SNC2D

**Problem Set: Lenses**

1. A 16mm high object is viewed with a converging lens of focal length 32 mm. For each object distance listed below:
   1. draw a scaled ray diagram using all the rules to locate the image of the object
   2. State the characteristics of each image (LOST)
      1. *d*o = 64 mm
      2. *d*o = 52 mm
      3. *d*o = 16 mm
2. Below is a list of optical devices. For each of the following cases, explain what kind of lens must be used and where the lens must be placed relative to the object:
   1. A copy camera produces an image that is real and the same size
   2. A slide projector produces an image that is real and larger
   3. A spotlight produces parallel light; there is no image
   4. A photographic enlarger produces an image that is real and larger
3. A pencil 15 cm high is placed 45 cm in front of a converging lens with a focal length of 12 cm. Using a scale ray diagram find:
4. The distance from the lens to the image *[16 cm]*
5. The distance from the object to the image *[61cm]*
6. The image height *[5.3 cm]*
7. For the object and distances from Question 1, calculate di using the thin lens equation and calculate your percent error.
8. For the object in Question 3 calculate di and your percent error.
9. An image formed by a diverging lens is only ¼ as far from the lens as the object. Find the distance from the image to the lens if the focal length is 30 cm. *[38cm]*
10. The sun is 1.49X 1011 m from the earth. A converging lens with a focal length of 32cm is used to form an image of the sun.
11. How far from the lens is the image formed? *[32 cm]*
12. How might you have guessed this result without even performing the calculation?
13. A tree 11cm from a converging lens forms an image 78cm from the lens. Calculate the focal length of the lens. *[73cm]*
14. A projector lens has a focal length of 25cm. A 35mm slide is placed 26 cm from the converging lens.
15. How far away from the lens must the screen be positioned? *[650 cm]*
16. What is the size of the image formed on the screen? *[875 mm]*
17. An object in front of a converging lens is 3 times the size of its image. If the focal length of the lens is 25 cm, how far from the lens is the object? *[100cm]*
18. An image formed by a diverging lens is 4 times the size of the object. If the object is 120 cm from the image, how far is the image from the lens? *[96 cm]*