Echoes of Light

Introduction

There are several different things that light can do. One of these behaviors is **reflection**. Reflection is when light bounces off a surface. A common case of reflection is when you look in a mirror. Whether you realize it or not, you are giving off light waves. These light waves travel to the mirror, then bounce back to your eyes. This is how you see your reflection.

Telescopes use mirrors to gather light. Mirrors are also used in telescopes to direct the light to the places and equipment that astronomers need it to go.

In this activity, you are going to discover something about light…the **Law of Reflection.**

Materials

laser pointer
mirror
protractor
binder clip
white paper

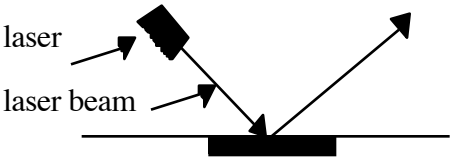
Procedure

1. Draw a straight line on your paper.

2. Place the mirror so the front of the mirror is along the straight line.

3. Use a binder clip to maintain the laser pointer in the "ON" position.

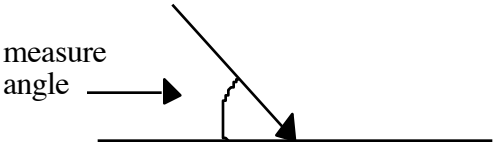
4. Draw an arbitrary slanted line that touches the mirror. Draw a dotted line that indicates where you think a reflected light beam would go. Now, test your prediction by placing the laser pointer so that it lines up with your initial line and reflects off the mirror.



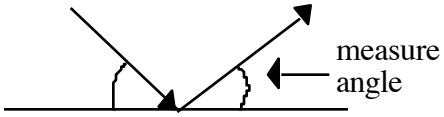
5. Using a pencil, trace the path onto the paper that the reflected laser beam follows. If you need help seeing the laser beam, talk to your teacher.

6. Remove the mirror and laser.

7. Using the protractor, measure the angle that the laser beam hits the line at. This is called the **incident angle**. Record this in a data table.



8. Using the protractor, measure the angle that the laser beam leaves the line at. This is called the **reflected angle.** Record this in a data table.



9. Repeat this procedure three more times.

Questions

1. Compare the incident angle and the reflected angle for each attempt.

2. From what part of the mirror does the laser beam reflect? The front of the mirror or the back of the mirror?

3. Household mirrors are called back-silvered mirrors, because the reflective coating is behind the glass. How do you think your results might change if you used a mirror where the reflective coating was on the front of the glass?

4. Mirrors with the reflective coating on the front of the glass are called front-silvered mirrors. What kind of mirrors do you think astronomers would use in a telescope: front-silvered or back-silvered?

Conclusion

Based on your measurements of the angles, write the Law of Reflection.

Teacher Notes: Echoes of Light

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Materials

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protractor
binder clip
white paper

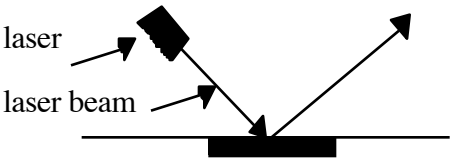
Procedure

1. Draw a straight line on your paper.

2. Place the mirror so the front of the mirror is along the straight line.

3. Use a binder clip to maintain the laser pointer in the "ON" position. **Warn the students to be careful with the lasers! They should not point the laser in each other's eyes!**

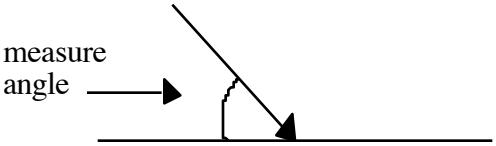
4. Draw an arbitrary slanted line that touches the mirror. Draw a dotted line that indicates where you think a reflected light beam would go. Now, test your prediction by placing the laser pointer so that it lines up with your initial line and reflects off the mirror.



5. Using a pencil, trace the path onto the paper that the reflected laser beam follows. *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.*

6. Remove the mirror and laser.

7. Using the protractor, measure the angle that the laser beam hits the line at. This is called the **incident angle**. Record this in a data table.



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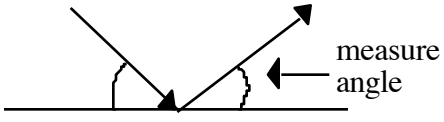

9. Repeat this procedure three more times.

Questions

1. Compare the incident angle and the reflected angle for each attempt.

The angles should be the same for each example.

2. From what part of the mirror does the laser beam reflect? The front of the mirror or the back of the mirror?

The reflecive coating for the mirror is on the back surface. The laser reflects off that coating. Sometimes, a small amount of light may also reflect from the shiny glass in the front and a dimmer reflection is also seen.

3. Household mirrors are called back-silvered mirrors, because the reflective coating is behind the glass. How do you think your results might change if you used a mirror where the reflective coating was on the front of the glass?

The results would be more accurate. With back-silvered mirrors, the laser has to pass through the glass of the mirror before it reflects. If there are imperfections in the glass, this can cause the beam to scatter.

4. Mirrors with the reflective coating on the front of the glass are called front-silvered mirrors. What kind of mirrors do you think astronomers would use in a telescope: front-silvered or back-silvered? Why?

Telescopes use front-silvered mirrors because they reflect light more accurately.

Conclusion

Based on your measurements of the angles, write down the Law of Reflection.

The Law of Reflection is the incident angle equals the reflected angle.