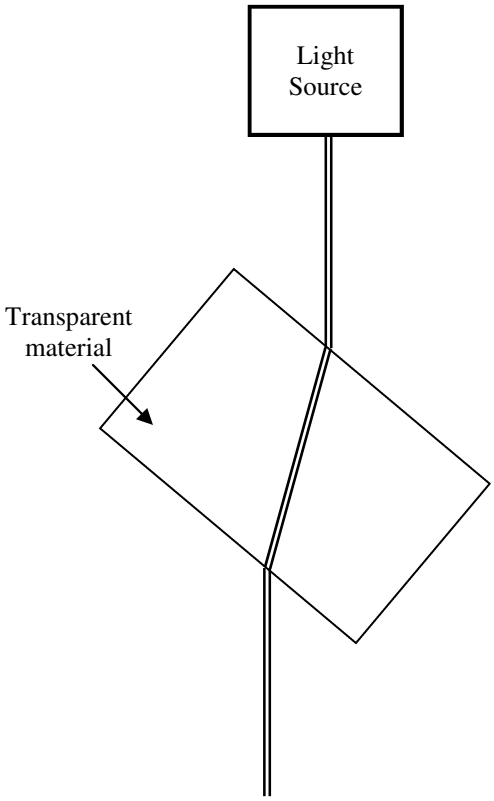
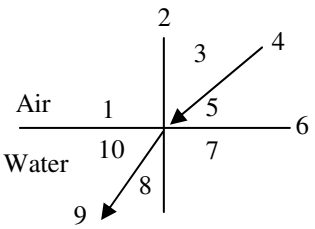
1. If a 3 cm object is 6 cm from a lens that cannot magnify,
   A) What kind of lens is it?
   B) If the focal length is 4.5 cm, find the height of the image.

   C) What is its magnification?



2. The diagram shows a ray of light refracting from air to water.
   Which number corresponds to:
   A. _____ θ_1
   B. _____ normal
   C. _____ Surface of water
   D. _____ Incident ray
   E. _____ θ_2
   F. _____ Refracted ray



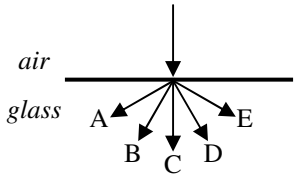
3. If the above incoming angle is 50º, find the refracted angle.

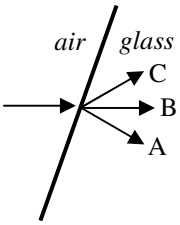
4. The diagram at the left shows light refracting thru a transparent material.
   A) Why does the light change directions?

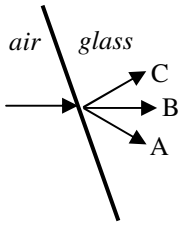
   B) Find the index of refraction for the transparent material and using the table in the book, figure out what materials it is. (*You will need a protractor.)*

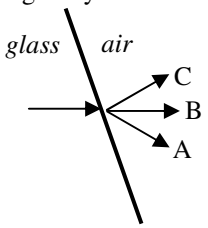
5. Does light travel faster or slower in the transparent medium?

6. For the situations below, decide the path of the light ray.

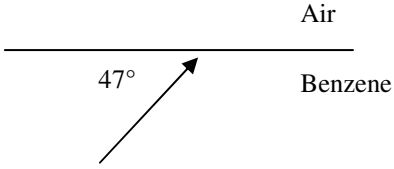








7. A light ray hits a boundary of Benzene and air.
   Draw what happens to the light ray.
   (*Hint: this is NOT straight forward. You MUST show calculations to support your decision. Use the table in the book for the index of refraction of Benzene.)*



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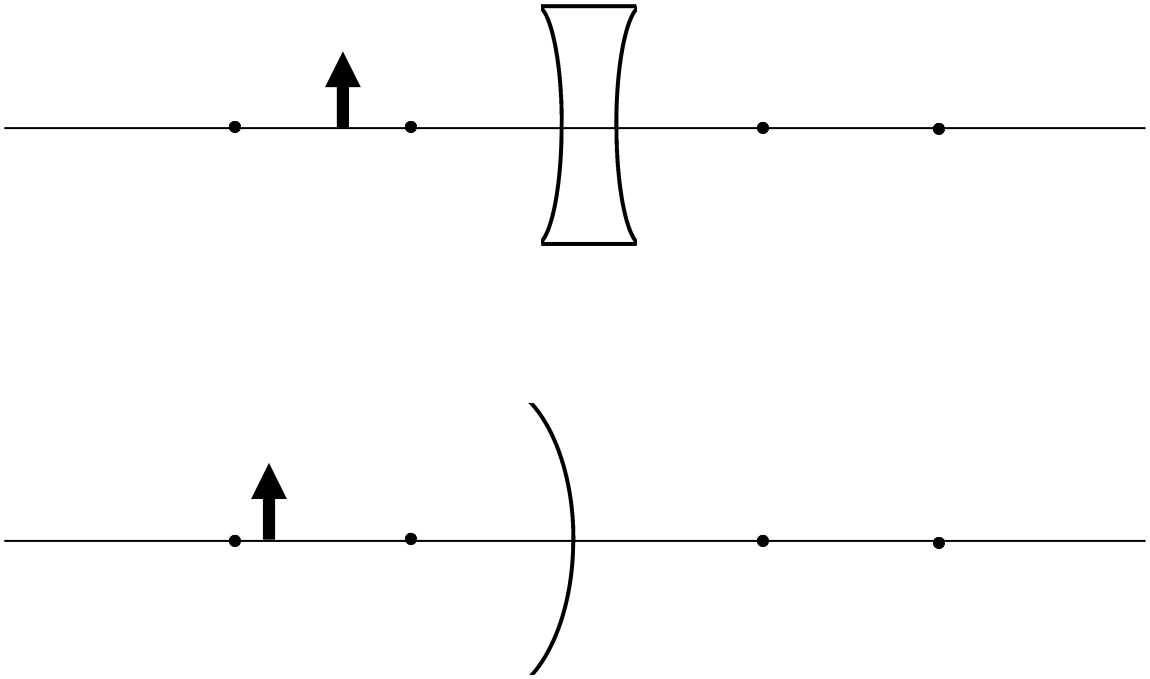
8. Draw ray diagrams for the following two devices. (The second one is a mirror.)



Using the lens applet from the internet to answer the following. If it doesn't work for you, come early to class. No excuses!

9. Both convergent and divergent devices can produce virtual images. How could you tell the difference just by p and q?

10. 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?

11. Read about polarization. (p. 546). How can you use two polarizers to create darkness?

12. Find the focal length of the following lens.