Teacher Notes: **ΔΔΔ** Middle School

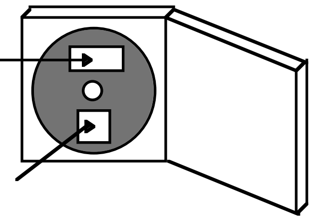
Introduction

Light has many interesting aspects. An example is **reflection**. Reflection occurs when light bounces off a surface. Think about what happens when you look in a mirror. Whether you realize it or not, you are reflecting light. This light travels to the mirror, then bounces back to your eyes. This is how you see your reflection.

A guideline to working with mirrors is the **Law of Reflection:** The angle light hits a mirror will be the same angle light leaves the mirror.

You can use this principle to make a triangle. In this experiment you are going to use a laser and several mirrors to bounce the light around until it forms a triangle. In most household mirrors, the reflective surface is placed behind the glass. These are called **back silvered mirrors**. Back silvered mirrors don't work as well for this lab. The glass that the light must pass through before can contain imperfections, which will skew the angles. If you do use these mirrors, you must correct for the thickness of the glass and measure all angles from the back of the mirror rather than the front.

To eliminate this adjustment, we recommend **front silvered** mirrors for this lab. As the name implies, the reflective surface is actually placed on the front of the mirrors. **Do NOT touch the mirror surface!** One way to protect the mirror is to secure them in a CD case. You may wish to add a warning label to the case. The mirrors can also be attached to blocks of wood so that they will stand vertically. Be careful when you store them. We do not recommend cleaning, but if you must, do so with a soft brush or cloth. Every wipe removes some of the reflective coating.



A suitable size for the triangle has sides of 25 cm. You can have students draw their own triangle or use the template provided. The results will be the same for any sized triangle, so you may wish different groups to use different sized triangles.

Materials

Laser pointer
Binder clip
White paper (8.5 x 11 inch with triangle drawn on it)
Protractor
Ruler (one foot)
3 front-silvered mirrors

Procedure

1 Draw a laser-shaped space along one of the sides of the triangle. It should point to one of the corners.

2. Ask your teacher how to correctly position the mirror vertically. Front-silvered mirrors are easily damaged. **Do not touch the front of the mirror**.

3. At each corner of the triangle, set up a mirror facing inward. Number them 1-3 with the first one facing the laser beam.

4. Turn the laser on. **Never look directly at the laser beam or allow it to shine in someone's eyes.** Use the binder clip to maintain the laser pointer in the ON position.

5. Place the laser and binder clip in the middle of its space pointing towards a mirror.

6. If you need help seeing the laser beam, ask your teacher for assistance. Some

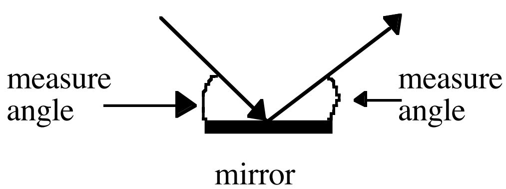
methods of making the laser beam show up include a water spray bottle, dry ice (to make this really work put a small chunk of dry ice into hot water), or a commercial fogger. Baby powder or chalk dust will work too, but be careful if you have students with asthma or other respiratory problems and they add dust to the mirrors.

7. Start adjusting the mirrors to reflect the laser light from one mirror to the next.

8. When all the mirrors are in place, draw a line showing where each mirror was. Be sure you draw the line accurately.

9. Remove the mirrors and the laser. Turn the laser off.

10. Using your protractor, measure the angle between your first mirror and the incoming laser light. Do the same for the outgoing laser light.



11. Using your protractor, measure the angle between each of the other mirrors and the incoming laser light. Do the same for the outgoing laser light. See previous picture.

Questions

1. What were the measurements of the angles for your first mirror?

The angles measured 60° and 60°.

2. What were the measurements of the angles for your second mirror?

The angles measured 60° and 60°.

3. What were the measurements of the angles for your third mirror?

The angles measured 60° and 60°.

4. What pattern did you notice about all of the angles you measured?

All of the angles were the same.

Conclusion

Does the incoming angle equal the outgoing angle? Use evidence from your lab to backup your claim.

Yes, the incoming angle equals the outgoing angle. All of the angles measured were 60°.