# Drawing Ray Diagrams for Converging Lenses
Lesson Notes

Learning Outcome
- How do you draw ray diagrams for converging lenses?

Converging Lenses: Three "Refraction" Rules
- In incident ray traveling ∥ to the P.A. will refract and pass through F. (Red)
- In incident ray traveling through F will refract and travel ∥ to the P.A. (Blue)
- In incident ray traveling towards the exact center of the lens will continue along its original path. (Green)
- All light originating from the same location on the object will intersect at the same location. (Grey)
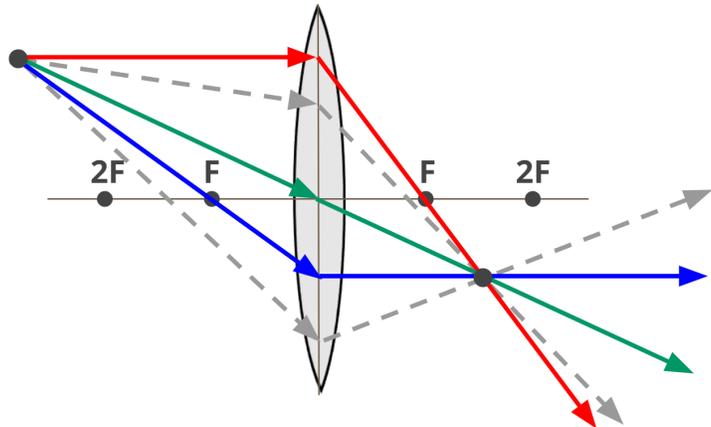
Case 1: Object Located Beyond 2F
1. Start on the top of the object.
2. Draw two sets of incident and refracted rays.
   Parallel to the PA and refracting through F.
   Pass through F and refracting parallel to the PA.
3. The image is the location where the refracted rays intersect.
4. Repeat for the bottom of the object.
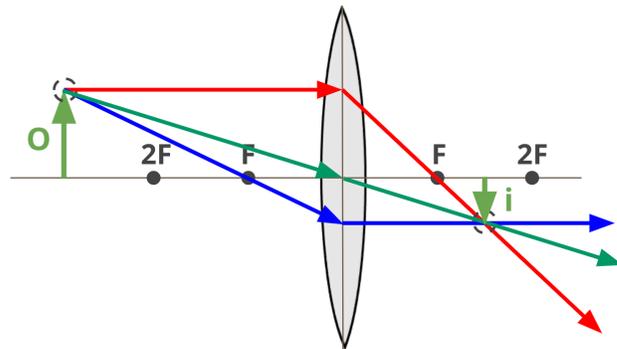
Case 2: Object Located at 2F
1. Start on the top of the object.
2. Draw two sets of incident and refracted rays.
   Parallel to the PA and refracting through F.
   Pass through F and refracting parallel to the PA.
3. The image is the location where the refracted rays intersect.
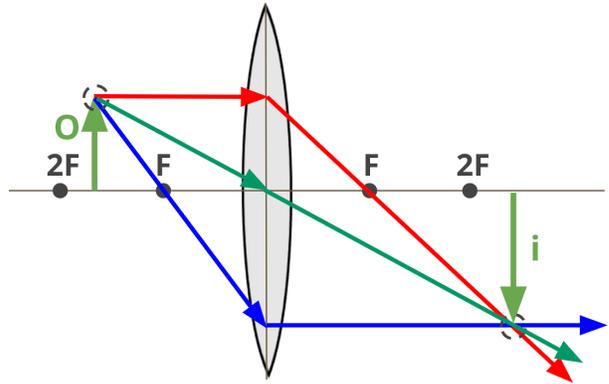4. Repeat for the bottom of the object.
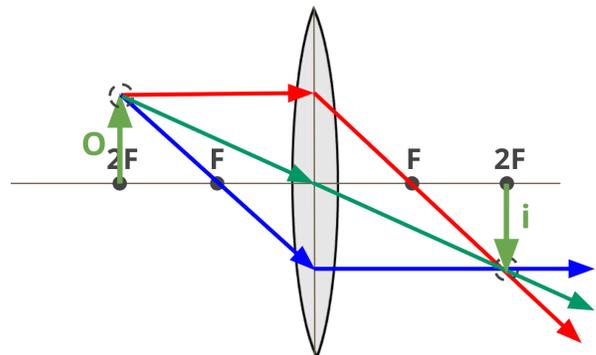
Case 3: Object Located Between F and 2F
1. Start on the top of the object.
2. Draw two sets of incident and refracted rays.
   Parallel to the PA and refracting through F.
   Pass through F and refracting parallel to the PA.
3. The image is the location where the refracted rays intersect.
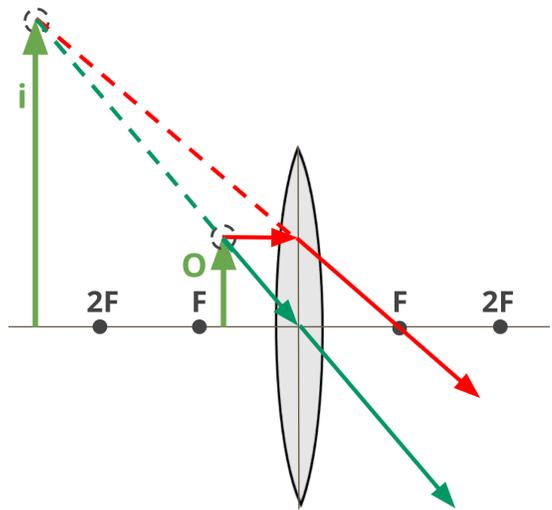4. Repeat for the bottom of the object.

Case 4: Object Located Between F and Lens
1. Start on the top of the object.
2. Draw two sets of incident and refracted rays.
   Parallel to the PA and refracting through F.
   Pass through the lens' center and continue along original path.
3. The image is the location where the refracted rays intersect.
4. Repeat for the bottom of the object.

What About the F Location?
1. Start on the top of the object.
2. Draw two sets of incident and refracted rays.
   Parallel to the PA and refracting through F.
   Pass through the lens' center and continue along original path.
3. The image is the location where the refracted rays intersect. But these rays do not intersect. There is no image for this object location.

Parallel light rays do NOT intersect.