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**Experiment: Thin Lenses**

**Introduction:**

The distance an object is from a lens has an effect on the image size and whether it is real or virtual. By changing the distance from the lens the effects it has can be observed.

**Procedure:**

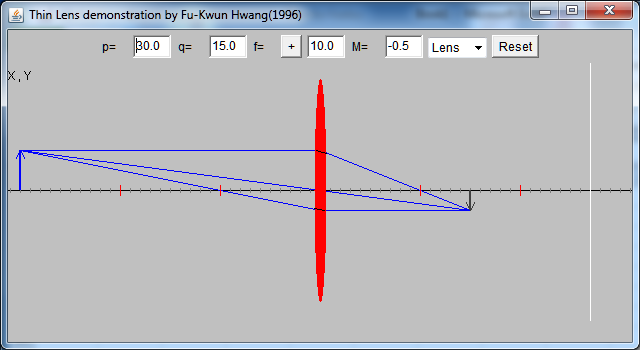
1. **Load the Java lab from** [**http://www.phy.ntnu.edu.tw/java/Lens/lens\_e.html**](http://www.phy.ntnu.edu.tw/java/Lens/lens_e.html)**.**
2. **Select “Lens” for the thin lens effect.**
3. **Press Toggle button to “+” (converging lens).**
4. **Change the value of p from 30 to 5 in decreasing increments of 5.**
5. **Record the location of the image (q) and the type of image (real or virtual) as well as the magnification (M) of the image**
6. **Plot a graph showing the objects position (x axis) versus the image position (y axis).**
7. **Plot a graph showing the objects position (x-axis) versus the magnification (y-axis).**
8. **Repeat Steps 3 through 7 for “-“(diverging lens).**

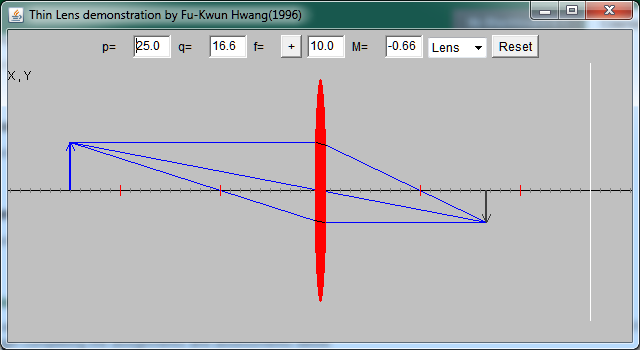
**Data and Observations:**

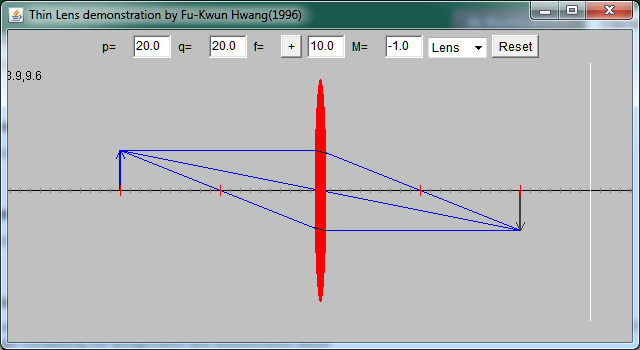
**Converging Lens**

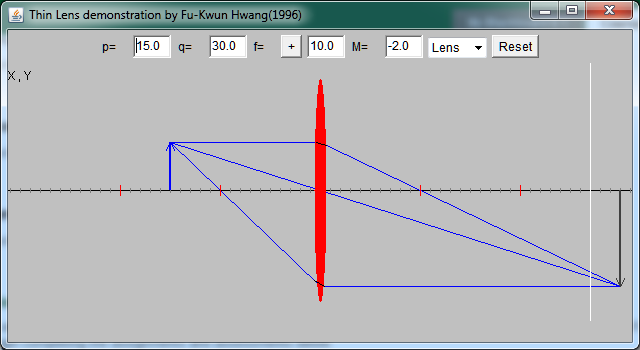
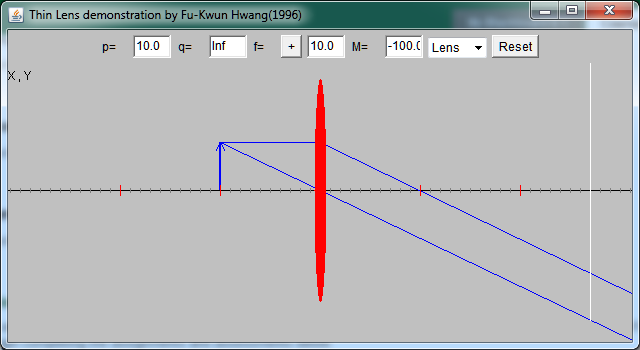
|  |  |  |  |
| --- | --- | --- | --- |
| **p** | **q** | **f** | **M** |
| **30.0** | **15.0** | **10.0** | **-0.50** |
| **25.0** | **16.6** | **10.0** | **-0.66** |
| **20.0** | **20.0** | **10.0** | **-1.00** |
| **15.0** | **30.0** | **10.0** | **-2.00** |
| **10.0** | **∞** | **10.0** | **-100.00** |
| **5.0** | **-10.0** | **10.0** | **2.00** |

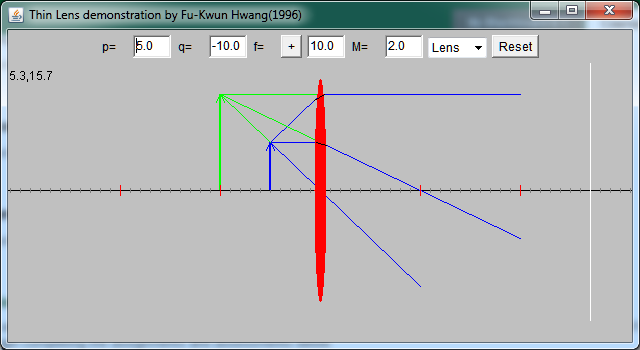
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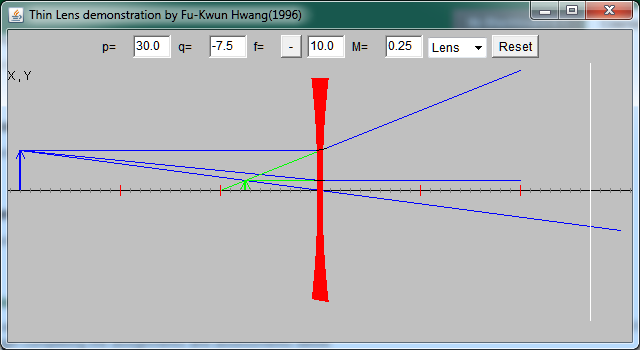


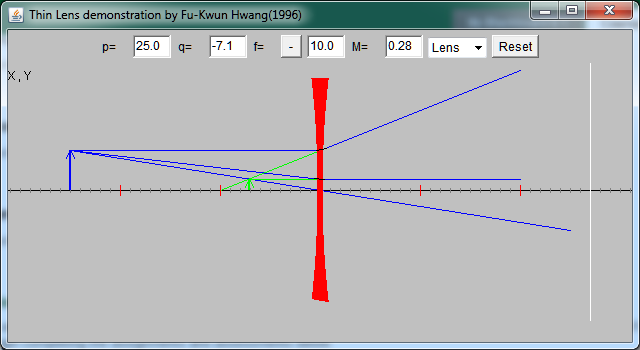
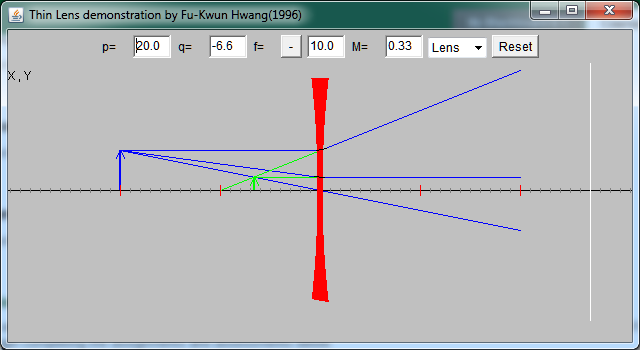


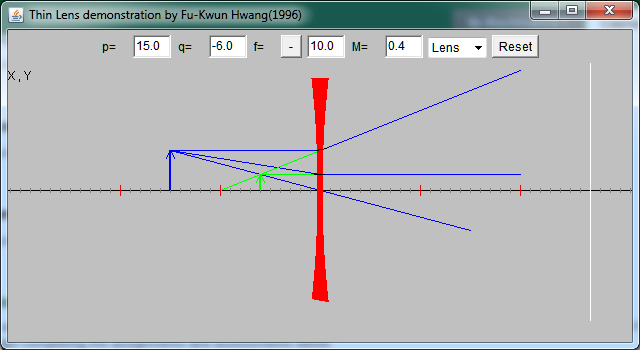
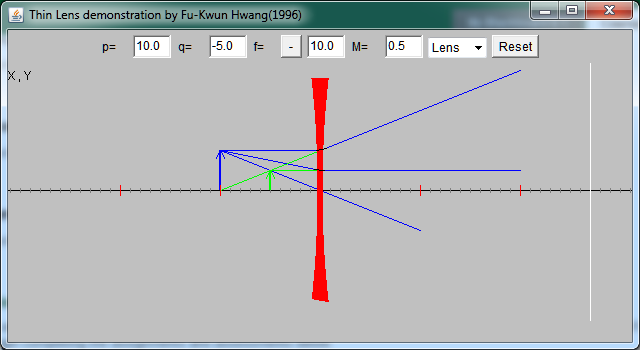
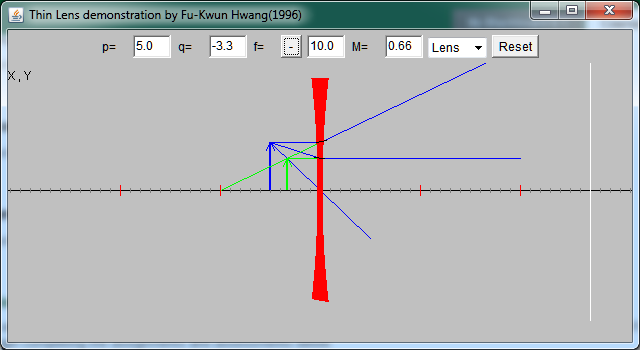




|  |  |  |  |
| --- | --- | --- | --- |
| Diverging Lens | |  |  |
| p | q | f | M |
| 30.0 | -7.5 | -10.0 | 0.25 |
| 25.0 | -7.1 | -10.0 | 0.28 |
| 20.0 | -6.6 | -10.0 | 0.33 |
| 15.0 | -6.0 | -10.0 | 0.40 |
| 10.0 | -5.0 | -10.0 | 0.50 |
| 5.0 | -3.3 | -10.0 | 0.66 |
|  |  |  |  |
|  |  |  |  |







**Conclusions:**

The closer an object gets to a converging lens the larger the real image is until the focal point of the lens is reached at which point there is no image or a virtual image when the object distance is less than the focal length.

The closer an object get to the diverging lens the larger the virtual image.