



Reflection & Refraction

Reflection

- ▶ Occurs when light hits a medium and bounces back towards the direction it came from
- ▶ Reflection is what allows us to see objects:
 - ▶ Lights reflects off an object and travels into the eyes → sight

Reflection Diagrams

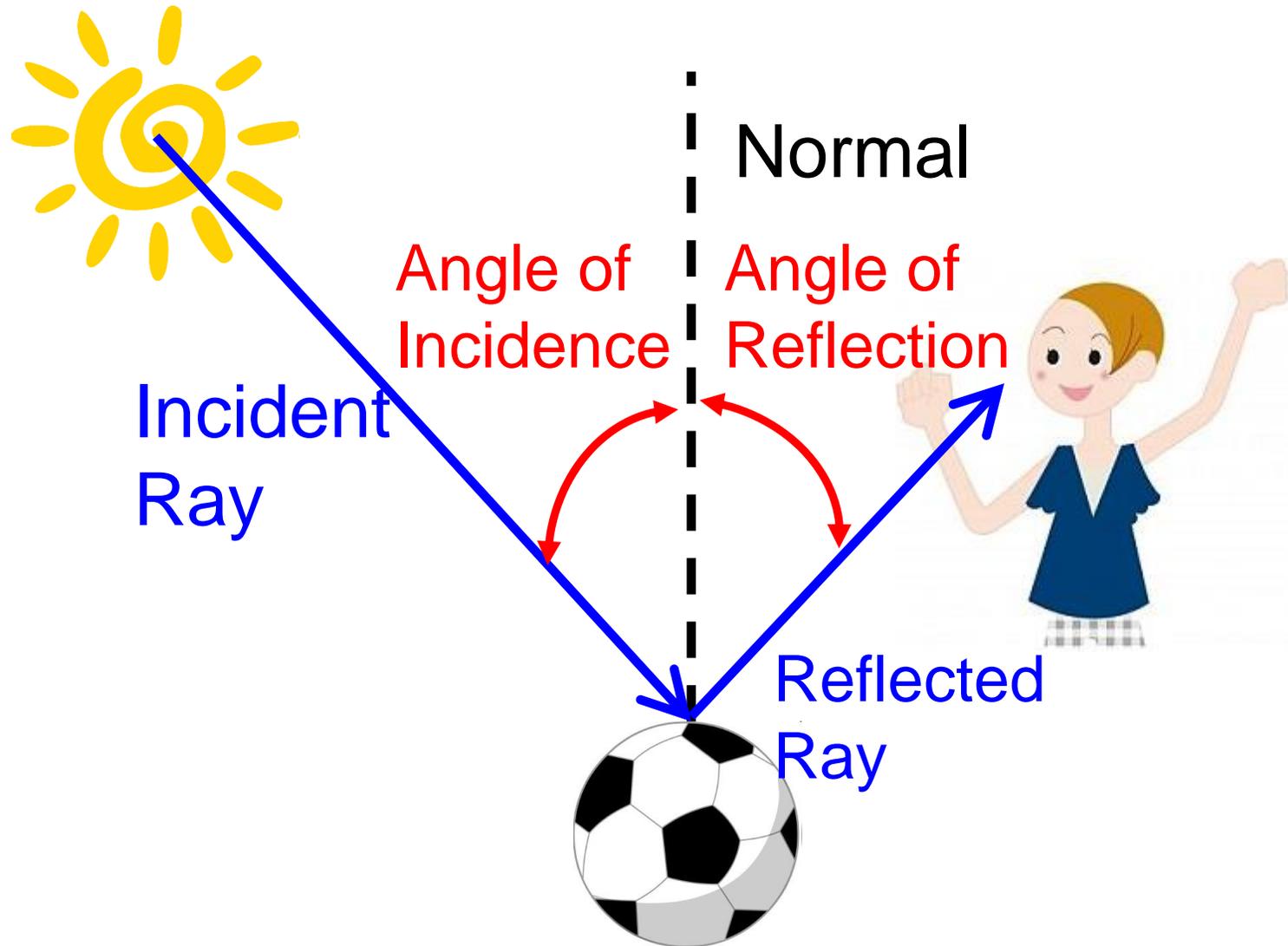
- ▶ Definitions:
 - ▶ **Incident Ray:** the ray that contacts the surface of an object
 - ▶ **Reflected Ray:** the ray that rebounds
 - ▶ **Normal:** a line perpendicular to the surface at the point of reflection

Reflection Diagrams

► Definitions:

- **Angle of Incidence:** the angle formed between the incident ray and the normal
- **Angle of Reflection:** the angle formed by the reflected ray and the normal

Reflection of Light



Laws for Reflection of Light Rays

- ▶ The angle of incidence is always equal to the angle of reflection
- ▶ The incident ray and the reflected ray are always in the same plane
 - ▶ Ex: on the same side of the mirror

Reflection and Mirrors

- ▶ When parallel light rays contact a surface such as a mirror, their reflections are parallel resulting in a true mirror image
- ▶ A mirror with no curve, or that is flat is called a plane mirror

Reflection and Mirrors

- ▶ Reflections from plane mirrors have several characteristics:
 - ▶ The image **appears to be behind** the mirror
 - ▶ The **distance** between the object and the mirror and the reflected image and the mirror are **equal in appearance**

Reflection and Mirrors

- ▶ Reflections from plane mirrors have several characteristics:
 - ▶ The **image in the mirror** is called a **virtual image**
 - ▶ A virtual image is not real and therefore **cannot be captured** on a mirror; it is made by lengthening the reflected rays

Image Formation in Mirrors

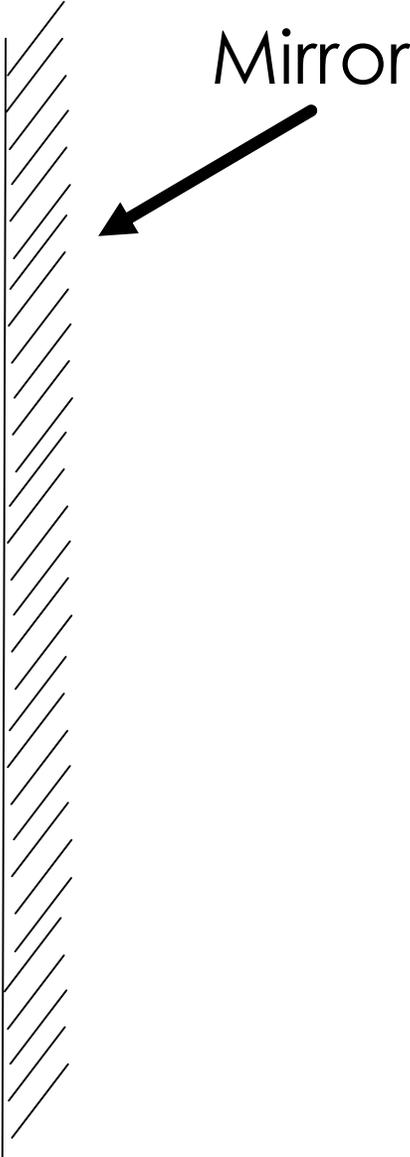
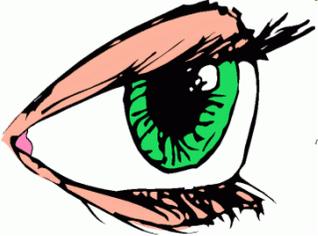
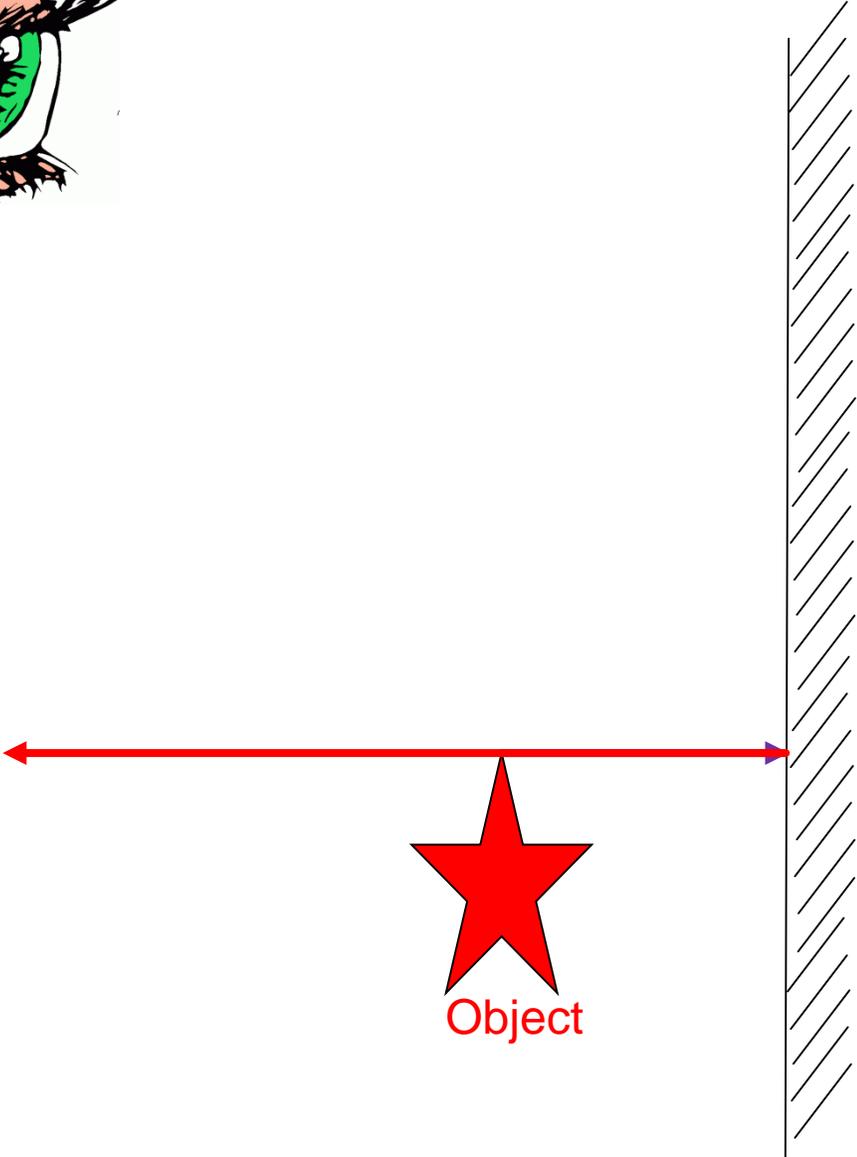
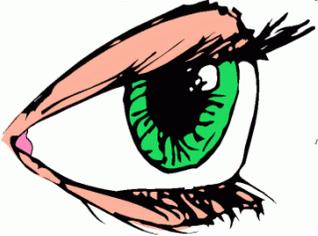


Image Formation in Mirrors



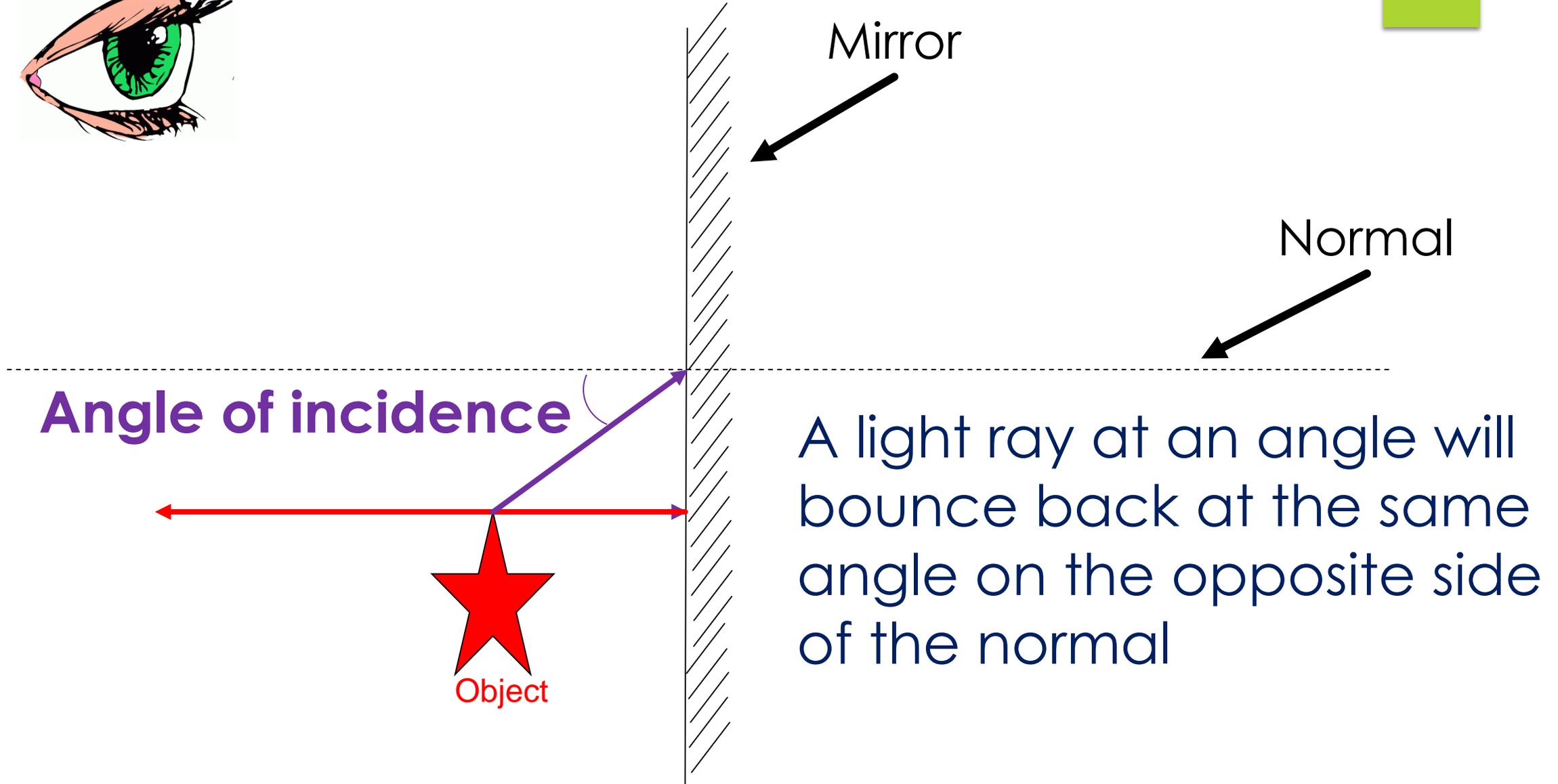
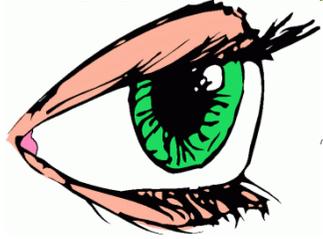
Mirror

Light travels in a straight line

A parallel line will bounce right back



Image Formation in Mirrors



A light ray at an angle will bounce back at the same angle on the opposite side of the normal

Image Formation in Mirrors

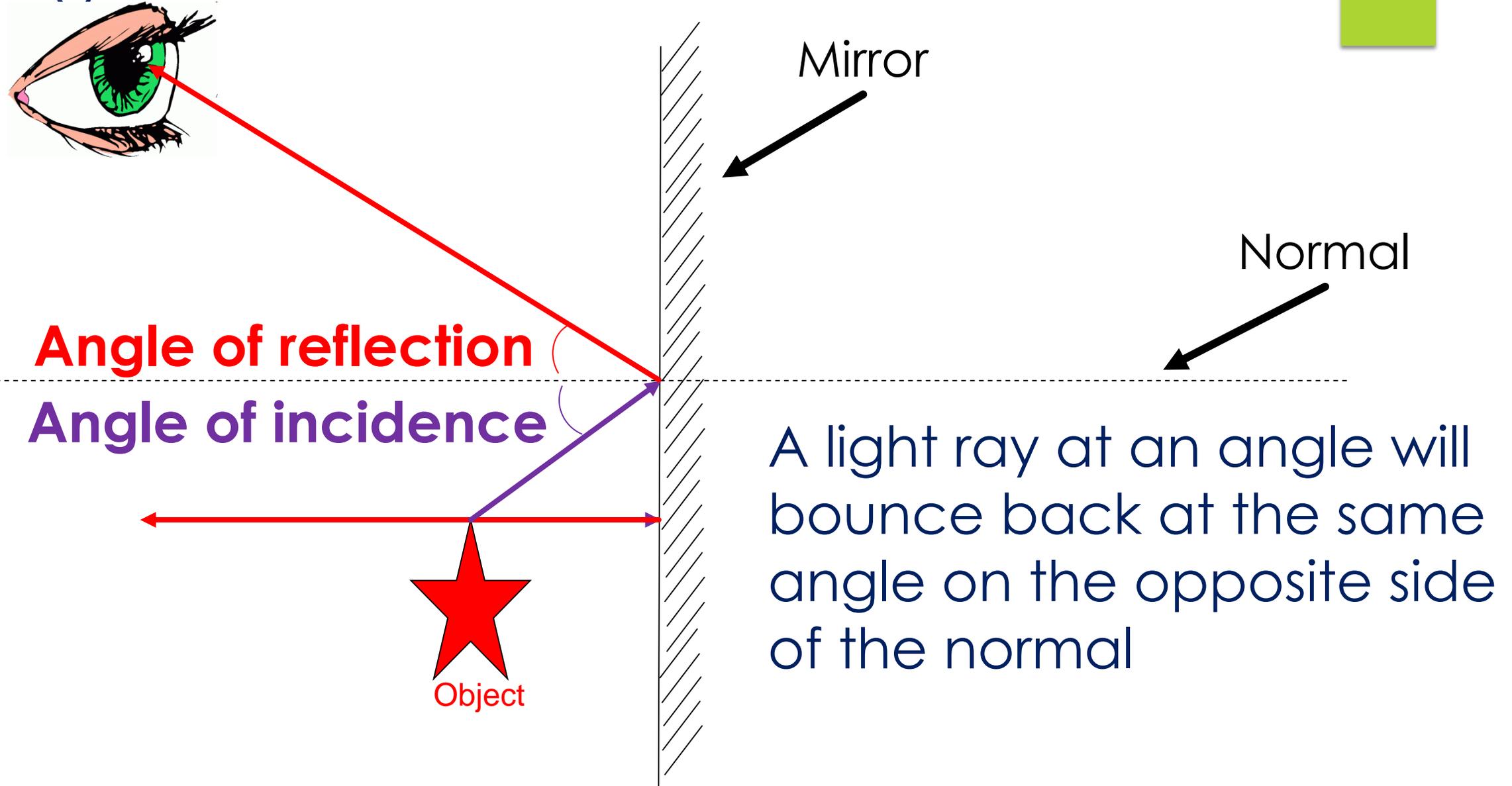
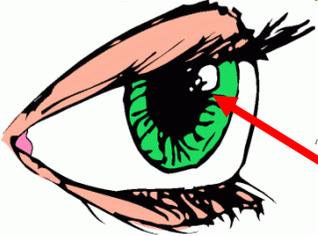


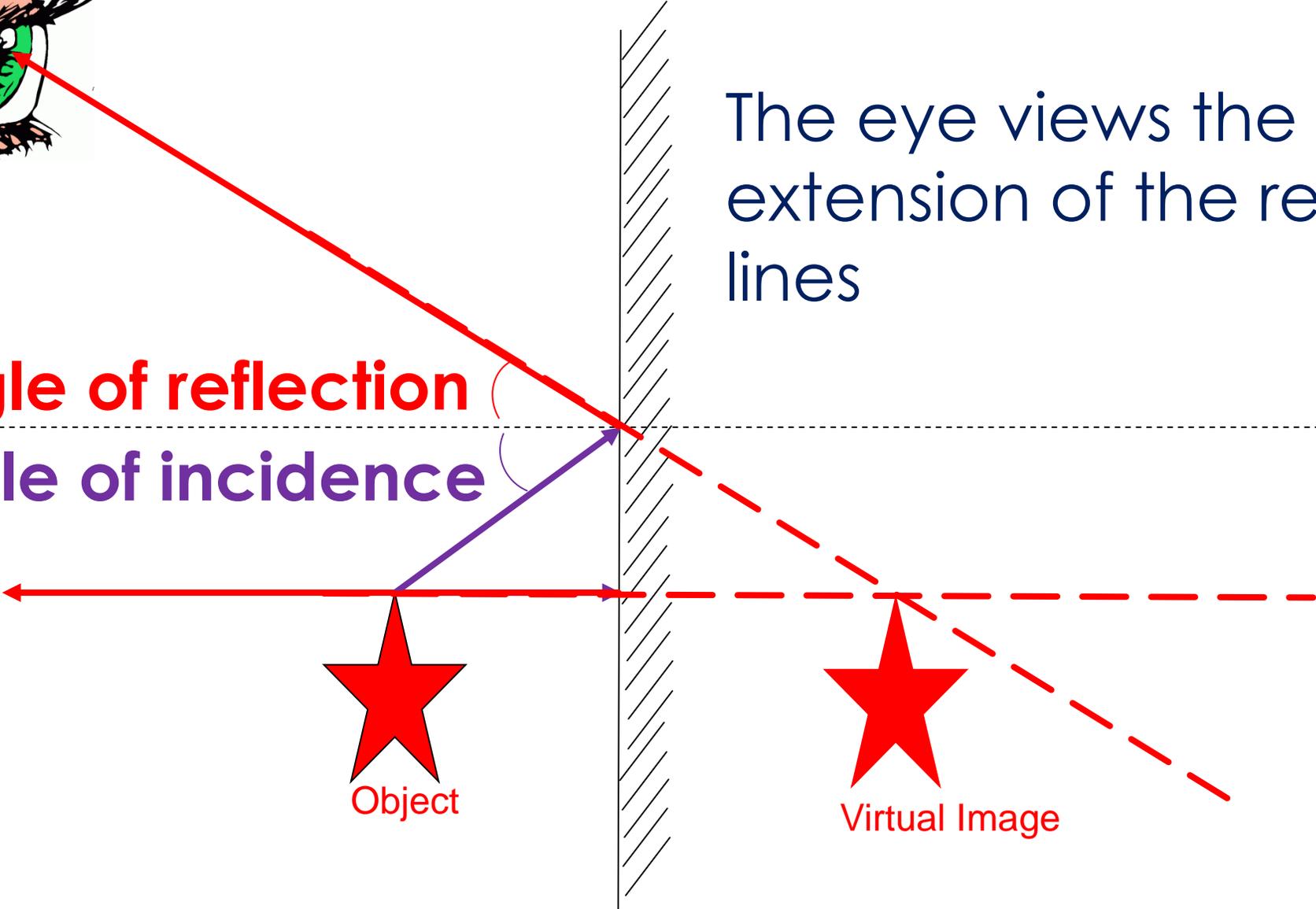
Image Formation in Mirrors



The eye views the extension of the reflected lines

Angle of reflection

Angle of incidence



Object

Virtual Image

Uses of Plane Mirrors

- ▶ The two principles that make plane mirrors useful are:
 - ▶ They **change the trajectory** (pathway) of light rays by **reflection**
 - ▶ This **increase** the observer's **field of vision**
- ▶ Uses: **rear-view mirrors, microscopes, and telescopes**

Refraction

- ▶ **Refraction:** the deviation of a light ray as it passes from one transparent medium to another
 - ▶ Occurs when the pathway of a light ray is changed
- ▶ Most often occurs as light goes from air to water
- ▶ Happens because the speed that light travels changes as the medium changes

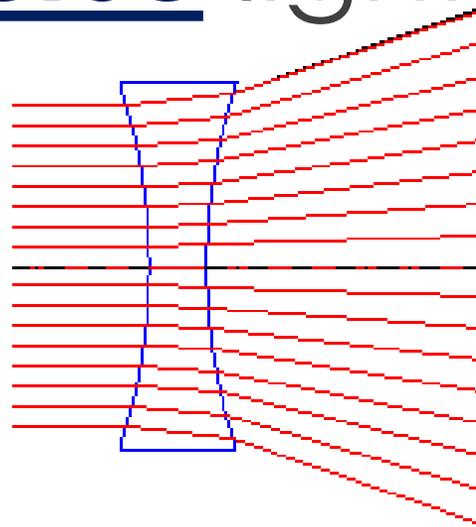
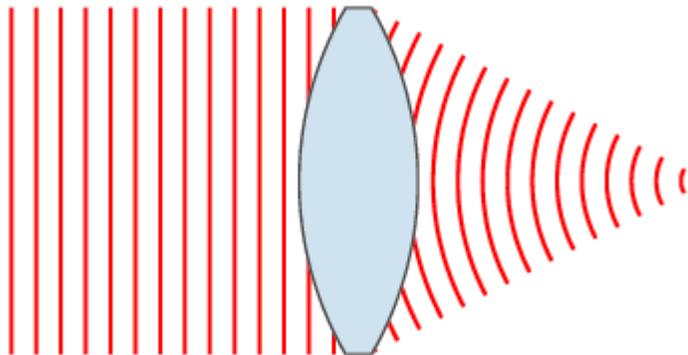


Lenses

- ▶ Lenses are made of transparent materials and have at least one curved surface
- ▶ The curve of a lenses allows it to refract light as it passes through
- ▶ There are two types of lenses
 - ▶ Converging lenses
 - ▶ Diverging lenses

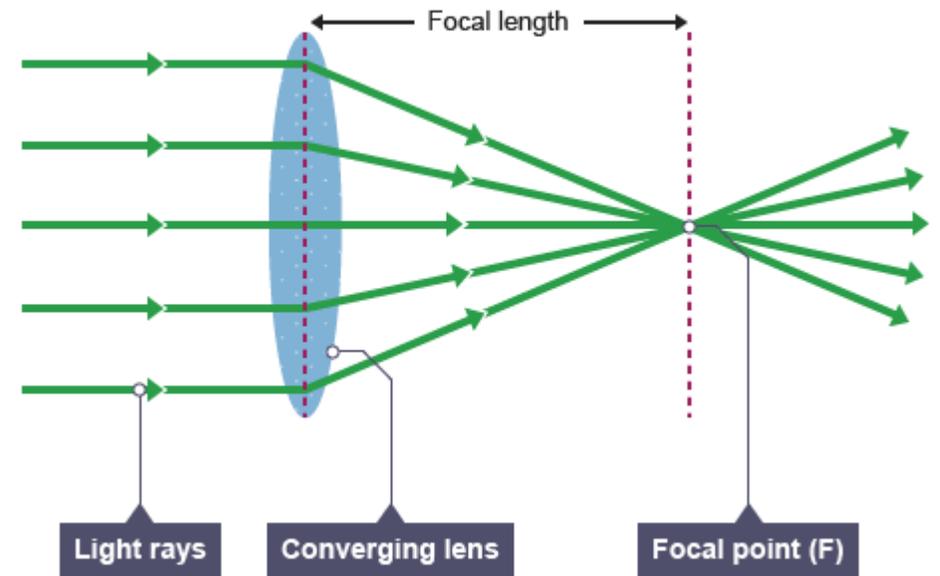
Lenses

- ▶ **Converging lenses** bring light rays **together**
- ▶ **Diverging lenses disperse** light rays



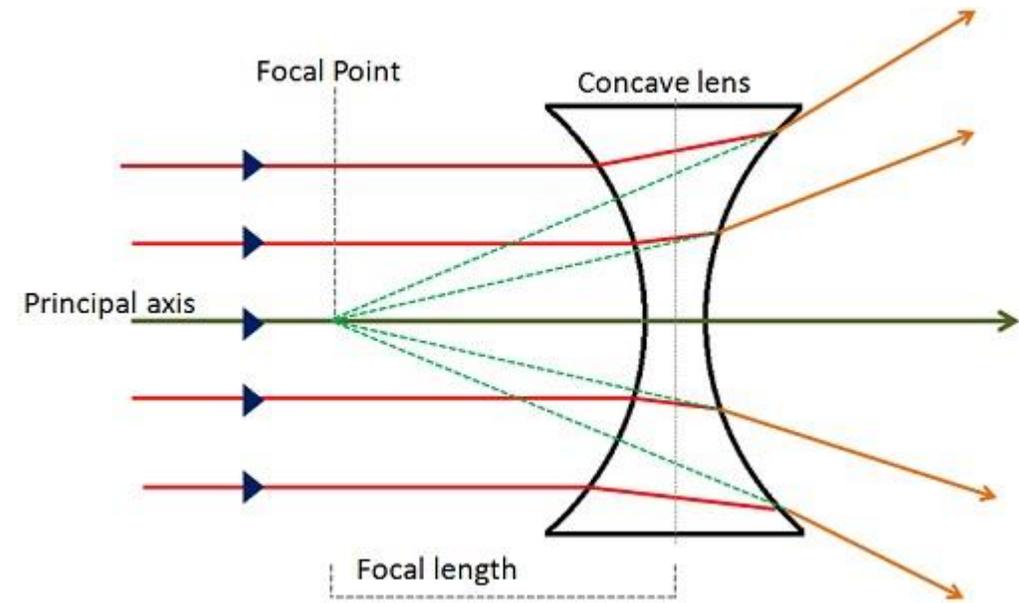
Focal Point: Converging Lens

- ▶ The **focal point** of a **converging lens** is the **REAL POINT** where the refracted rays **ACTUALLY meet** when the incident rays run parallel
- ▶ The focal point is **after the lens**



Focal Point: Diverging Lens

- ▶ The focal point of a diverging lens is the VIRTUAL point from which the refracted light rays APPEAR to emanate when the incident rays run parallel
 - ▶ The focal point is before the lens



Did you know...

- ▶ When you see **white**: it is **all the light rays** being reflected equally back to your eye
- ▶ When you see **black**: all of the light is being **absorbed** (that's why your black T-shirt gets so hot in summer)
 - ▶ it is the **absence of light**

Why is grass green and not red?

- ▶ The grass **absorbs** all of the light ray colours **EXCEPT green**. It **reflects green** back to your eye.

