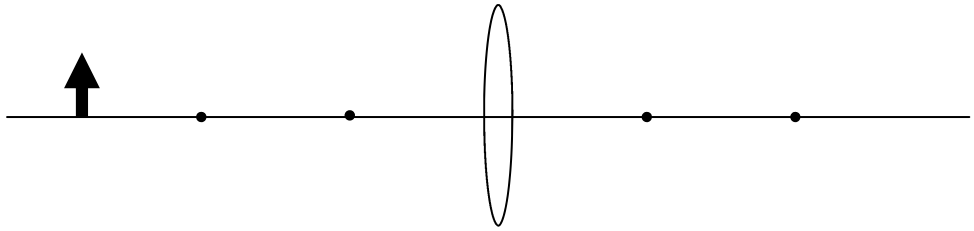
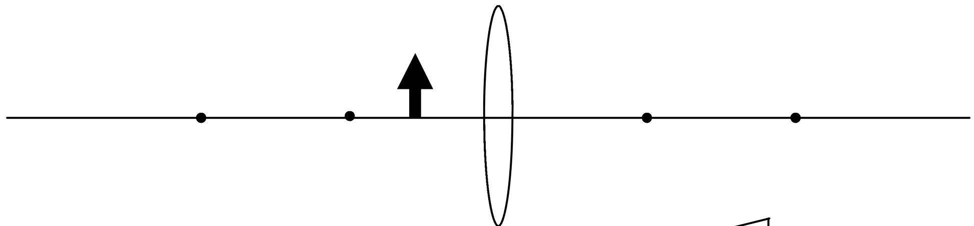
B-day: Due Mon., May 3

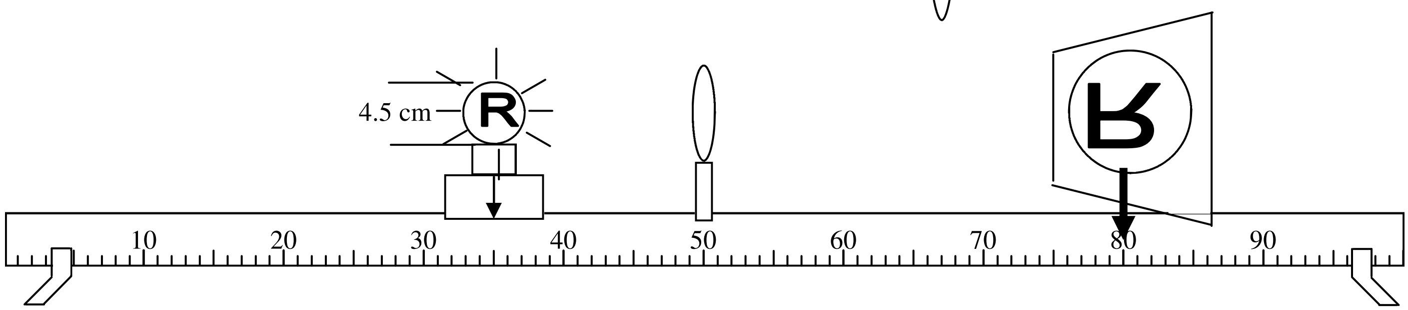
2009-10 Light 6

1. Draw the ray diagram for this lens. (*Use a ruler; be exact.*)
   A. Is the lens convergent or divergent?
   B. If f is 12 cm, what is C?
   C. Label p, q, h, and h'.
   D. Describe the image's location, magnification, etc.)



2. Draw the ray diagram and describe the image.





3. The diagram above shows a meter stick with a lettered light bulb making an image. Since all of the numbers are in cm, you don't have to convert. Just use cm.
   A. Is the image real or virtual?
   B. Is the image magnified or reduced?
   C. Calculate the focal length.

$$\frac{1}{p}+\frac{1}{q}=\frac{1}{f}$$

The equation for magnification at the right is really 3 equations in 1:
$M = h'/h$; $M = -q/p$ and $h'/h = -q/p$.

   D. Calculate the magnification of the image using p and q.

$$M=\frac{h'}{h}=-\frac{q}{p}$$

   E. Using the magnification and the height of the object, calculate the size of the image.

From the lab:

   F. What would happen to image if:
      i. you moved the object (*the light source*) to the left (*farther from the lens*)?
      ii. you moved the object to the right (*closer to the lens*)?

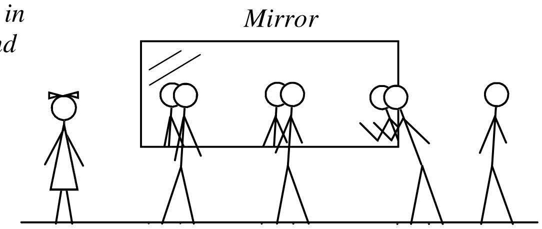
Mark "f" and "C" on the diagram, under the meter stick.

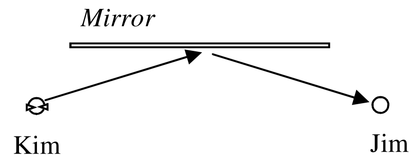
   G. Where is the object in relation to f and C?
   H. Where is the image, in relation to f and C?

Use the above diagram and the two ray diagrams you drew above answer the following questions. You may also refer to the lab. (If you were not careful with the ray diagrams, now would be a very good time to remedy that.)

4. A. If the object is outside of C (farther from the lens than C) where is the image?
   B. If the image is outside of C, where is the object?
   C. If the object is inside f, where is the image?
   D. If the object is at C, where is the image?
   E. When the object is outside of C, describe the image (magnified or reduced; inverted or erect).
   F. When the object is inside of C, describe the image.

Slim Jim is walking by a long flat mirror (plane mirror). His image is always exactly in front of his body, even when he moves beyond the mirror. When he looks around the edge of the mirror, the image of his legs are still attached to his upper body. When he is to the right of the mirror Slim Jim can't see himself, Slim Kim can see him. The diagram at the right shows why.





5. In both diagrams above show where Jim's image is when he is to the right of the mirror. For the right diagram continue the straight line from Kim thru the mirror. Make it dotted to show that it is not real when it goes into the mirror.

6. Think about yourself when looking in a mirror. You reach your hand close to the mirror. Where is your image's hand? Is it closer or farther from the mirror than your image's body?

From the "Refraction" notes:

7. Light is traveling at an angle of 42° in water. What is its angle in air?

8. Light is traveling at an angle of 55° in water. What is its angle in air? (*I'll explain the math in class.)*

Studying for the end-of-course exam…

9. A projectile is launched horizontally from a 12 m tall ledge.
   A. Fill in the blanks.
   B. Calculate the time in the air (hang time).
   C. Calculate its range.