Lab: Image formation with lenses, calculating the Focal Length

Lenses can produce both Real and Virtual images in much the same way as concave mirrors. All of the same rules apply (measuring angles based on Normals for instance as well as the 'focal point/length being defined by the location in space where ALL parallel rays will pass through).

In this lab, students set up candles again but this time followed the light THROUGH the lens to create images.

Calculating the Focal length of a LENS using the same series of 4 measurements we did with curved mirrors.

- Two experiments with the object (a candle) OUTSIDE of F.
- One experiment with the object INSIDE of F
- One experiment with the lens being used outside on a sunny day to measure directly, the focal length.
- For each experiment, the students should determine the Uncertainty in their measurements as well as the Uncertainty in their final determination of F. From these calculations, they should create a bar-chart to 'visualize' the values of F as well as the uncertainty (to scale) to determine the overlap of the results and by extension, the likely most accurate value for F.

To Hand In; Simply a clean and well organized document (1-2 pages or One sheet of 11x17 paper) which includes the following:

- Technical drawings (called Ray Diagrams) that represent each of those same experiments, noting measured values for image distance, object distance, These would be like the drawings Clark did on the board.
- *(Note: these drawing should also include the 'uncertainty' in the measurements)*.
- The Image/Object and Focal Length Equations for each of the first three experiments.
- A math section that shows the equation (above) in use to determine what the focal length f, must have been as well as the uncertainty in that calculation.
- A drawing (such as Clark did) which illustrates the final value for your calculations of focal length, including the uncertainty in those values and comparisons of the 'overlap' of the ranges of uncertain values.