Squared

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 square. In this experiment you are going to use a laser and several mirrors to bounce the light around until it forms a square.

Materials

laser pointer
binder clip
white paper (8.5 x 11 inch)
protractor
ruler (one foot)
4 front-silvered mirrors

Procedure

1. Draw a square on the paper. Use a protractor to be sure the angles are all the same. Use a ruler to be sure all the sides are the same length.

2. Draw a laser-shaped space in the center of the square. It should point to one of the corners.

3. At each corner, draw where you think the mirror should go so that the laser light will complete the square. Keep in mind the following:
    - your laser is going to be in the center of the square, so the first angle will be a little tricky
    - use a protractor to measure the angle between the laser and mirror exactly
    - remember, the incoming angle is the same as the outgoing angle.

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

5. Line up the mirror exactly on the line you drew for it.

6. 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.

7. Place the laser and binder clip in the middle of the square.

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

9. If your angles were measured properly, you should be able to see the laser bounce off each mirror and end up back at the first mirror. If they are not, then move one to three mirrors until the square is complete. Mark the new mirror placement positions and measure any new angles. Turn the laser off.

Questions

1. How long is one side of your square?
2. What are the angles in your square?
3. What is the angle between the laser and the first mirror?
4. What were the final measurements of the angles for mirrors 2, 3, and 4??
5. What pattern did you notice about all of the angles you measured?

Conclusion

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