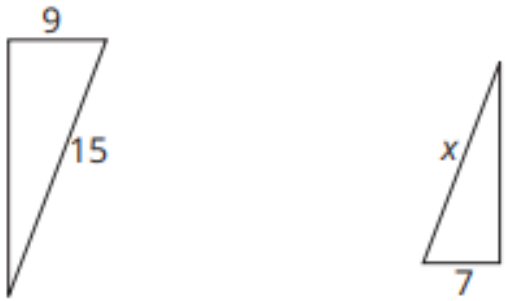
Warm Up

Solve for the unknown in each pair of similar triangles.

1.

2.



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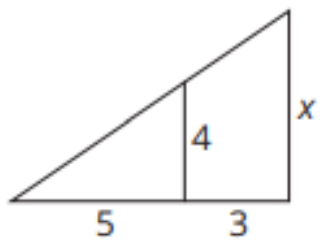


Learning Goals

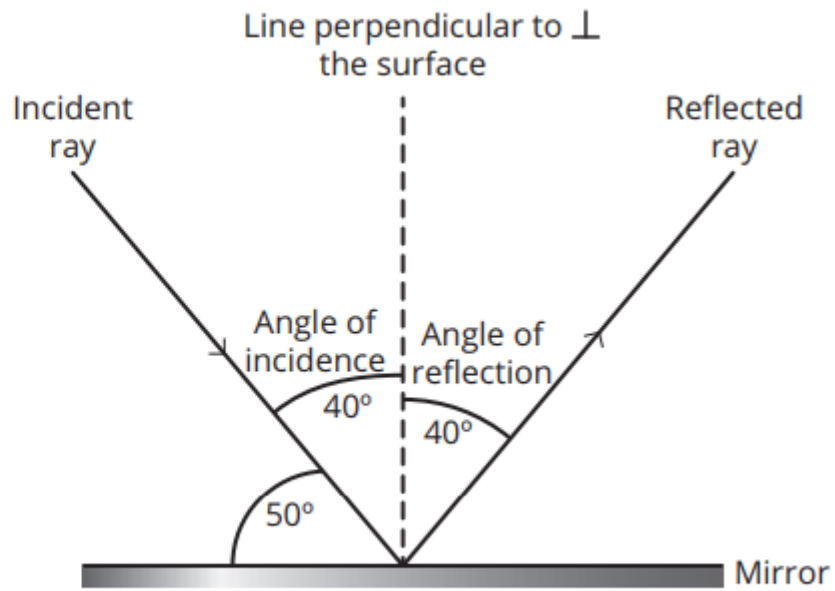
- Identify similar triangles to calculate indirect measurements.
- Use similarity to solve for unknown measurements.

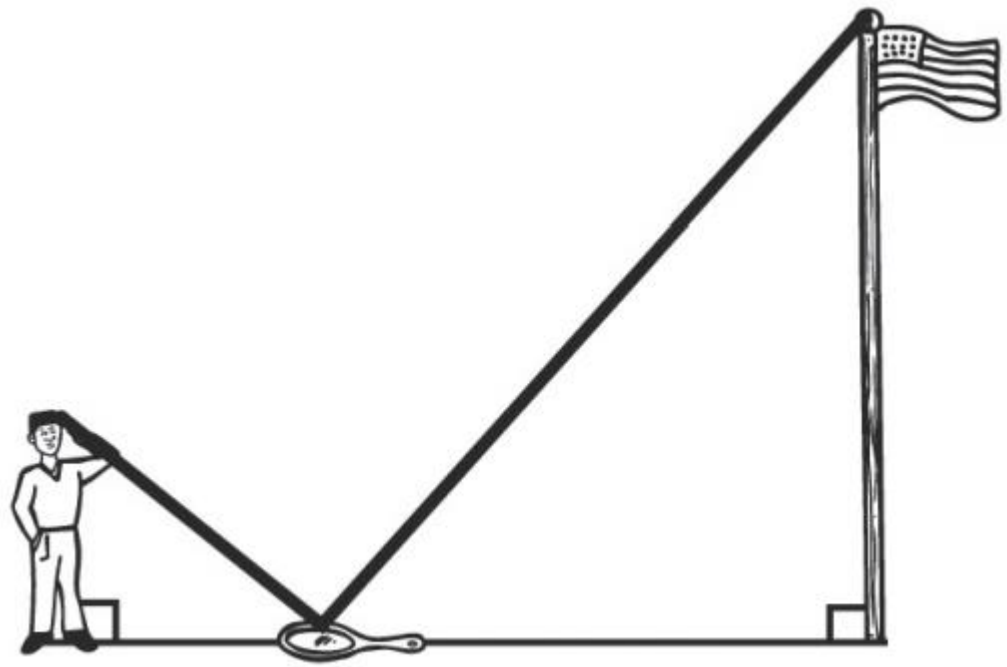
Key Terms

- indirect measurement
- angle of incidence
- angle of reflection
- Law of Reflection

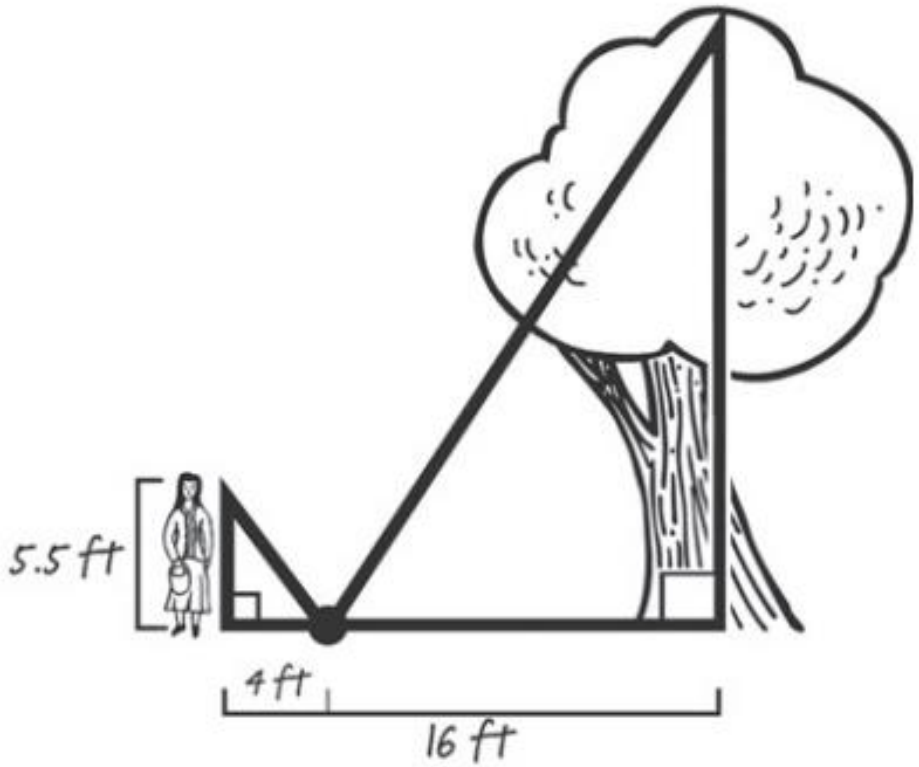
At times, measuring something directly is impossible, or physically undesirable. When these situations arise, **indirect measurement**, the technique that uses proportions to calculate measurement, can be implemented. In this activity, you will use a mirror and your knowledge of similar triangles to measure objects indirectly.

Before you get started, you need to know a law of physics that describes the predictable manner in which light travels. An incident ray is a beam of light that reaches and reflects off a mirror, and a reflected ray is the beam of light that bounces off the mirror. Each ray forms an angle with a line perpendicular to the surface. These angles are called the **angle of incidence** and the **angle of reflection**. The **Law of Reflection** states that the measure of the angle of incidence equals the measure of the angle of reflection.



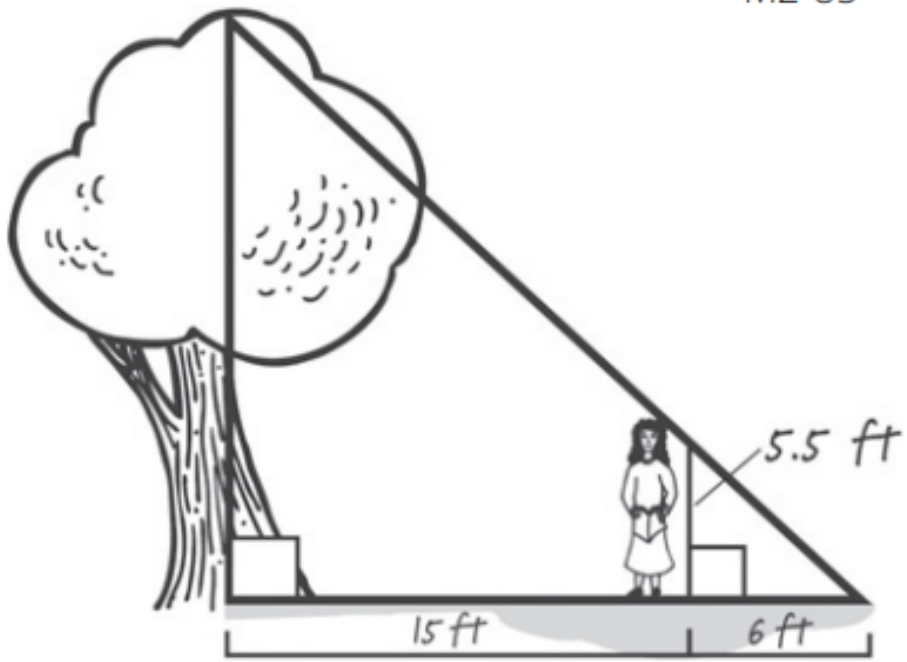


1. **Maureen goes the park and uses the mirror method to gather enough information to calculate the height of one of the trees. The figure shows her measurements. Calculate the height of the tree.**



2. **Stacey wants to try the mirror method to measure the height of one of her trees. She calculates that the distance between her and the mirror is 3 feet and the distance between the mirror and the tree is 18 feet. Stacey's eye height is 60 inches. Draw a diagram of this situation. Then, calculate the height of this tree.**

3. **Stacey notices that another tree casts a shadow and suggests using shadows to calculate the height of the tree. She lines herself up with the tree's shadow so that the tip of her shadow and the tip of the tree's shadow meet. She then measures the distance from herself to the tip of the shadows, and then measures the distance from herself to the tree. A diagram of this situation is shown. Calculate the height of the tree. Explain your reasoning.**



4. **Emma spikes a volleyball so that it bounces off the ground 4 feet away from her. Her hand was 5 feet off the ground when she hit the ball, and the net is 6 feet beyond the position where the ball hit the ground. The ball bounced over the net, just grazing the top of it. How high is the top of the net?**