

Astronomy Lab: Building a Telescope

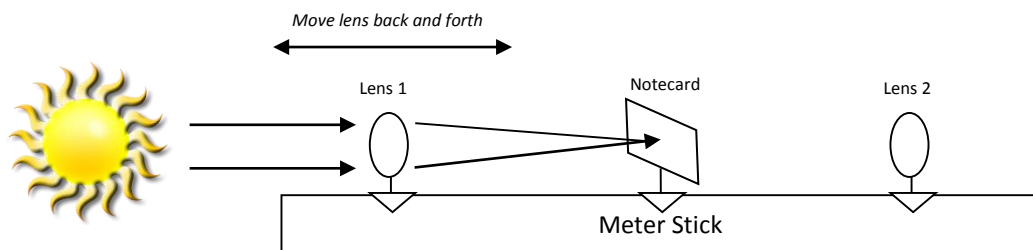
Objective: To build a simple telescope like the ones Galileo used, and discover how it works.

Materials:

- meter stick
- 2 meter stick holders
- 2 lenses of different thickness with holders
- index card with holder

Procedures:

- 1) Clip the notecard to the 50 cm line on the meter stick. Then, clip the two lenses on either side of the notecard.



- 2) Aim one end of the meter stick at a window. Light given off will pass through the lens and form an image of the object on the screen. Carefully slide the lens back and forth on the meter stick until a clear, sharp image appears on the index card. Do not move the index card.
- 3) The distance between the lens and the card is called the focal length. Measure this distance and record on the data table.
- 4) Turn the meter stick around so the other end points to the window. Without moving the screen or the first lens, determine the focal length of the second lens. Record on data table.
- 5) Your telescope is almost ready to use. Point the end of the meter stick with the longer focal length toward a distant object. Without changing the positions of the lenses, remove the index card and its holder. Look at distant objects through both lenses. You may have to adjust the lenses slightly to focus the image. You have just constructed a telescope.

Name: _____ Period: _____ Date: _____

How to calculate the magnification power:

In a telescope, the lens with the shorter focal length is called the eyepiece. The lens with the longer focal length is called the objective. You can calculate the magnification power of your telescope by using the following formula:

$$\text{Magnification power} = \frac{\text{Focal length of objective}}{\text{Focal length of eyepiece}}$$

Data: Focal length of objective (thin lens that light comes through) = _____ cm

Focal length of eyepiece (thick lens you look through) = _____ cm

Magnification power of your telescope = _____ X

Analysis Questions:

- 1) What type of optical telescope have you constructed? _____
- 2) Try looking at the telescope through both sides of the meter stick. How do the images differ?
- 3) What did you specifically notice about the direction and/or position of the image on the card when you were setting up the telescope?
- 4) Look at the magnification power formula above. To build a telescope with the greatest magnification, what kind of lenses would you want to use, and why? Make sure to mention the focal lengths of both the objective lens AND the eyepiece.
- 5) Besides magnifying the image, what is the other job of a telescope? How does the aperture (or diameter) of a telescope help it to do this job?