

Washtenaw County Elementary Science Olympiad

Photon Phun Workshop 1

Introduction to light

Prof. Katsuyo Thornton

Prof. Liang Qi

Jason Luce

Dept. of Materials Science and Engineering

Univ. of Michigan

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What will we learn today...?

- * Introduction to light
- * How light travels
- * How light reflects
- * How to use protractor
- * Light relay



Why is light important?

Why is light important?

- * To see things
 - Stars used for navigation before technology
- * To provide energy
 - The Sun provides heat and light
 - Can be used to generate electricity (solar power)

More about light

- * Light can pass through some materials, but not others
 - Opaque materials: metal sheet, wood, etc.
 - Transparent: glass, water, some plastic, etc.
 - Translucent: waxed paper, frosted glass, etc.
- * Light travels very fast!
 - Takes only 8 min from the Earth to the Sun
 - A car traveling at 60mph: 177 years!

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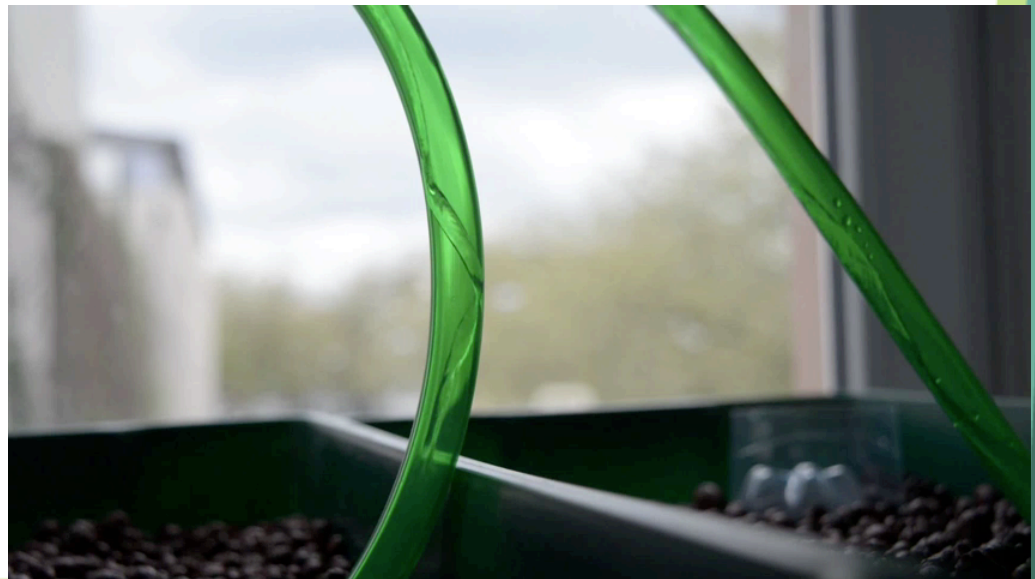
How does light travel?

- * Light travels in a straight line until it hits another material
 - At that point, it can reflect or refract (change direction) – discussed later

This is very different from matter (like water)!

- * Water molecules interact with walls and other water molecule, and does not need to flow in a straight line.

<https://www.youtube.com/watch?v=8gEmdm0fCgs>

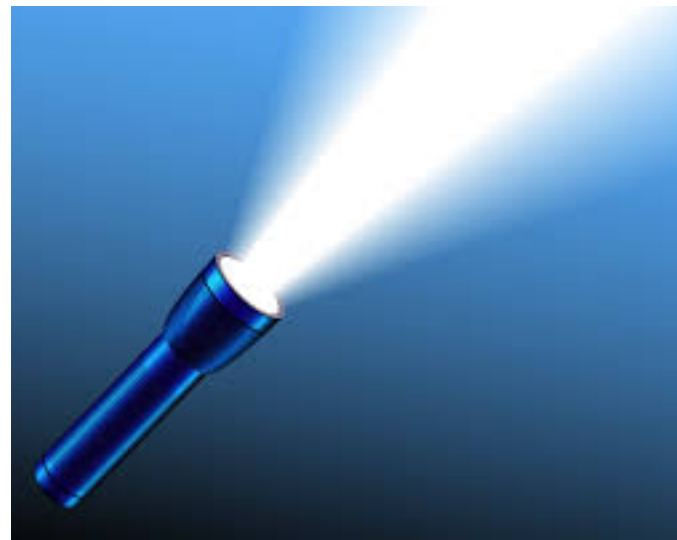
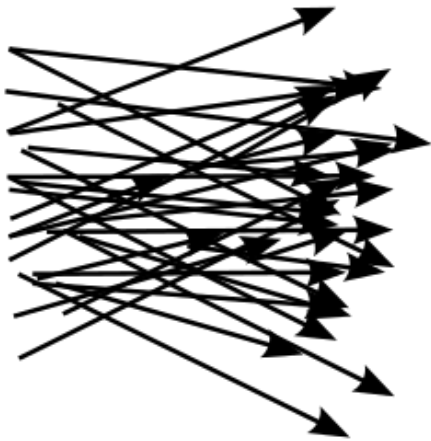


How does light travel?

- * Light travels in a straight line until it hits another material
 - At that point, it can reflect or refract (change direction) – discussed later
- * How do we know?
- * Design an experiment!

Most light is made up of light traveling in different directions

- * It might look like light is not traveling straight!



Left image source: https://en.wikipedia.org/wiki/Collimated_light
Right image source: shutterstock.com; used with license



How do we select only the ones going in one direction?

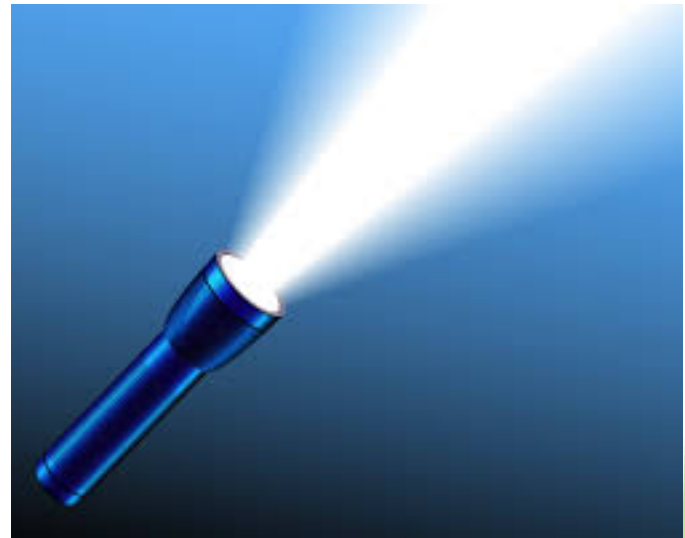
Activity 1: Does light travel in a straight line?

- * Take one of the tubes (one per team)
- * Insert the flashlight into the tube
- * Go to a wall or some object to use as a “screen”
- * How can you get the light to come out to the other side?
- * Hint: pulling the tube tautly can help!

Q. Why light and matter travel differently?



<https://www.youtube.com/watch?v=8gEmdm0fCgs>



Q. Why light and matter travel differently?

- * Matter interacts extensively with other matter
- * Light tend to interact less
 - With air, interaction is very small
- * In Photon Phun event, you will use mirrors to bend the path of the light!

Reflections

- * An image can bounce back off an object, such as, a mirror, pond or lake, or shiny metal.
- * Where does the light go when it reflects?

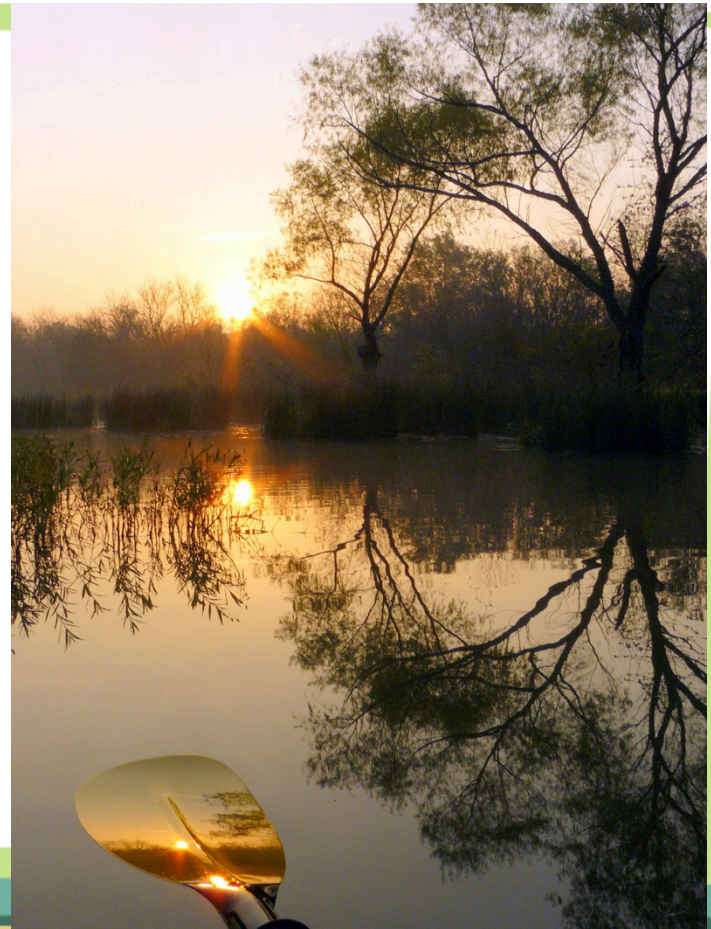


Image source: [https://en.wikipedia.org/wiki/Reflection_\(physics\)](https://en.wikipedia.org/wiki/Reflection_(physics))

Reflections

* **Reflection:** light or an image bounces back off an object's surface

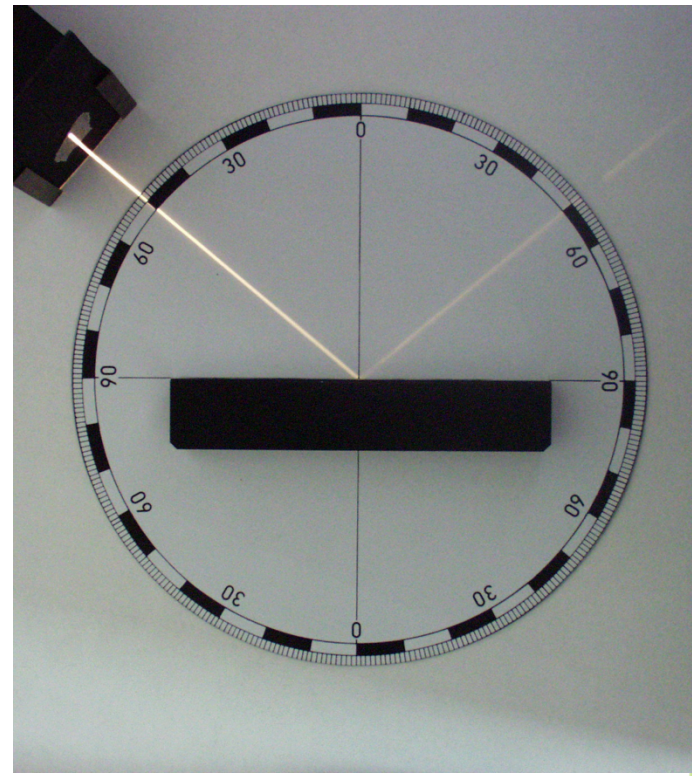
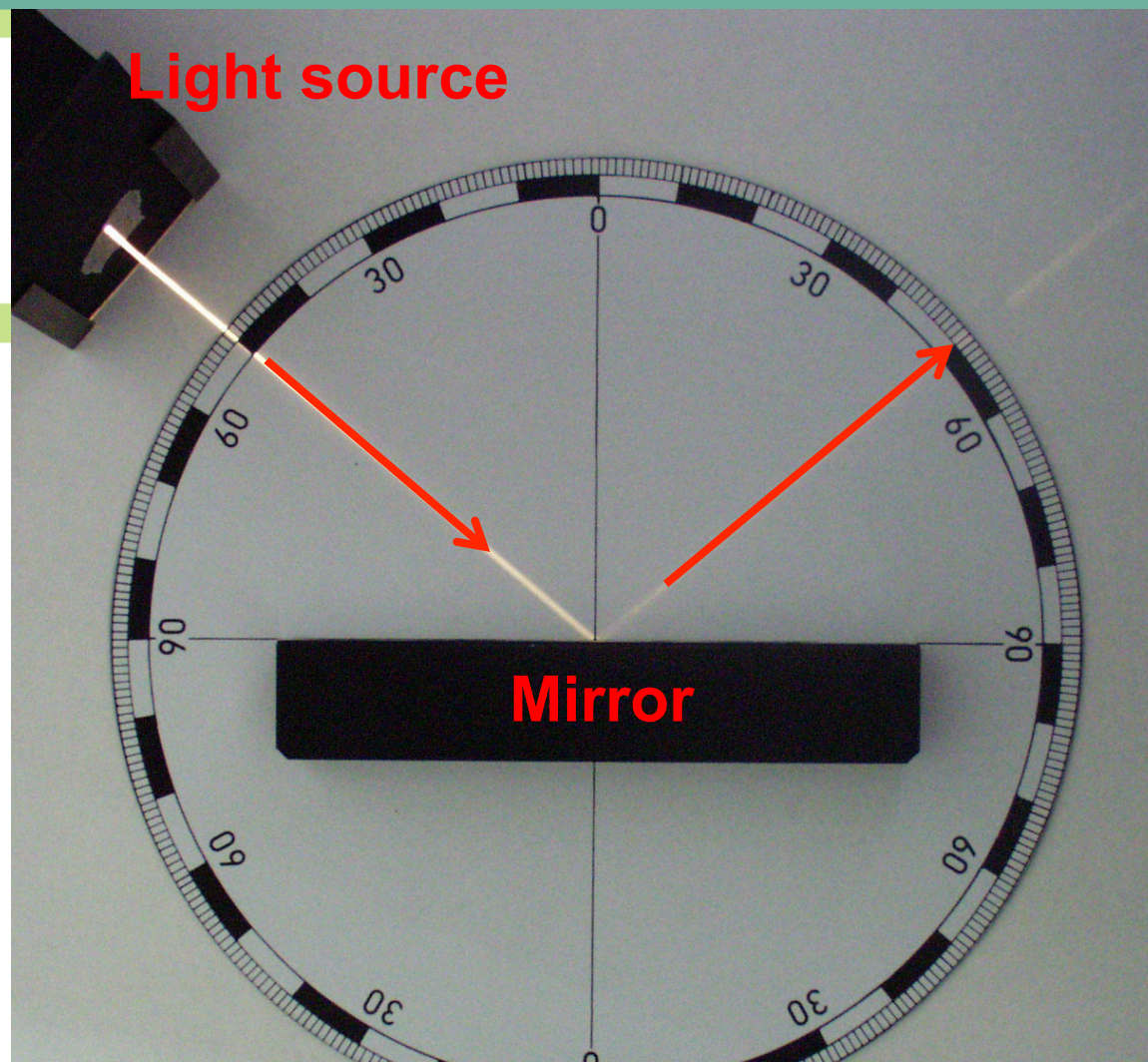
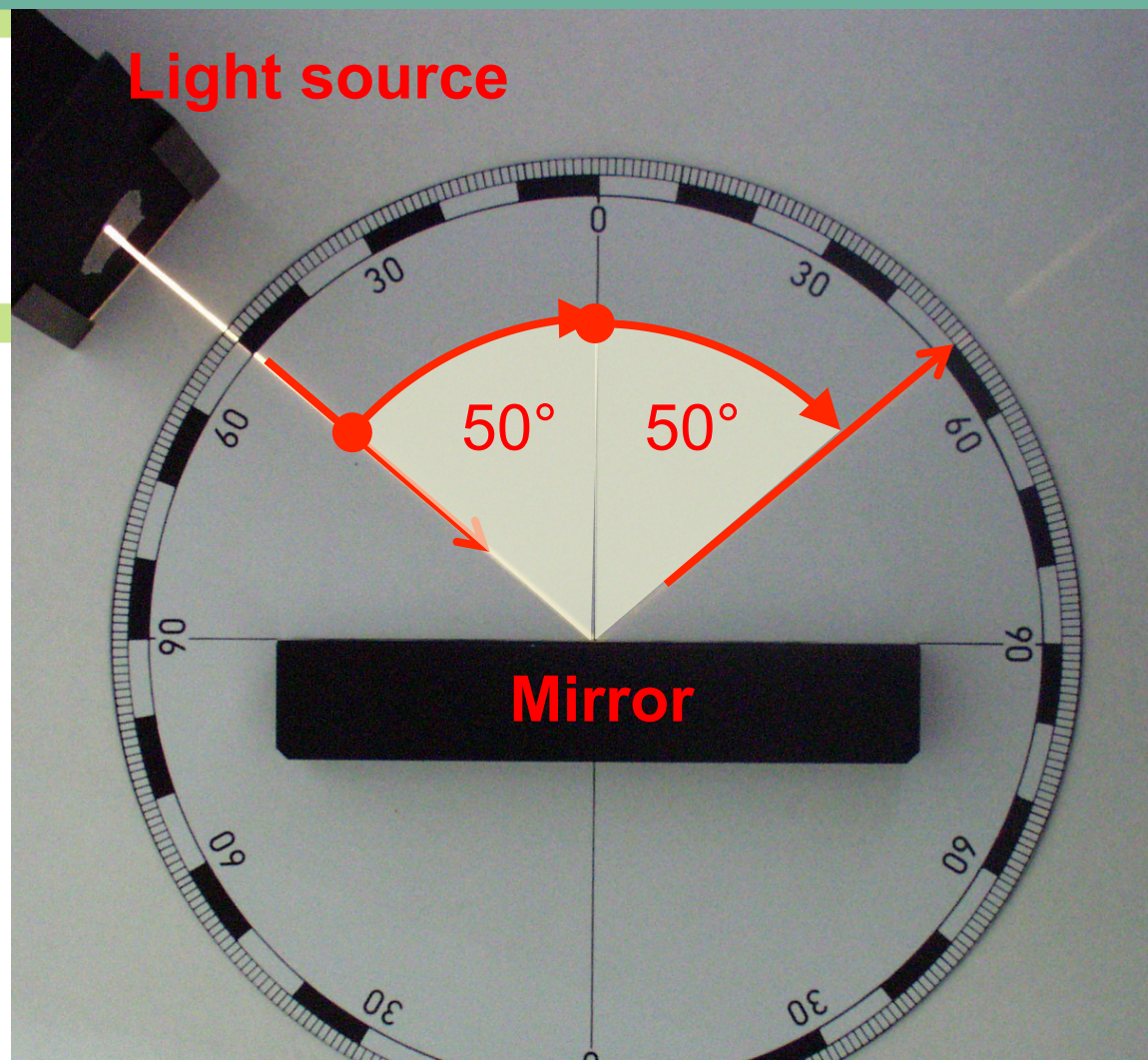


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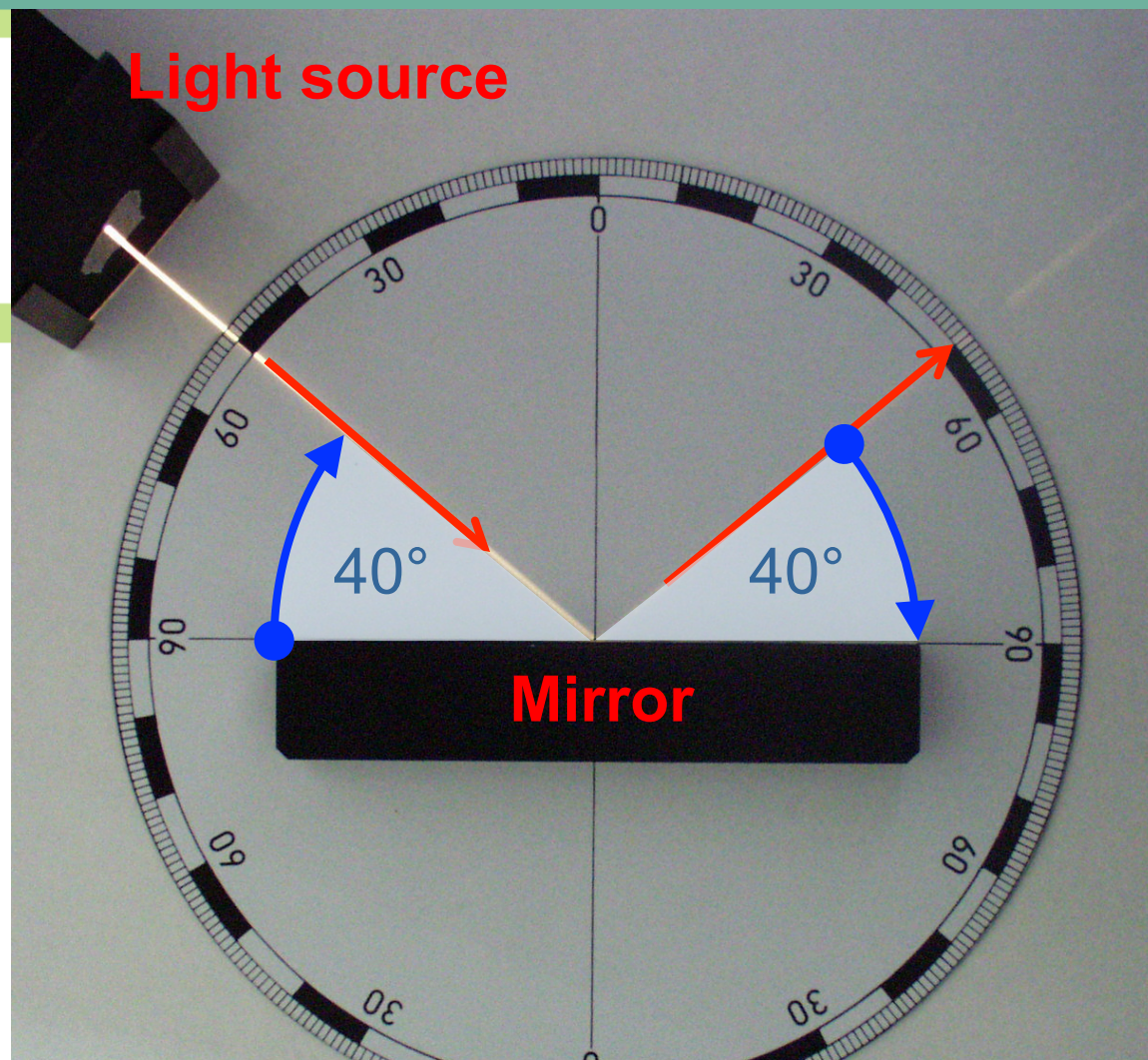
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Reading a protractor

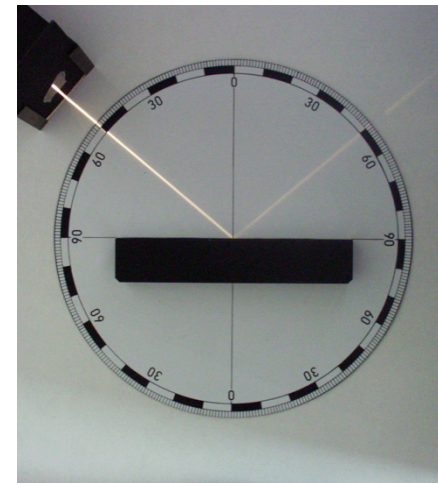
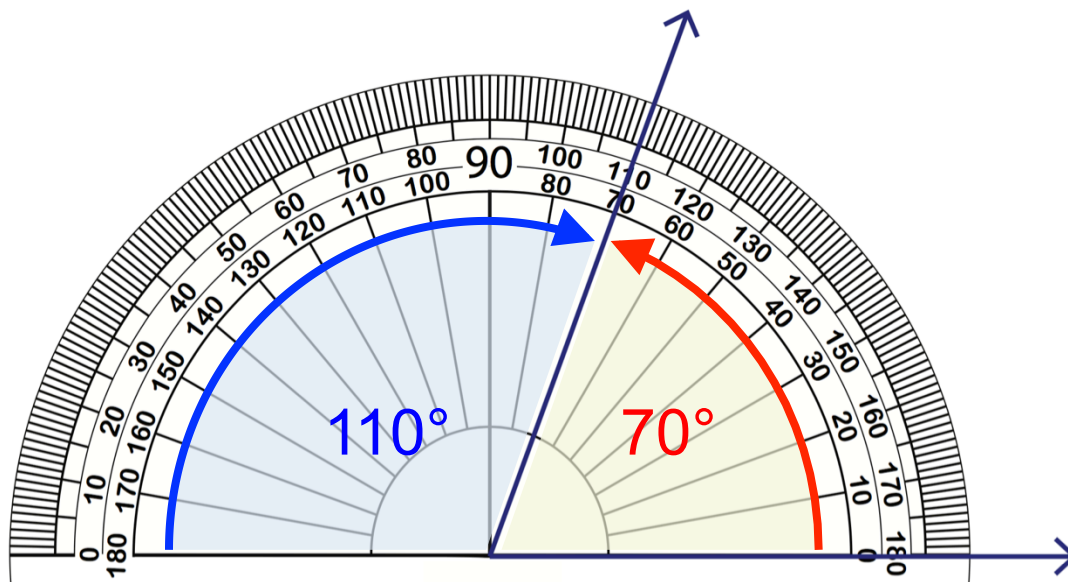
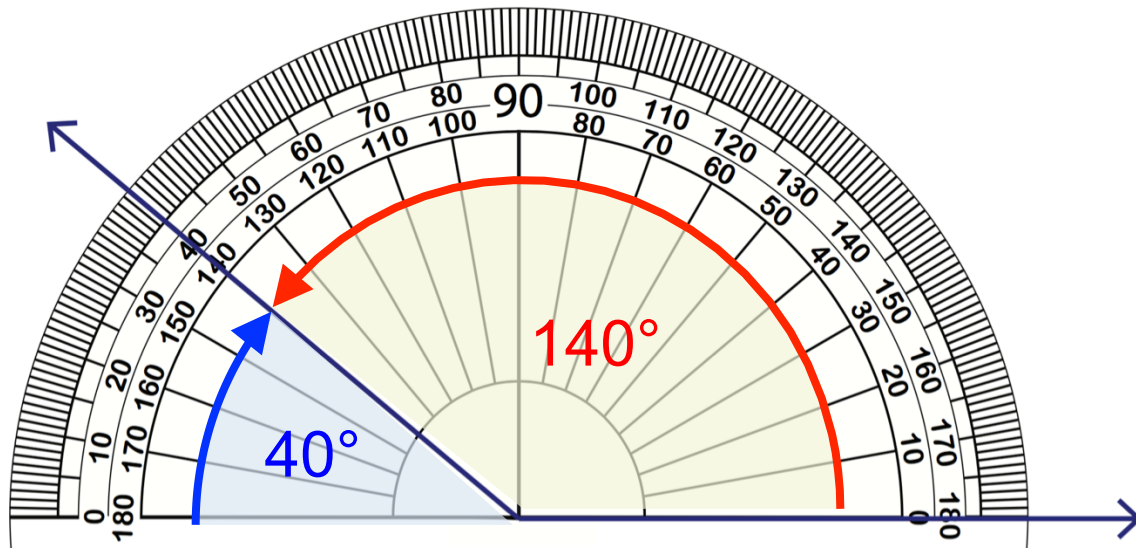
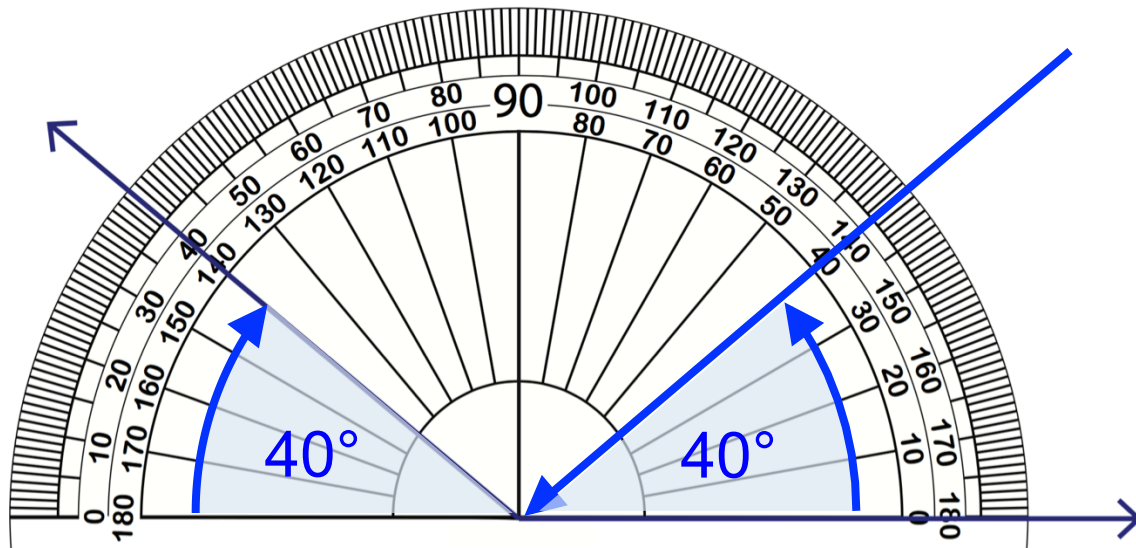


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Reading a protractor



Reading a protractor



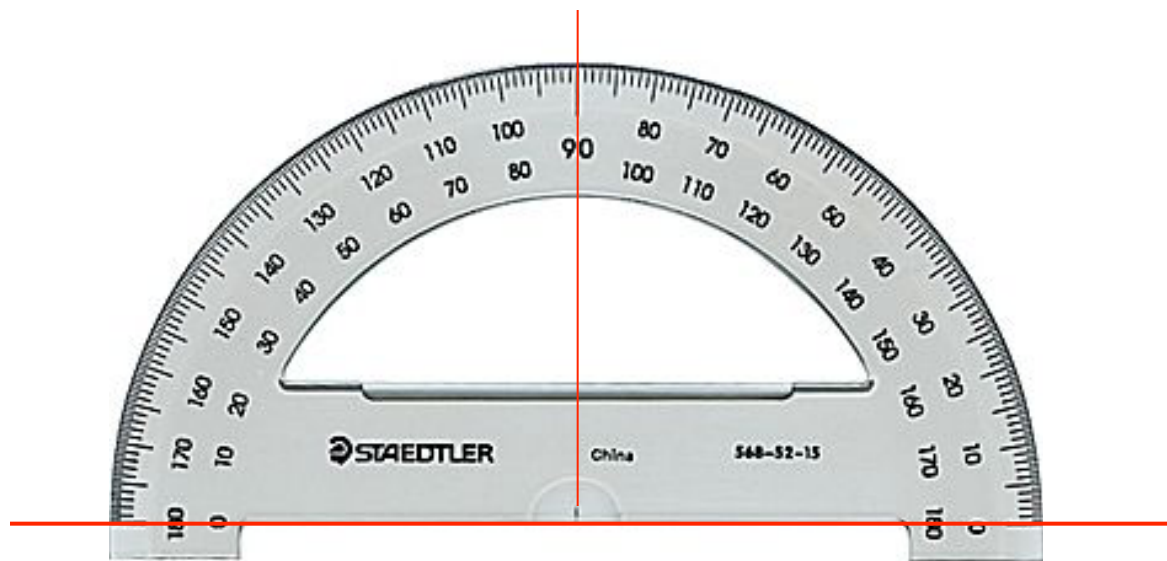
Activity 2: Protractor

- * Worksheet on how to use protractor (page 1 and 2)



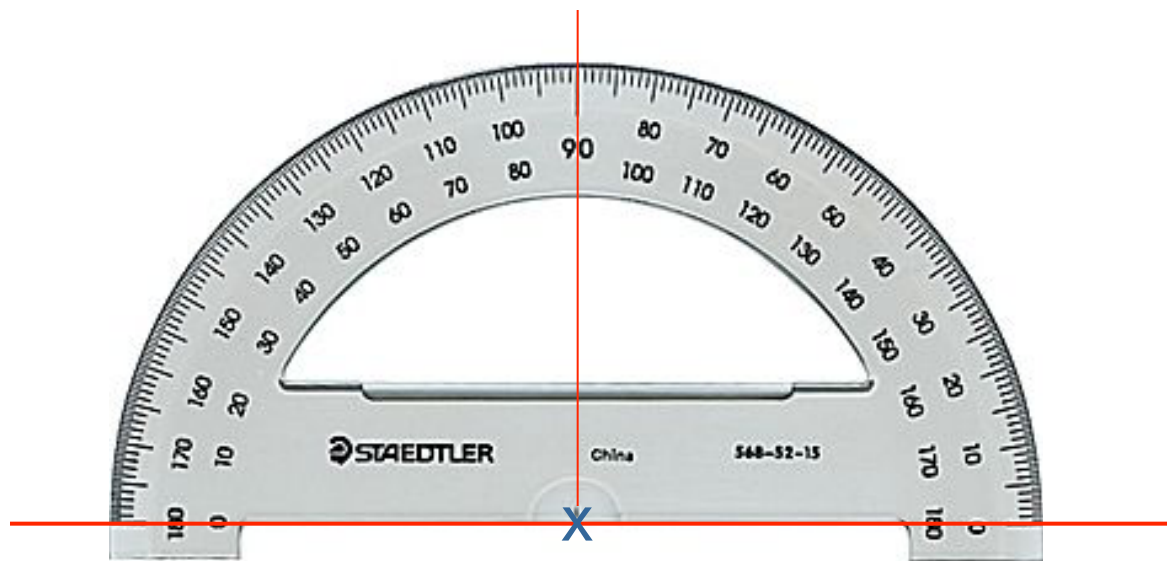
Line connects $0^\circ/180^\circ$ points
X is at the center of the line

Image source: http://www.staples.ca/en/Staedtler-Protractor-6-inch-180-degree-Tinted/product_13230_2-CA_1_20001



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Activity 3: Law of Reflection

- A member put a piece of paper with a straight line on the floor, and hold a mirror aligned on the line
- Place a flashlight on the floor such that it shines on the mirror at an angle
- Another member takes one string and pull it taut to the flashlight
- Another member takes the other string and pull it taut along the reflected light
- Use a ruler to draw the lines along the string
- Measure the angles of the incoming light and reflected light, measured from the surface



What results did you get?

Activity 4: Reflection

* See worksheets page 3-5

Take-away...

- * Light travels straight
- * The angle between the incoming light and surface is the same as angle between the reflected light and the surface
- * Use of protractor

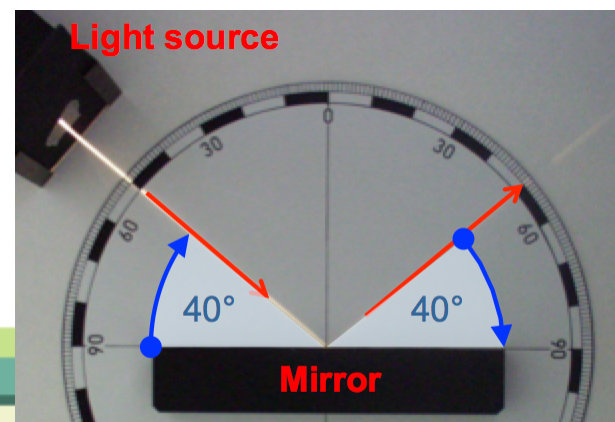
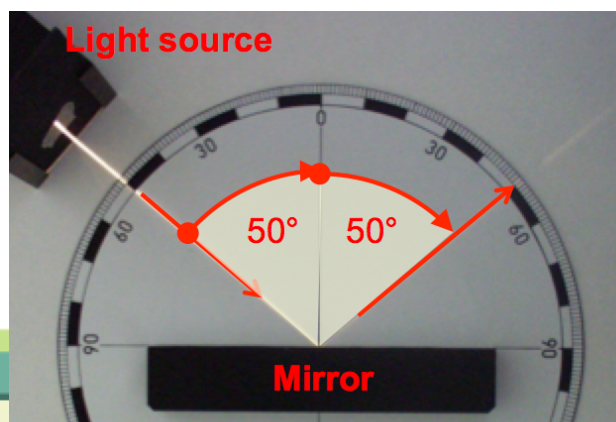


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Thanks!

Questions?

Light relay demo next



Supplementary Materials
for Coaches and Parents

Activity 1 Materials

- * A flashlight
- * Split flexible tubing such as Gardner Bender FLX-1007GRT sold at Home Depot/Lowes
- * See picture for the final product



Activity 3 Materials

- * Put a hole near the bottom of a mirror and thread a yarn or string a few feet long (see picture)

