Diameter of the Moon

Purpose

To calculate the diameter of the Moon using proportions.

Background

The diameter of the Moon is proportional to the diameter of a cardboard disk, given that you know the distance to the Moon and the distance to the cardboard disk.
The relationship is:

$$\frac{\mathbf{d}}{\mathbf{l}} = \frac{\mathbf{D}}{\mathbf{L}}$$

so that:

$$\mathbf{D} = \mathbf{L}(\mathbf{d}/\mathbf{l})$$

where **D** = diameter of Moon
d = diameter of cardboard disk
L = distance to Moon
l = distance to cardboard disk

In this activity, students will measure **d** and **l.** They will be given **L.**
They will calculate **D.**

The diameter of the Moon (**D**) is 3,476 km.

Preparation

Review and prepare materials listed on the student sheet.
Choose a day and location for this activity which is best for viewing a full Moon.

A cardboard disk of 2 cm diameter works well. Better accuracy may be achieved by using a larger disk, thus a greater distance **l**. However, if obtaining or cutting cardboard is difficult, then this activity can also be done with dimes. A dime held out at arm's length will cover the Moon.

The distance from Earth to the Moon for a given date can be obtained by asking a local planetarium staff, Or for this activity, students may use an average value of 382,500 km.

Diameter of the Moon

In Class

If students work in pairs, then one student can use the string to measure distance from their partner's eye to the disk.

The same units do not have to be used on both sides of the equation, but **d** and **l** have to be the same units. The **D** will be the same unit as **L**.

Wrap-Up

To compute the density of the Moon use the diameter to compute volume and use the mass value of 7.35×10^{22} kg.

Density of the Moon is 3.34 grams/cubic cm.

Diameter of the Moon

Purpose

To calculate the diameter of the Moon using proportions.

Key Words

proportional

Materials

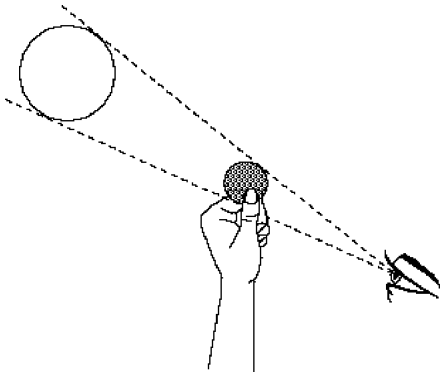
2-cm wide cardboard disk

wooden stake (optional)

meter stick

calculator

string



Procedure

1. On a day when you can see the Moon: place a **cardboard disk** on top of a **stake** or on a window sill so that it exactly covers the Moon from your point of view behind the cardboard disk.

2. Have a friend **measure the distance** from your eye to the cardboard disk.
   Call this distance **l** and write the value here:

   l = _____

3. The distance from Earth to the Moon varies between 360,000 km and 405,000 km. Find the distance for today's date or use an average value for your calculations of 382,500 km.
   Write the value that you are going to use here:

   L = _____

4. What is the diameter of the cardboard disk?

   d = _____

5. The diameter of the Moon is proportional to the diameter of your cardboard disk by this equation:

$$\frac{d}{l} = \frac{D}{L} \qquad \text{so that, } \mathbf{D = L(d/l)}$$

where: **D** = diameter of Moon
d = diameter of cardboard disk
L = distance to Moon
l = distance to cardboard disk

Diameter of the Moon

Results

1. By your calculations, the diameter of the Moon is:

   D = _____

2. Compare your result with the accepted diameter of the Moon. How close did you get?

3. How many times smaller is the diameter of the Moon than the diameter of Earth?

4. When you calculated the diameter of the Moon, did you have to use the same units on both sides of the equation?

5. How and where could you find the value for the distance to the Moon for today's date?

6. What else would you need to know to compute the density of the Moon? Try it.