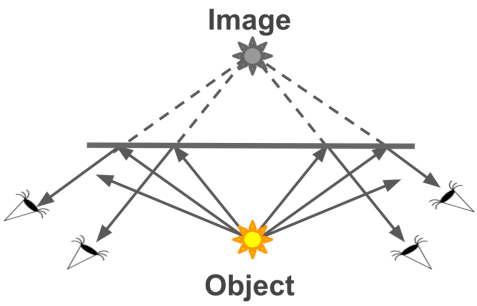
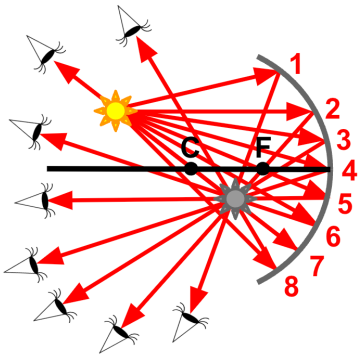
Image Formation by Lenses
Lesson Notes

Learning Outcomes
- How and why does a lens form an image of an object?
- How are real images different than virtual images?

Image Formation Revisited
Image: a replica of an object formed at a location in space where all the reflected or refracted light appears to come from.

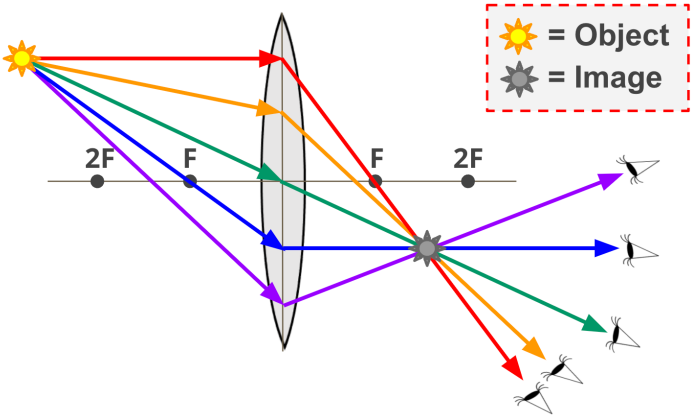
Plane Mirrors


Virtual image: formed when reflected rays diverge.

Concave Mirrors


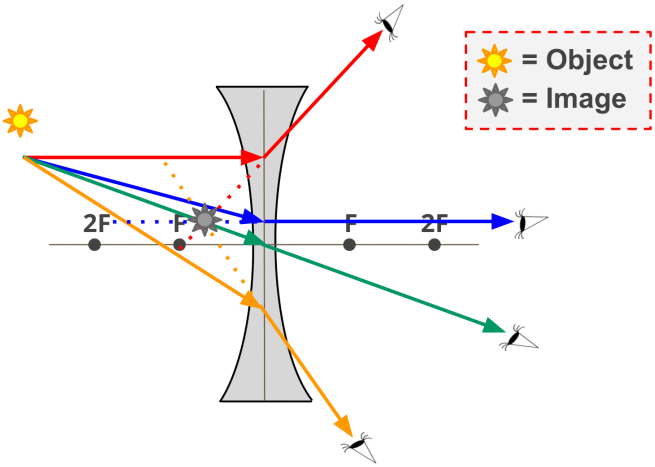
Real image: formed when reflected rays converge.

Converging Lens Image Formation
- Converging lenses can produce both real and virtual images.
- Light from the object refracts through the lens and converges to a point, thus forming a **real image**.
- Each observer sights along a different line of sight at the same image location.
- As an observer sights at this image location, a ray of light comes to their eyes, giving the appearance of a replica of the object (i.e., of an image).



Diverging Lens Image Formation

- For diverging lenses, the light diverges after refracting through the lens.
- A diverging lenses produces a **virtual image** that is located on the object's side of the lens where the refracted light appears to diverge from.
- As each observer sights at this virtual image location, refracted rays come to their eyes, giving the appearance of a replica of the object (i.e., of an image).



Ray Diagrams for Lenses

- Images are located where the refracted rays intersect.
- For **real images**, light rays from the same point on the object pass through the lens and converge.
- For **virtual images**, light rays from the same point on an object pass through the lens and diverge. But the refracted rays can be extended backwards to the object's side to locate the intersection point.
- Ray diagrams are based on this understanding.