A-Day Due Fri., Mar 6
B-Day: Due Mon., Mar 9

2009 PreAP Light and Optics 5

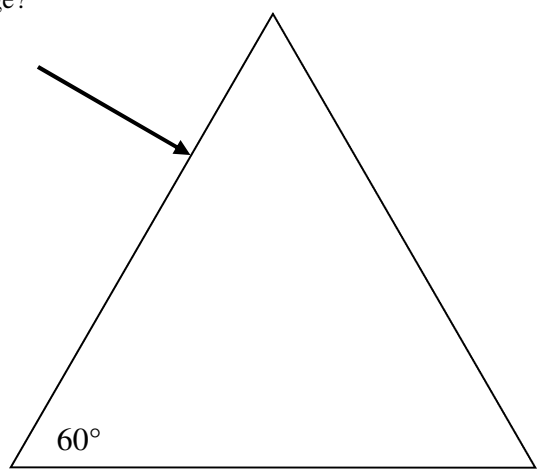
1. If the radius of curvature of a CONCAVE lens is 10 cm? What is the focal length?

2. A 4 cm object is 6 cm in front of a *concave* lens with a radius of curvature of 10 cm.
   A. Is the focal length for this lens positive or negative? B. In the equation, will f be + or –?
   C. If C = 2f, f =

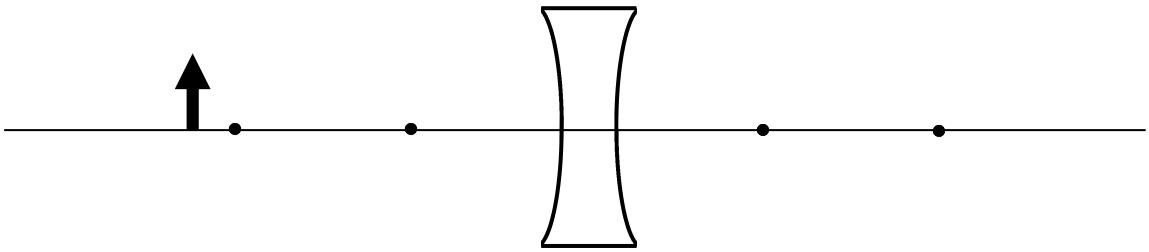
   D. Find the distance to the image. E. Find the height of the image.

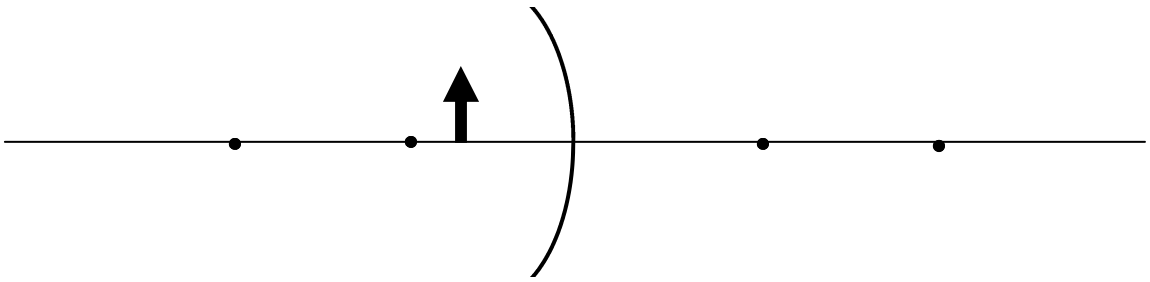
   F. Find the magnification. D. Is it a real or virtual image?

3. A beam of light of wavelength 560 nm hits an equilateral ***glass*** prism straight on (at 0° to the normal). Figure out the path of the light in the prism, including with angles. Use a protractor, if necessary.
   (*Because it is equilateral, the geometry is pretty easy.*)

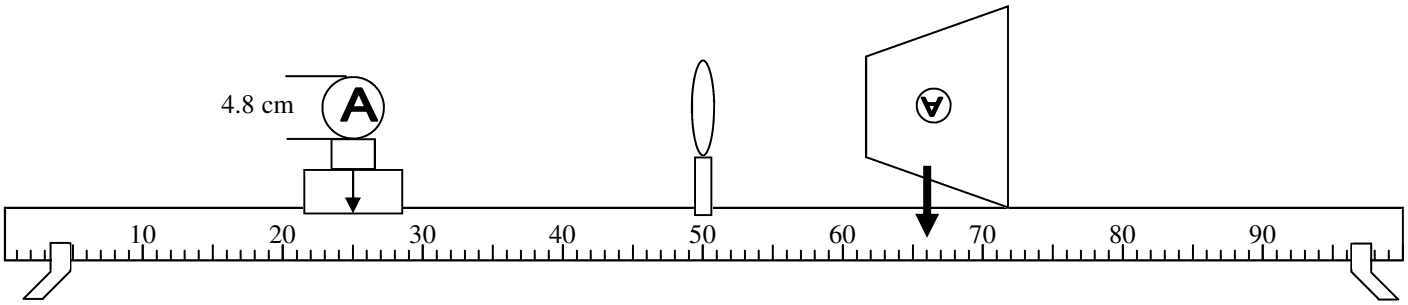


4. Draw the following ray diagrams. Describe the image, optically.

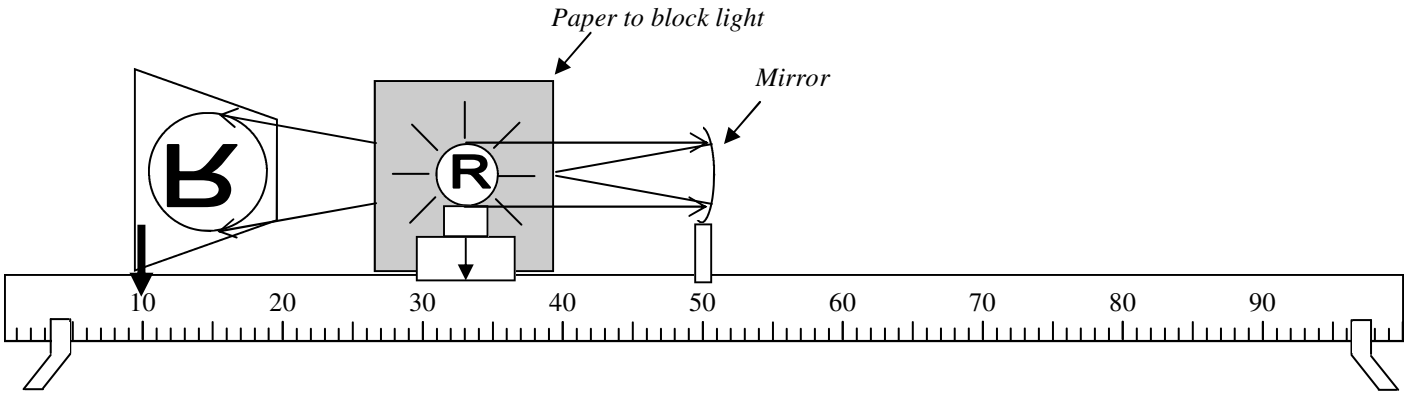




Copyright © 2009, C. Stephen Murray



5. For the above diagram:
   A. Calculate the focal length.
   B. Calculate the magnification.
   C. Calculate the height of the image.



6. For the above diagram:
   A. Calculate the focal length.
   B. Calculate the magnification.
   C. Calculate the height of the image.

7. [p556] A. Back in Sound, we used intensity to measure what quantity of sound: period, frequency, or amplitude?
   B. The intensity of sound decreases or increases as you move away from the sound source?

   C. From the equation for intensity of sound, how much does the sound change if you are twice as far away from the source?
   C. So, relating both sound and light (back in chapter 14), intensity of both are known as i_____ s_____ laws. (How they change with distance [p556].)
   E. So, the brightness of light relates to its: amplitude; period; frequency; color; wavelength?

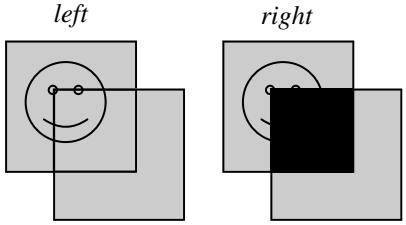
8. A. What is total internal reflection?

   B. When does this occur (relate it to another topic we have discussed)?

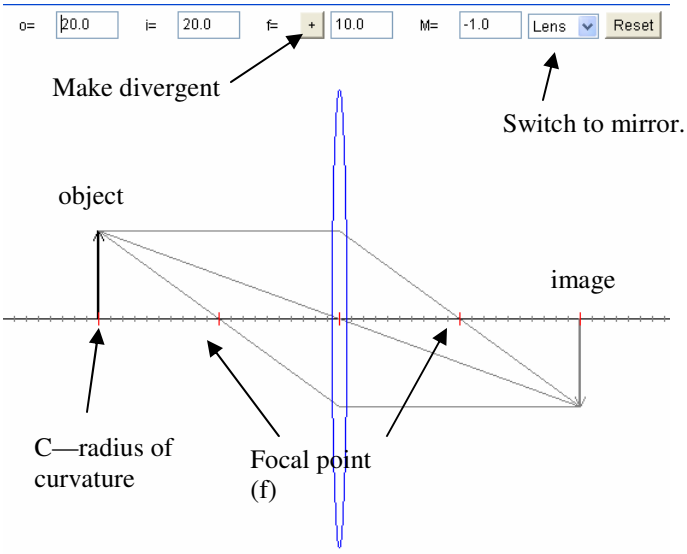
   C. How do we use it in our world?

Read about polarization. (p. 546).

9. Two polarizers are placed over a happy face.
   In which situation is one of the polarizers turned 90°?



Copyright © 2009, C. Stephen Murray



Get ready to spend a little time with our Internet Lens Applet (in Light Links marked VERY IMPORTANT). Get a cup of hot chocolate, your house shoes, a warm blanket….
(The diagram at the right will help you with navigation).

The regions you will use are: outside C; at C; between C and f; at f; inside f. Other descriptions you already know: virtual, real, magnified, reduced, on real side, etc.

10. Starting with the default convex lens, fill in the table below.

Device	convergent/ divergent	For the object	For the image:		
		location	location	Real/ virtual	magnified/ reduced
Convex Lens		At C			
		outside C			
		between C and f			
		at f			
		inside f			
Concave Lens		At C			
		outside C			
		between C and f			
		at f			
		inside f			
Concave Mirror		At C			
		outside C			
		between C and f			
		at f			
		inside f			
Convex Mirror		At C			
		outside C			
		between C and f			
		at f			
		inside f			

11. A. Which kind of optical devices can create virtual images?
    B. Which kind of optical devices can magnify?
    C. Which kind of optical devices can reduce?
    D. Which kind of optical devices can create real images?
    E. Since both convex and concave lenses can produce virtual images, how could you tell the difference just by knowing the distances to the object and image?
    F. Where would you put the object to make the light rays come off the device parallel?
    G. A student works the following problem: "*A convex lens with a 4 cm focal length produces an image 10 cm from the right side of the lens. Find the distance of the object.*" The student works the problem and gets an answer of p = 9 cm. WITHOUT WORKING THE PROBLEM, how can you tell that they did it wrong?

Copyright © 2009, C. Stephen Murray