m
Distance to the Sun = _____ (!) m

Calculation:

So diameter of the sun =