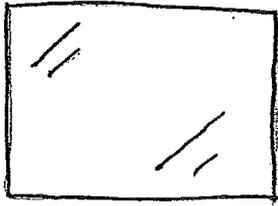


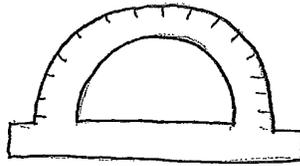
# Measuring Reflection

In this portion of the lab, you will measure how light is reflected from a mirror. Your goal is to determine a lawful relationship that will describe the direction of reflected light from a mirror relative to the incoming light onto the mirror.

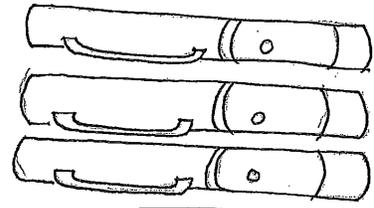
## You will need:



a mirror



a protractor

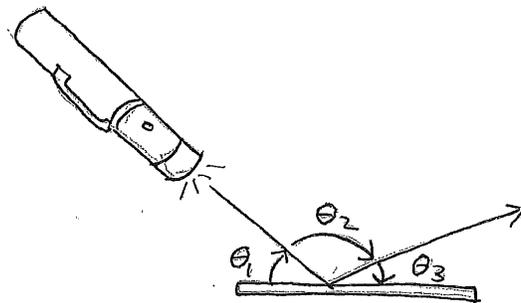


3 frickin' lasers.  
(red, green, blue)

## What to do:

A cautionary note: DO NOT LOOK DIRECTLY INTO THE LASERS!

This will cause immediate eye damage, so don't mess around. Be careful where the beam is shining so you don't get caught unawares.



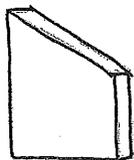
$$\theta_1 + \theta_3 + \theta_2 = 180^\circ \text{ or } \pi \text{ rad}$$

Pick one of your three lasers and shine it on the mirror. The beam will reflect off the mirrored surface to another point, which you can find with your hand or maybe some paper. Measure the three angles depicted in the diagram. Now turn your laser a bit so  $\theta_1$  changes and measure the three angles again. Repeat for each laser. What is the relationship between  $\theta_1$  and  $\theta_3$ ?

# Measuring Refraction

In this portion of the lab, you will measure how light is refracted through lenses and prisms. Your goal is to examine properties of different lenses using 3 light sources.

## You will need:



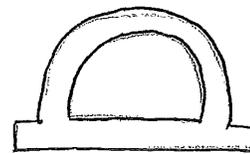
a prism



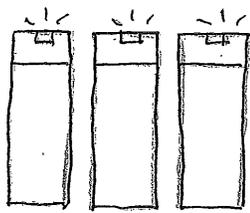
a convex lens



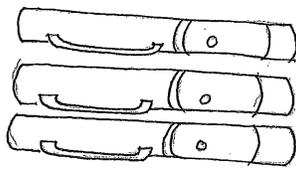
a concave lens



a protractor



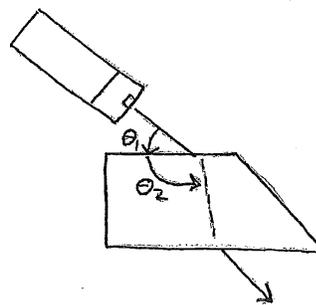
3 LiteBlox...



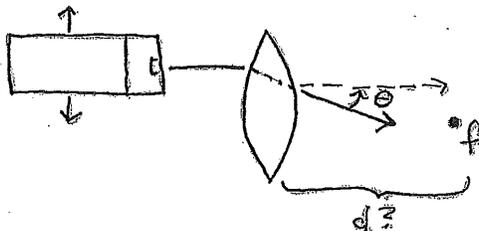
...or 3 frickin' lasers.

## What to do:

Use of the LiteBlox to shine light into the prism as shown. Record the angle  $\theta_1$  and  $\theta_2$ . Change  $\theta_1$  and see what effect this has on  $\theta_2$ . Repeat with each of the 3 LiteBlox.

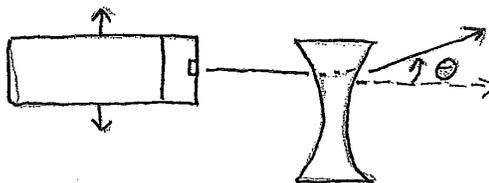


Shine light from one source straight at the convex lens. Measure  $\theta$  for a few vertical positions of the source.



The light coming out of the lens always crosses a point 'f'. How far is this from the lens?

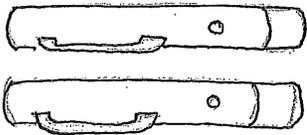
Repeat these steps for the concave lens. Where is the point 'f' where the rays converge?



# Measuring Diffraction

In this portion of the lab, you will observe a phenomenon called diffraction, which is a wave property of light. Your goal is to observe various diffraction phenomena.

## You will need:



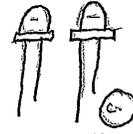
2 frickin' lasers.  
(red, green)



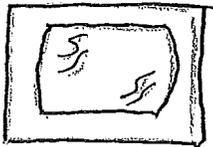
an index card



A safety pin



Some LEDs and a  
button battery.

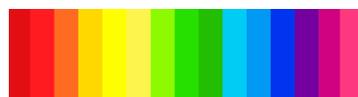
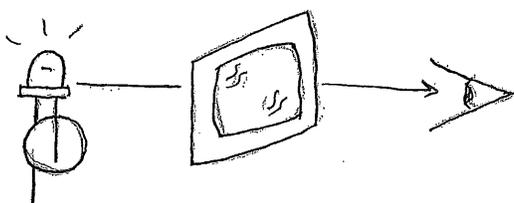
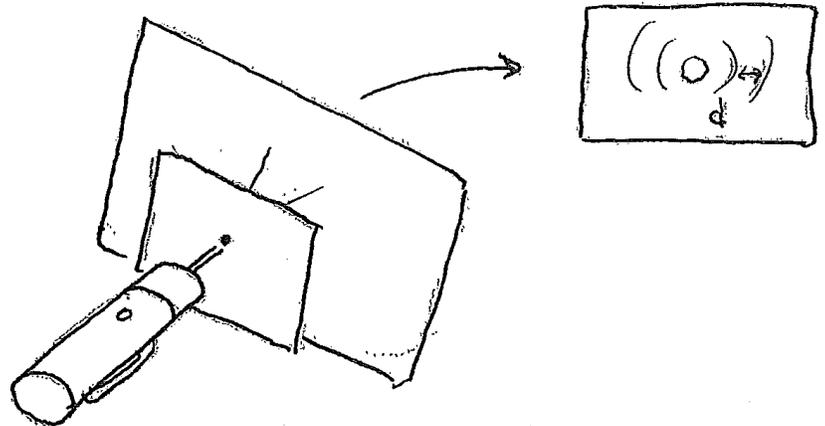


A diffraction  
grating.

## What to do:

Poke a small hole in the card with the safety pin. It needs to be VERY small. Shine one laser through it onto a surface that is about 10ft away.

You should observe some faint rings around the brightest spot of light. Measure the distance between these.



Make a 'firefly' by taping a button battery to the leads of an LED. Look through the diffraction grating at the LED and observe the spread of colors. Mark what bands of color you see on a ROYGBIV line.