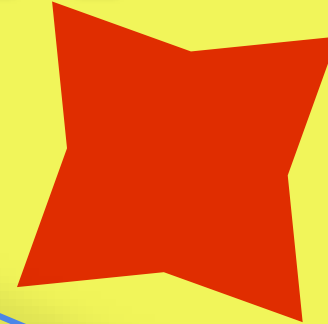
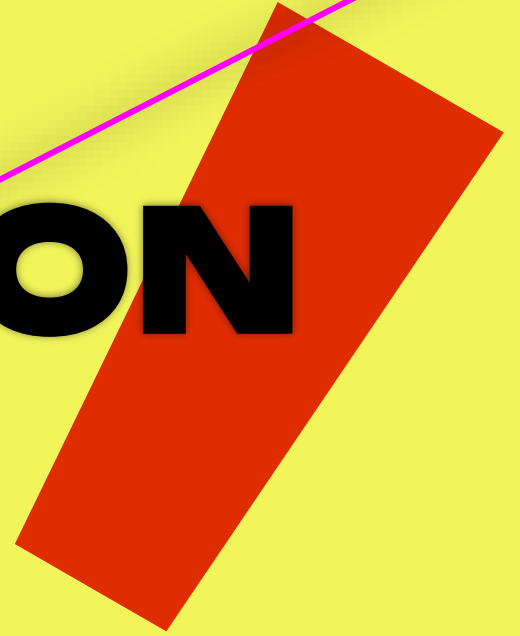
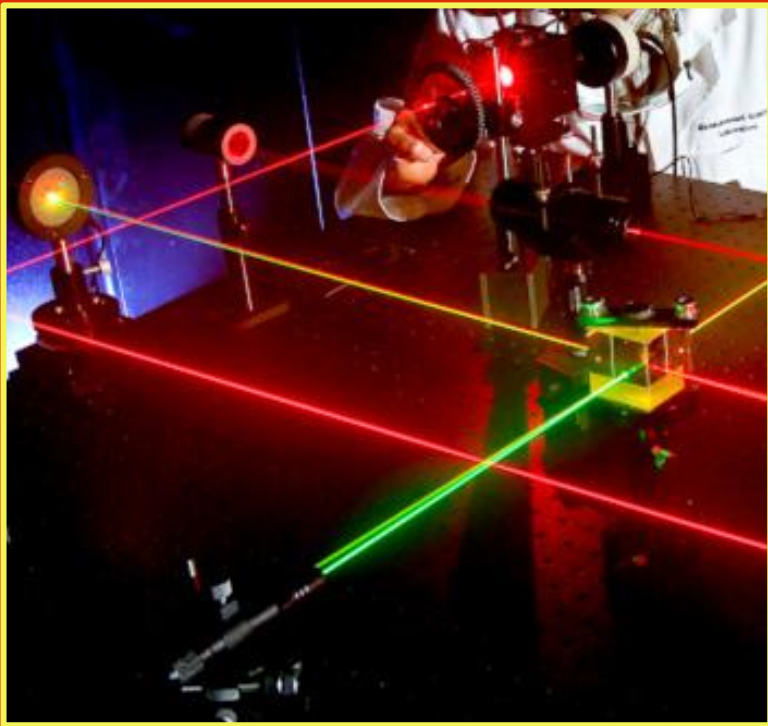


The Montgomery Science Olympiad Team Presents...

# REFLECTION RELAY



# Reflection Relay!



What is a **LASER**?

Definition & Examples

How does a **LASER** work?

Explanation & Simulation

How do I use a **LASER**?

Rules & Regulations

What is a reflection?

Background & Theory

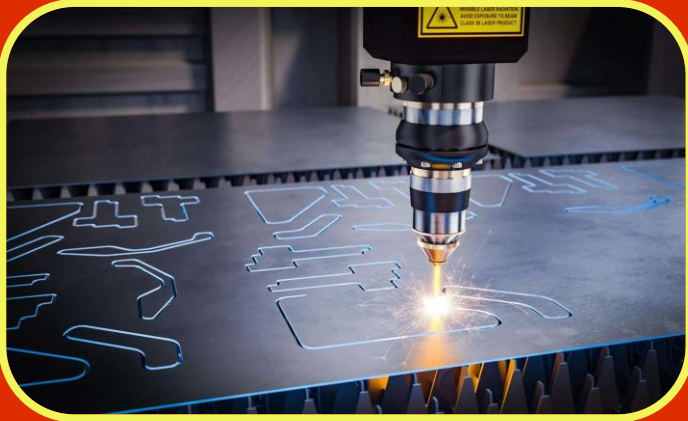
How does a **LASER** reflect?

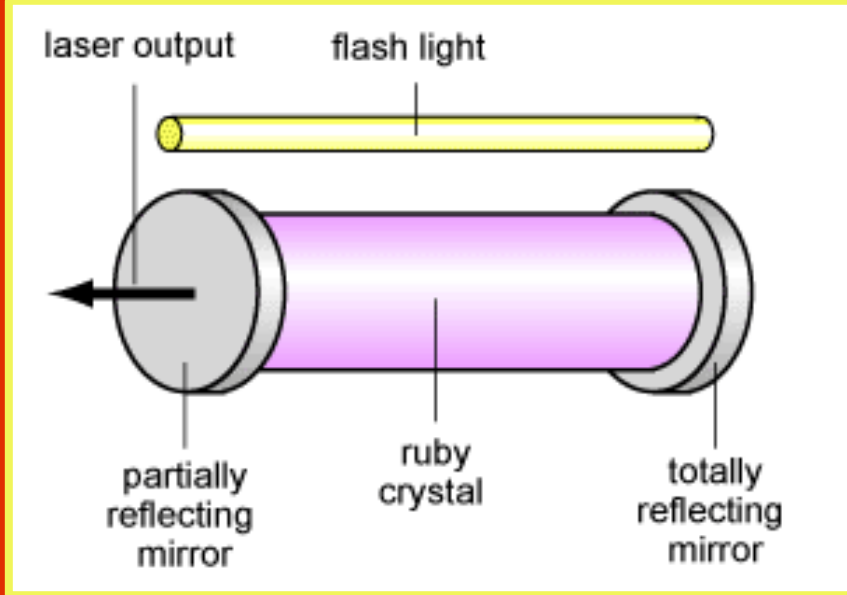
Analogies & Demonstration



# What is a LASER?

- LASER: light amplification by stimulated emission of radiation
- Applications:
  - Barcode Scanners
  - Lasik Eye Surgery
  - Fiber Optic Communication
  - Laser Cutting
  - CDs, DVDs, and Blu-ray Discs





# How does a LASER work?

- Light is made of individual particles called photons
- Ruby Crystal
  - Photons bounce around in this special crystal cavity, **stimulating it** and creating more and more light. This **amplifies** the beam.
- Partially Reflective Mirror
  - Allows some of the light to come through, where the beam focuses.
- The light that comes out is **coherent**, meaning it all has the same color and frequency.

- Do NOT point the LASER up or directly at anybody. Even low-energy LASERs can cause severe damage to eyesight.
- Do NOT look into the box or into the mirrors when you are doing the relay. It's both disallowed under competition rules and illegal.
- Do NOT keep the LASER on for prolonged periods of time. This wastes the laser's battery and degrades its components.

### How do I use a **LASER**?

- To turn on the LASER, tap the button on its side. Some LASERs are toggle (which means you have to click it) and some aren't (which means you have to hold the button).
- Make sure the LASER beam is aligned with the centerline before you begin your reflection relay.
- Keep the LASER on only when in the box. It should remain off otherwise.

# What is a reflection?

- a reflection occurs when light (or some other wave) changes direction after interacting with a new material



- reflections can occur with mirrors, or with other substances such as water.



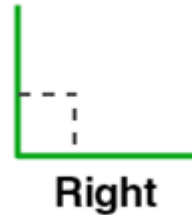
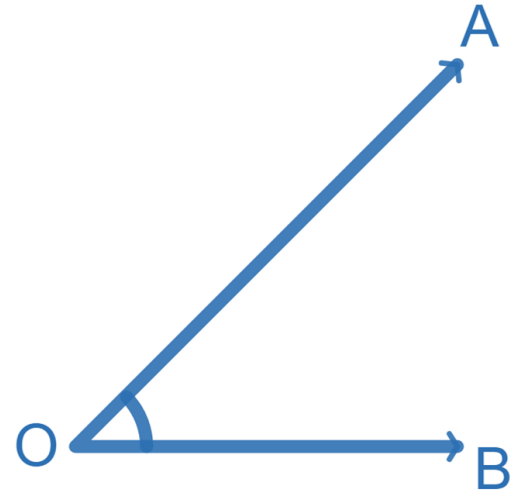
This is a **specular**, or clear reflection.

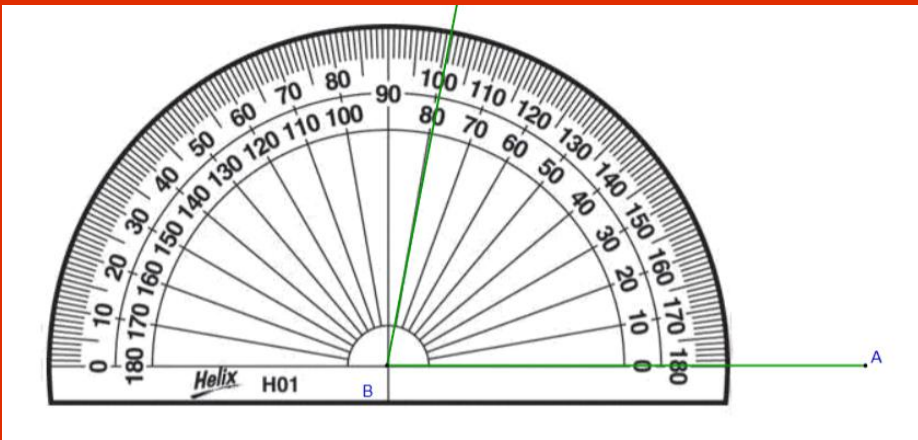
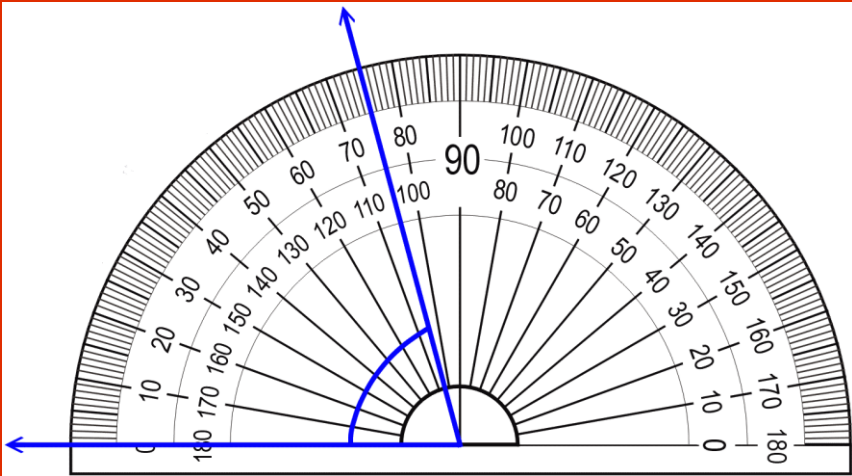
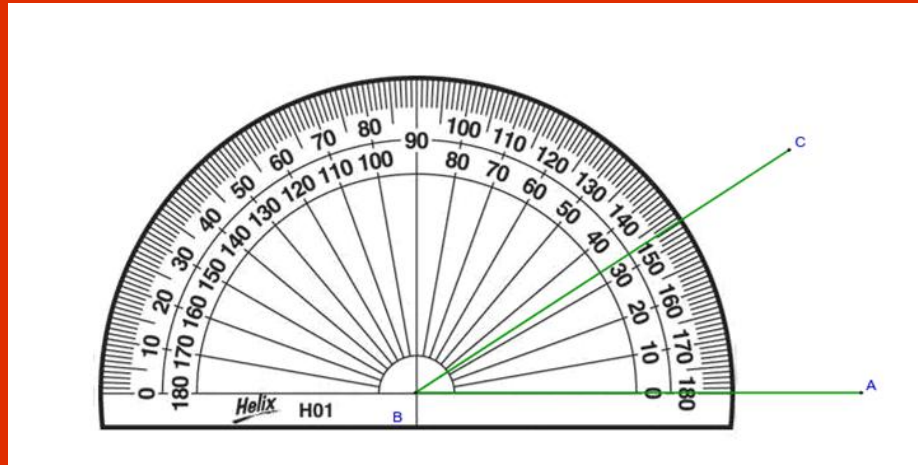
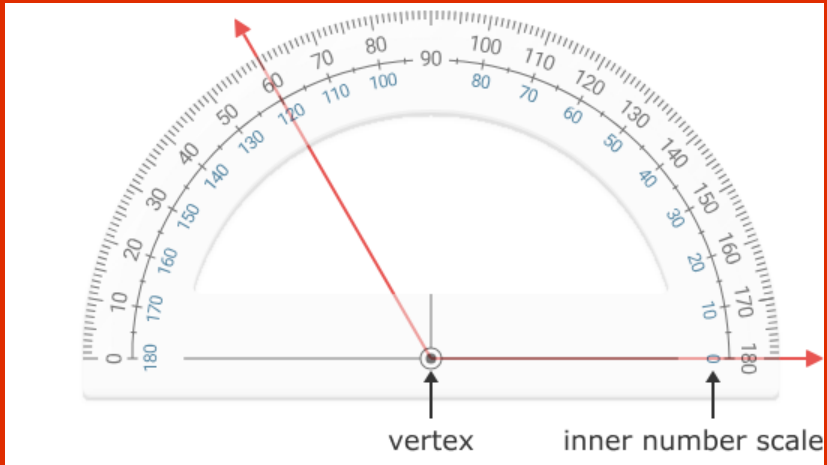


This is a **diffuse**, or “messy” reflection.

## Geometric Background

- an angle is the amount of space between two intersecting lines
  - how “tilted” the lines are compared to each other
- measure an angle with a protractor
- a full circle is  $360^\circ$





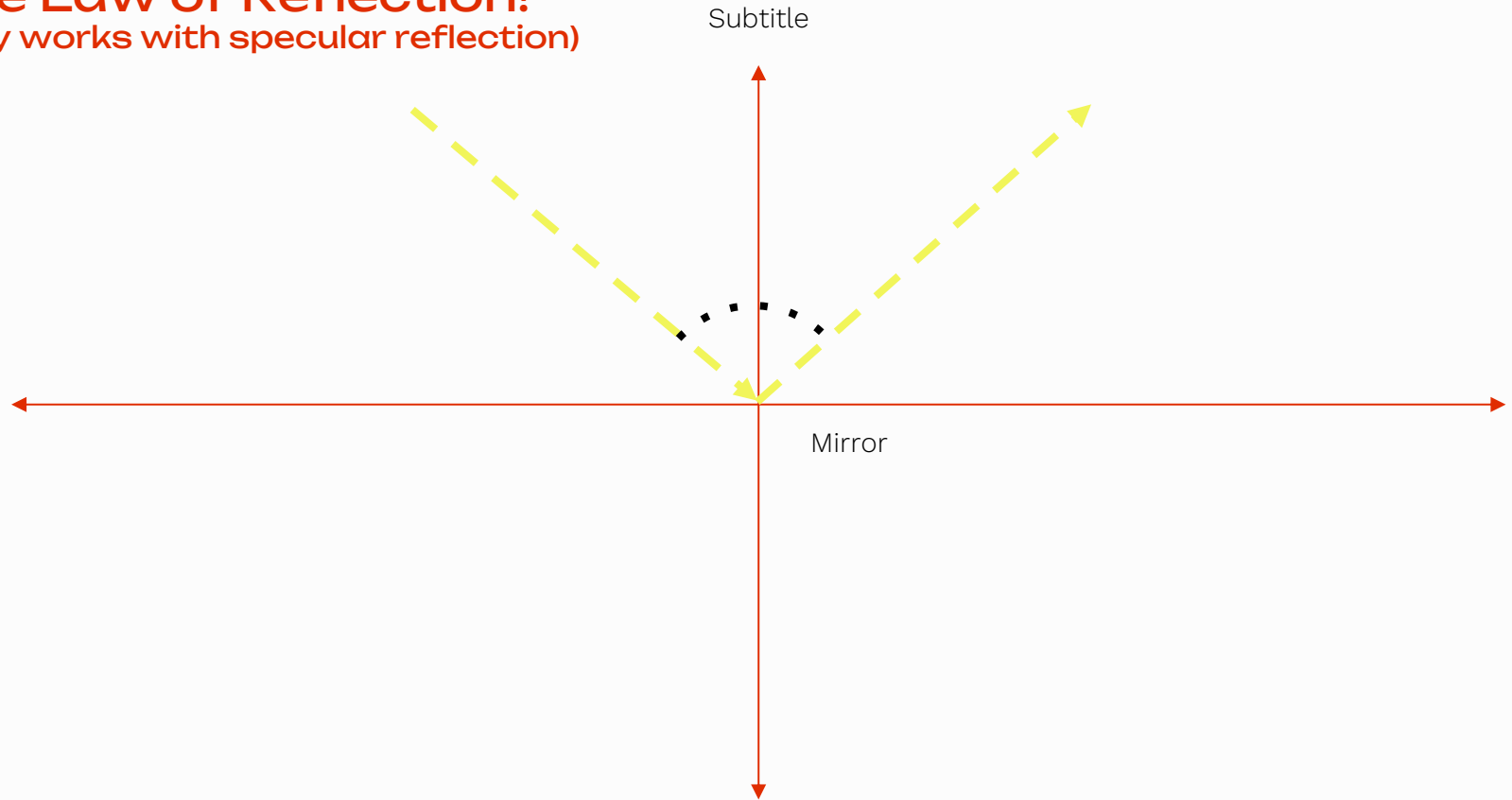


# Laws of Reflection



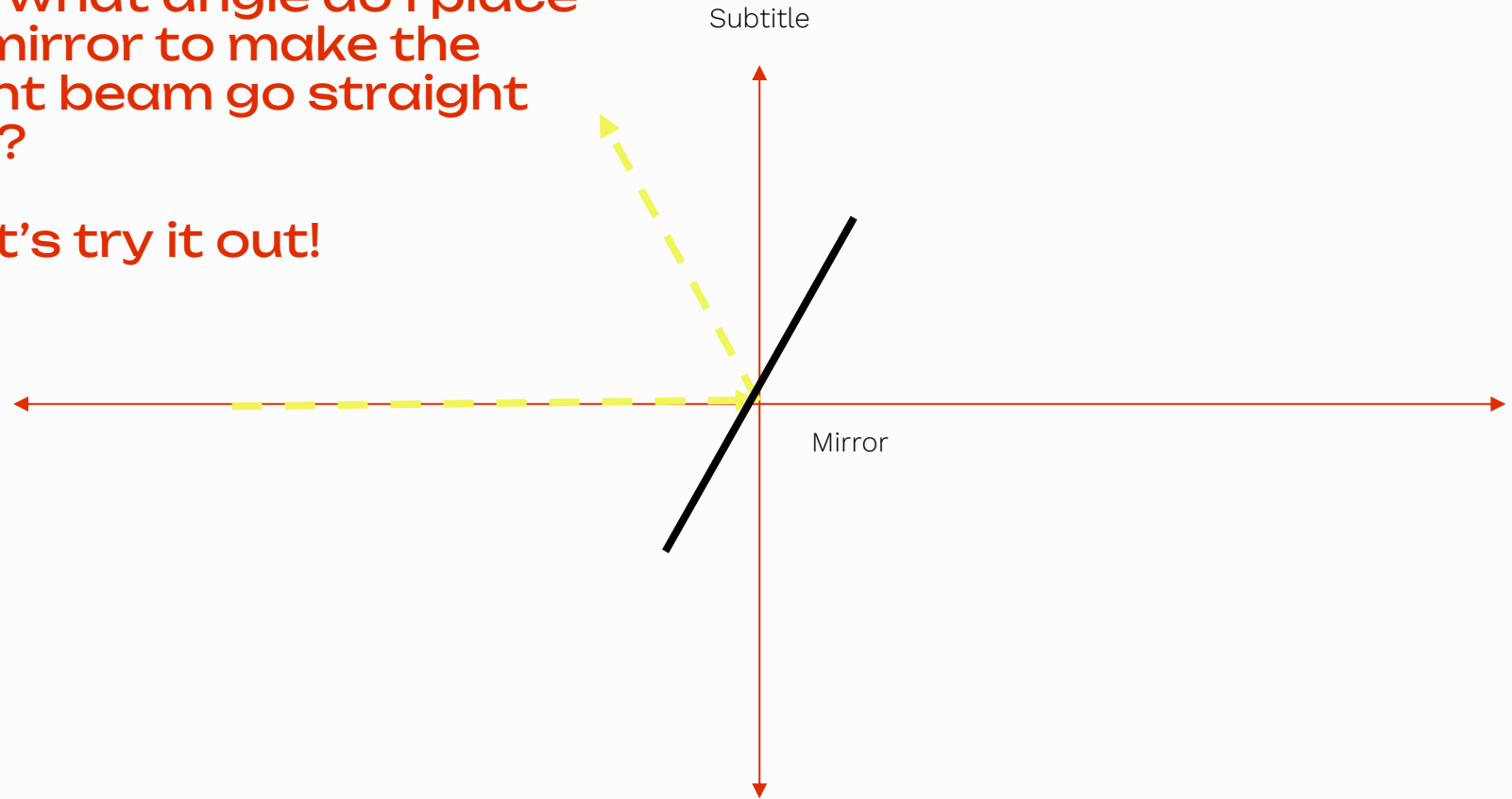
# The Law of Reflection!

(only works with specular reflection)



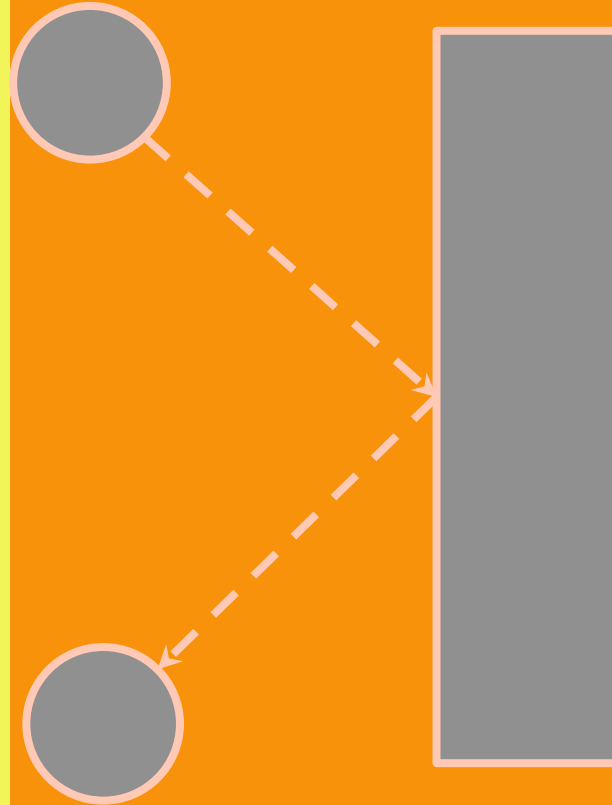
At what angle do I place  
a mirror to make the  
light beam go straight  
up?

Let's try it out!



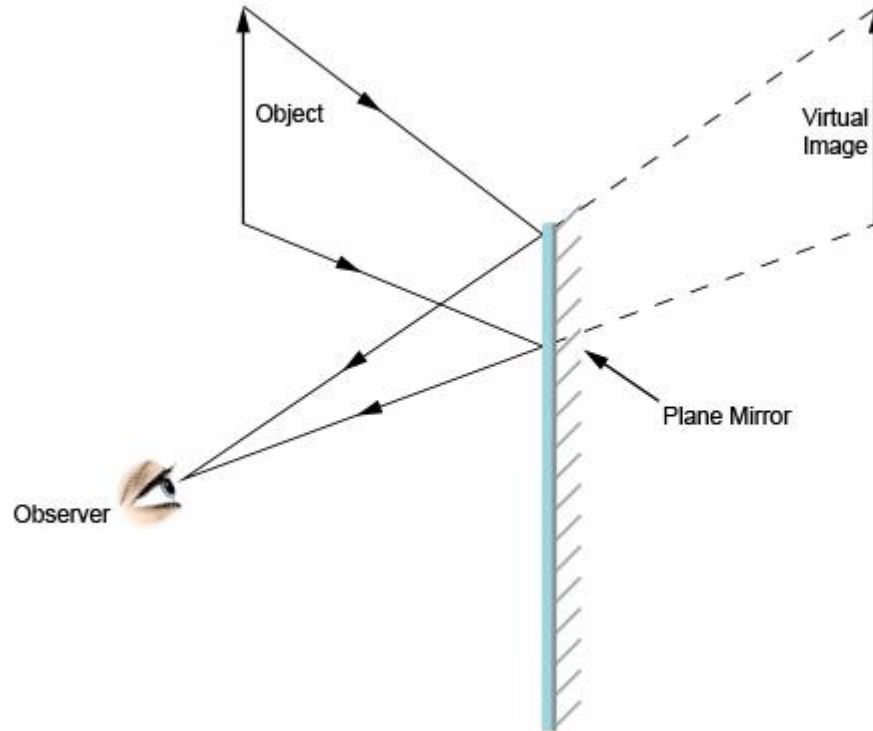
# How does a laser reflect?

- a beam of light can be thought of as a bunch of particles called *photons*

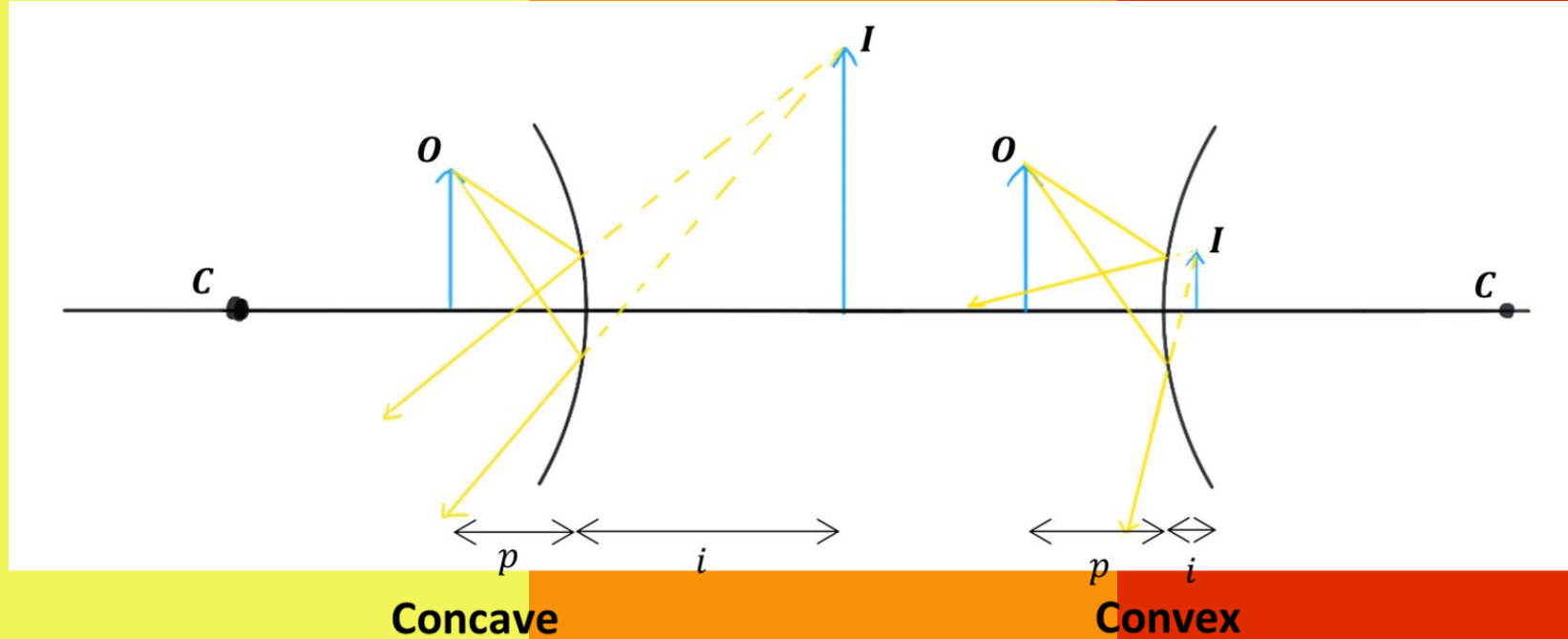


- these photons bounce just like a ball!

# Ray Tracing Mirrors



# Ray Tracing Mirrors





# Try it out!

[try it out online!](#)