Physics 221

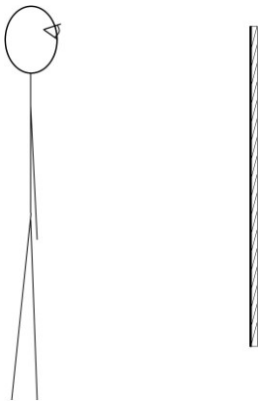
Reflection and Plane Mirrors

Part I: How Tall?

Predictions

1. A plane mirror is affixed to the wall. What is the minimum length that the mirror can be for you to see your entire body from head to toe (just as tall, $\frac{3}{4}$ as tall, $\frac{1}{2}$ as tall etc…)? Is it possible to answer? Maybe it depends. If so, on what?

2. Can Slim see his entire body from head to toe in the mirror to the right? If so, where does the top of the mirror need to be mounted to allow him to see his entire body? Explain.



Experiment

Materials: Plane mirror mounted to the wall, meter stick, dry erase marker, tallest and shortest members of your group.

Devise an experiment that will determine the exact portions of the mirror that are needed to see the tallest and then the shortest of your group members. Describe this procedure and report your results.

Does the object's distance from the mirror matter?

Model

Use the ray model of light to create a diagram similar to what you did in your workbooks showing the location of the objects image in the mirror and how much of the mirror is needed to create this image. (Use a ruler and protractor so that the diagram is to scale)

Part II: Line of Sight

Prediction

If a small mirror is sitting flat in the middle of a table, where do two people have to stand so that person A can see the person B's eyes in the mirror?

If person A stands so that they can see person B's eyes in the mirror, does that mean that B can also see A's eyes in the mirror?

Experiment

Materials: very small mirror (no more than 2" square), meter stick, minimum of 3 people and a table.

1. A. Place a mirror in the middle of your table. One person in your group will be the "object" and the other the "observer". The object should find a position that they can comfortably maintain without moving their head. Now the observer moves until they find a location from which they can see the object's eyes in the mirror.

   B. While the object and observer remain in the positions described in 1A. above, a 3rd person will create a scale diagram of the two people's eye positions relative to the mirror. Use an entire sheet of paper so that your diagram uses the majority of the paper. Include both the horizontal and vertical distance from each person's eyes to the mirror.

2. A. The object remains in the **same position** they were in for part 1 (measure again if necessary to position the object's eyes the same as in part 1). Now the observer finds a different, 2nd, position that allows the observer to see the object's eyes in the mirror.

   B. Clearly mark this 2nd position for the observer in your drawing from part 1. Include both the horizontal and vertical distance from the observer's eyes to the mirror.

3. Now the observer will try to find a location where they can see the object's eyes in the mirror but the object cannot see the observer's eyes in the mirror? Describe your findings.

4. A. The object remains in a comfortable position; however, this time with their arms crossed in front of them. Now the observer should find a position where they can see the object's hand in the mirror.

   B. A 3rd person will create a NEW (2nd) scale diagram with the observer's eyes, the object's hand and the mirror.

   C. Describe what the object sees in the mirror while the observer sees the object's hand.

Analysis

1. Explain why it is that when the observer can see the object's eyes in the mirror, the object can also see the observer's eyes in the mirror without exception.
2. Consider the case when the observer can see the object's hand in the mirror. Why is it *not* the case that the object can also see the observer's hand in the mirror?
3. Many people claim mirrors switch left to right? Does the light switch from left to right? Why do you think this claim exists?