**Never look directly at the Sun without proper eye protection. You can seriously hurt your eyes and even go blind.

Upgraded Pinhole Projector Using a Box
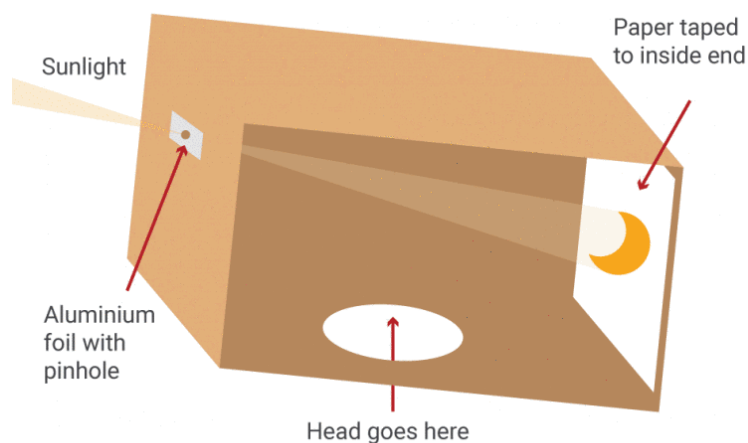
This type of pinhole projector works on the same principle as a basic pinhole projector. However, the box makes this projector much sturdier and easier to set on a surface. And it only requires a few extra items to construct.

You Need:

- a long cardboard box or tube

- scissors

- duct tape

- aluminum foil

- a pin or a thumbtack

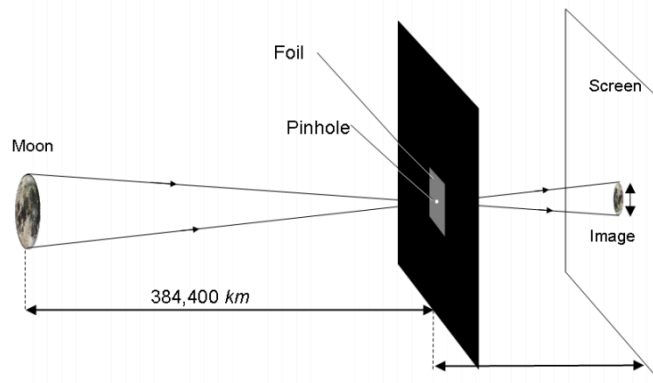- a sharp knife or paper cutter

- a sheet of white paper

What to Do:

1. Cut a rectangular hole at the end of the box. You can tape 2 boxes together to make a long box. The longer the box, the larger the projected image.

2. Using the scissors, cut out a piece of the aluminum foil slightly larger than the rectangular hole. Make sure the foil is completely flat and not crinkled.

3. Tape the foil over the rectangular hole in the box.

4. Use the pin to poke a tiny hole in the center of the foil.

5. Tape the sheet of paper on the inside of the other end of the box.

6. Stand with your back toward the Sun. Place the box over your head with the pinhole towards the Sun. Adjust your position until you see a small projection, a negative image, of the eclipsed Sun on the paper inside the box.

Sunlight

Paper taped to inside end

Aluminium foil with pinhole

Head goes here

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Finding the Sun or Moon's Diameter with your Pinhole Projector

• Measure accurately and record the distance between the pinhole and the white paper or screen.

The distance between my image and the pinhole camera was _____ cm.

• Measure accurately and record the diameter of your images of the Sun or Moon (using the same units).

The diameter of my Sun or Moon image is _____ cm.

• The diameters of the moon and the cut-out semi-circle are in the same proportion as the distances between your eye and the moon and between your eye and the window.

$$\text{Diameter of Sun or Moon} = \frac{\text{Distance from Earth of Sun or Moon} \times \text{Diameter of Image}}{\text{Distance to Screen from Pinhole}}$$

• The distance of the Earth from the Sun is 149,600,000 km
• The distance of the Earth from the Moon is 384,400 km
• You will need to make sure that you change all your distance measurements to the same units, e.g. meters. (Remember there are 100 cm in 1m and 1000 m in 1km.)

Diameter of Sun or Moon = _____

Things to think about:
• How many times bigger is the Sun than the Moon?
 • Why do you think that they appear to be about the same size to us?