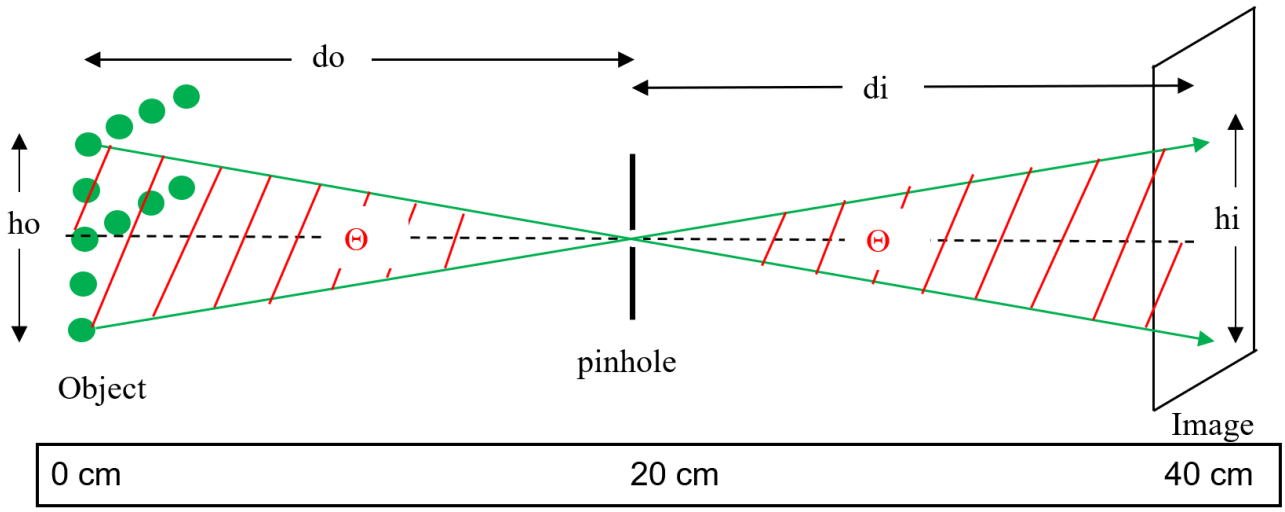
Pinhole Cameras

When light from an object passes through a pin hole, the light forms an image on a screen. In an **almost completely** dark room, place the lighted "F" object at the 0 cm position and the screen at the 40 cm position on the meter stick as shown in the figure below. Use the **Pinhole Configuration Cards (92-7700-04)** Place the pinhole at the 20 cm position and notice the light pattern on the screen. The pattern on the screen is called an image. Describe the image on the screen.

Next, use a straight edge to draw the light rays from the bottom of the object through the pinhole and the light ray from the top of the object through the pinhole to show why the image is inverted (upside down).



Now slowly move the screen toward the pinhole and describe the changes in the image.

Leave the object and pinhole in the same position, but move the screen to the 30 cm position.

Measure $\mathbf{h_o}$, $\mathbf{h_i}$, and $\mathbf{d_o}$ and $\mathbf{d_i}$. Label these values on the sketch above.

$\mathbf{h_i}$ = _____ $\mathbf{h_o}$ = _____ $\mathbf{d_o}$ = _____ $\mathbf{d_i}$ = _____

Write a possible equation between $\mathbf{h_o}$, $\mathbf{h_i}$, $\mathbf{d_o}$ and $\mathbf{d_i}$.

Next, Next, would your equation work when the image distance ($\mathbf{d_i}$) is greater than the object distance ($\mathbf{d_o}$)? Why or why not?

Go ahead and move the screen farther away (to the 50 cm position) and measure the new values of $\mathbf{h_o}$, $\mathbf{h_i}$, $\mathbf{d_o}$ and $\mathbf{d_i}$. Put these new values into your equation. Is it still okay?

Predict what might happen to the image if the pinhole was half the diameter. Predict how the image will be similar. Predict how it will be different.

Uncover the large diameter pinhole. Compare this image to the image from the smaller pinhole.

Did you know that a pinhole can help you to see very small objects and also very close objects?

Do you normally wear glasses (or contacts) to read? ___ yes _ _ no

At the bottom of this page, you will see a note in a very small font. With one eye closed, move the paper to the smallest distance that you can read the message. This called the near point of your vision. Have your lab partner measure this distance.

What is your near point?
distance = _____ cm

Repeat this experiment with the other eye. Record your results.
near point distance = _____ cm

Now hold the larger pinhole next to your eye and repeat the experiment. Again, have your lab partner measure the distance. What is the near point with the pinhole?
near point distance = _____ cm

Predict what will happen with the smaller pinhole:

Try it and describe what really happens. Explain your results.

Find someone in class who wears eyeglasses for reading. Compare the near point with glasses to the near point without glasses. Write a summary sentence of your results: