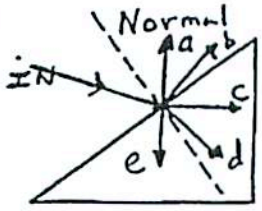
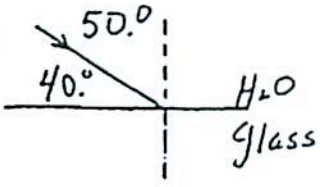
IB Physics I WS 8 Name: KEY Per:____

a,d 1. When monochromatic light strikes a prism as shown, rays which indicate possible future paths are: (*Circle*)
(a) b c (d) e



c 2. Light at the proper angle could undergo total internal reflection in passing from (a) air to water, (b) glass to diamond, (c) ethanol to water, (d) water to glass, (e) none of the above

a 3. Light is inciden from water into glass as shown. Then angle of incidence is (a) 50° (b) 40°



a 4. In 3 above, the light reflected from the interface would leave at an angle of (a) 50° (b) 40° from the normal

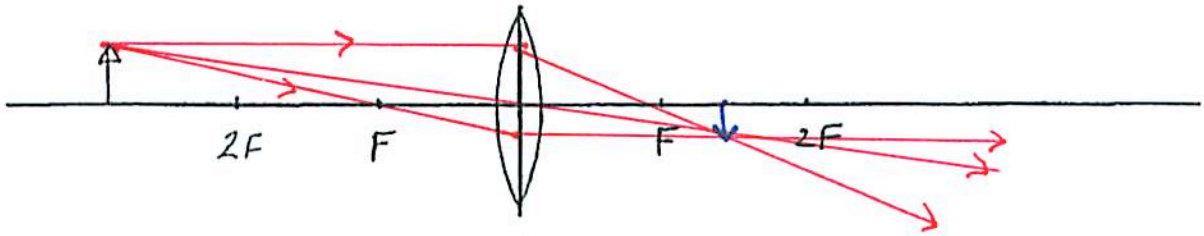
0.766 5. In 3 above, the sine of the angle of incidence is (*Fill in the blank*) $\sin 50° = .766$

0.679 6. In 3 above, the sine of the angle of refraction is (*Fill in the blank*) $n_1 \sin\theta_1 = n_2 \sin\theta_2$
$\sin\theta_2 = \frac{n_1}{n_2} \cdot \sin\theta_1 = \frac{1.33}{1.5} \sin 50° = .679$

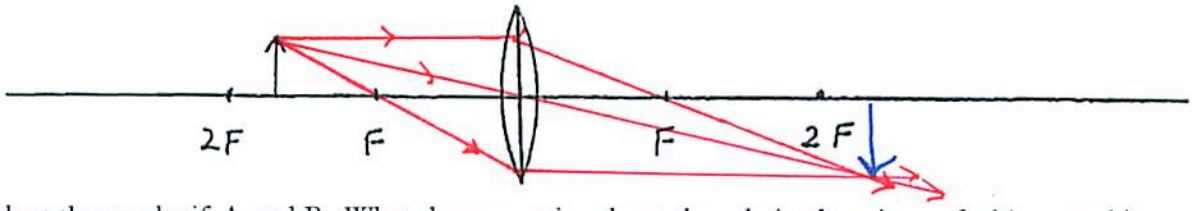
42.8° 7. In 3 above, the angle of refraction is (*Fill in the blank*) $\theta_2 = \sin^{-1}(.679) = 42.8°$

8. Draw ray diagrams to locate the images in each case.

A.



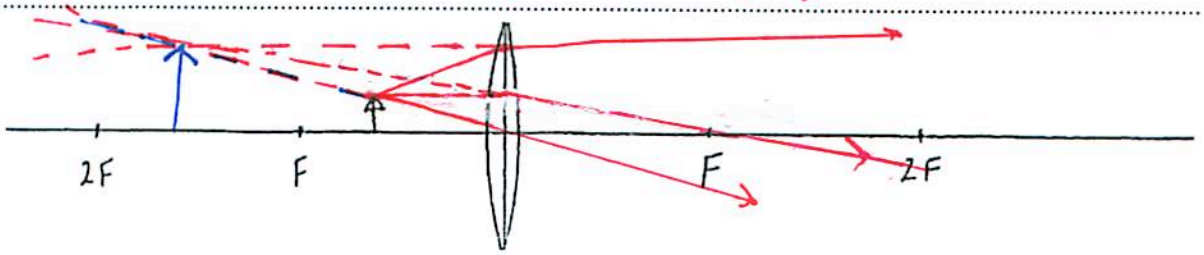
B.



Look at the results if A and B. What do you notice about the relative locations of objects and image? Sizes?

The closer the object gets to the lens (as long as it doesn't cross F), the further & larger the image gets.

C.



-over for side 2-

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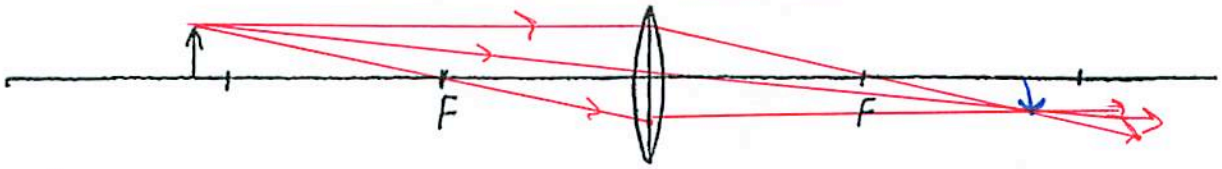
For problems 9 and 10, draw the ray diagrams and show work on this sheet to answer the questions.

9. Assume the f = 100. cm, and the object is 215 cm from the lens.



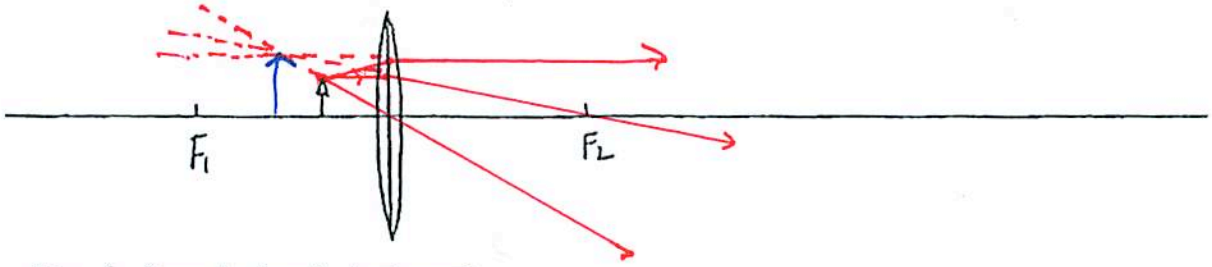
a. How far from the lens is the image?

$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \Rightarrow d_i = \left(\frac{1}{f} - \frac{1}{d_o}\right)^{-1} = \left(\frac{1}{100\text{cm}} - \frac{1}{215\text{cm}}\right)^{-1} =$ **187 cm**

b. If the object is 7.00 mm tall, how tall is the image

$M = \frac{h_i}{h_o} = \frac{-d_i}{d_o} \Rightarrow h_i = \frac{-d_i}{d_o} \cdot h_o = \frac{-7\text{mm} \cdot 187\text{cm}}{215\text{cm}} =$ **6.09 mm**

10. Assume f = 100. cm, and that the object is 20.0 cm from the lens.



a. How far from the lens is the image?

$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \Rightarrow d_i = \left(\frac{1}{f} - \frac{1}{d_o}\right)^{-1} = \left(\frac{1}{100\text{cm}} - \frac{1}{20\text{cm}}\right)^{-1} =$ **-25 cm**

b. How large is the image compared to the object?

$M = \frac{h_i}{h_o} = \frac{-d_i}{d_o} = \frac{-(-25\text{cm})}{20\text{cm}} = 1.25$

$\Rightarrow$ **1.25 times as big**