

## 16.2.1: Reflection

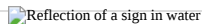
 Reflection of a sign in water

Figure 14.1.1

The designers of this sign used the fact that light can reflect off of many surfaces, including water, to make the sign legible. It takes a bit of thought, but words can be written in such a way that their reflection is legible, even though the words themselves are not.

### Reflection of Light

 Wave reflecting off a barrier

Figure 14.1.2

### The Law of Reflection

When a light ray strikes a reflecting surface, the angle of incidence (measured from the normal line) is equal to the angle of reflection (also measured from the normal line). This is called the **Law of Reflection**.

If the reflecting surface is a very smooth surface, the reflection will be a **regular reflection**, in which the light rays maintain their position relative to each other and objects will be visible and identifiable in the reflected image. If the reflecting surface is rough, the reflection will be a **diffuse reflection**, and objects will not be visible or identifiable in the reflection. When you are considering the size of things on the scale of wavelengths of light, even surfaces that appear smooth may be very rough in terms of light waves, and most surfaces produce diffuse reflection.

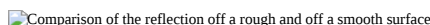
 Comparison of the reflection off a rough and off a smooth surface

Figure 14.1.3



### Left and Right Reversal in a Plane Mirror

The images that appear in a plane (flat) mirror are reversed in some ways and not reversed in other ways. In the image below, the man's right hand is labeled. The same hand in the mirror image, however, looks like a left hand. While the left and right of the image are reversed, the top and bottom of the image are not.

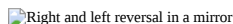
 Right and left reversal in a mirror

Figure 14.1.4

In the simulation below, the young man is getting ready for the prom. He needs to stand at a particular distance and have the mirror be a particular length to be able to view his entire body. Rays of light are emerging from various light sources in the room and bouncing off him into the mirror. Play around with rays from different locations, try different mirror lengths, and see what you can discover about the reflection of light in a mirror.

### Summary

- The law of reflection states that, when a light ray strikes a reflecting surface, the angle of incidence (measured from the normal line) is equal to the angle of reflection (also measured from the normal line).
- If the reflecting surface is a very smooth surface, the reflection will be regular, in which the light rays maintain their position relative to each other.
- If the reflecting surface is rough, the reflection will be diffuse and objects will be distorted in the reflection.

- Images in a plane mirror are reversed left and right but not reversed top and bottom.

## Review

1. How does regular reflection differ from diffuse reflection?
2. If a light ray strikes a mirrored surface at an angle of  $25^\circ$  to the surface, what is the angle of incidence?
3. For problem #2, what will be the angle of reflection?
4. A dry cement road is a diffuse reflector. When it rains, the water fills in all the little holes and cracks in the cement road and it becomes a smooth regular reflector. At night, when you are depending on the light from your headlights to show you the lines on the road, a wet road becomes much darker and it is more difficult to see the lines. Explain why this occurs.

## Explore More

Use this resource to answer the questions that follow.



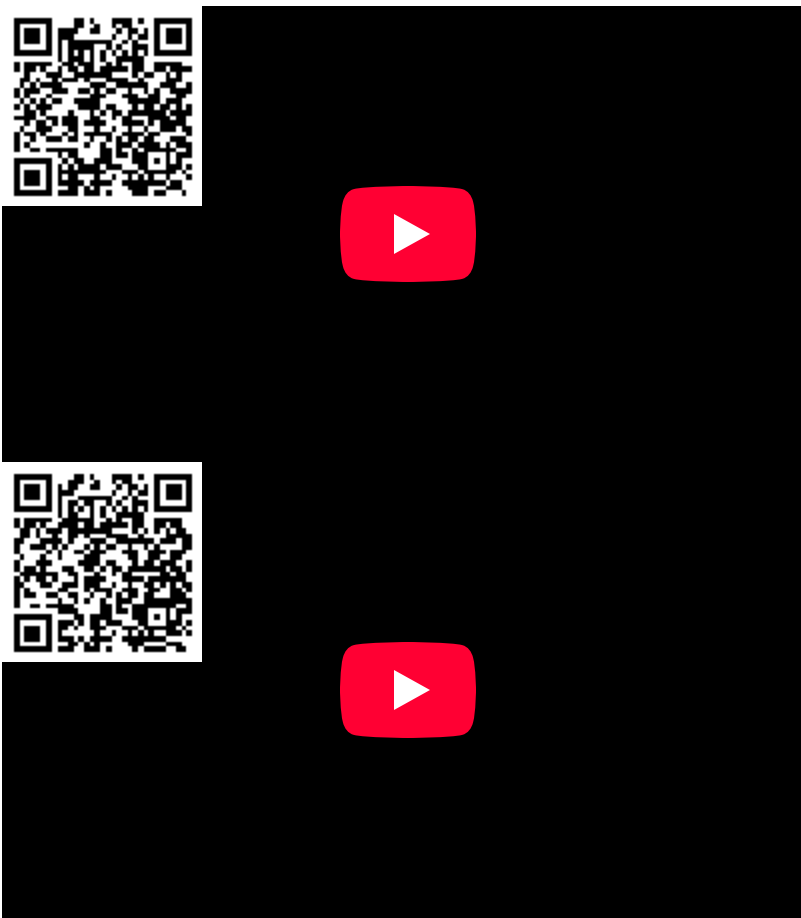
1. Both the angle of incidence and the angle of reflection are measured from the \_\_\_\_\_.
2. In reflection, the angle of incidence \_\_\_\_\_ the angle of reflection.

## Additional Resources

Study Guide: Geometric Optics Study Guide

Videos: Geometric Optics 1: Reflection - Overview





Real World Application: Oil and Water

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