Delta, Delta, Delta

Materials:

Laser pointer, 1/2-inch binder clip, 8.5 x 11-inch graph paper, protractor, ruler, and three front silvered mirrors.
Optional: three CD jewel boxes to hold the mirrors in a vertical position

Activity

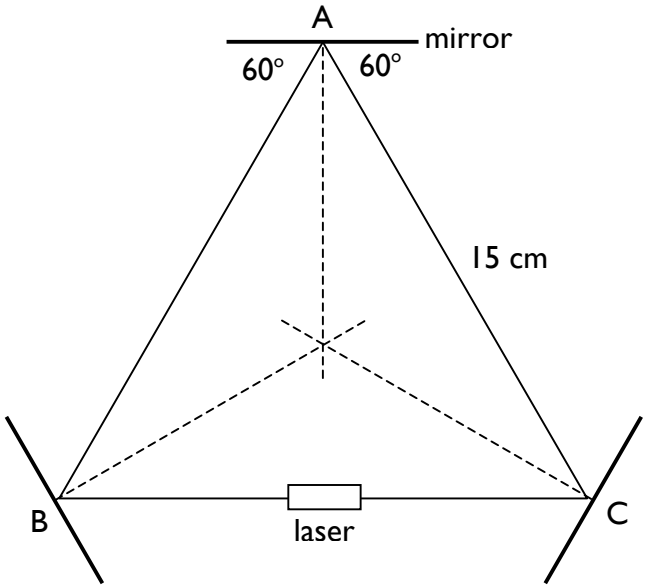
Engage

Ask students to describe what the law of reflection means.

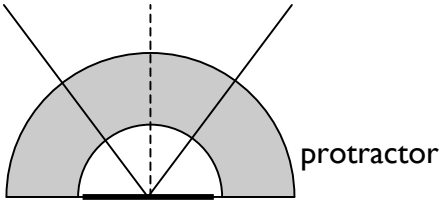
Explore

1. Construct an equilateral triangle, with sides at least 15 centimeters long. Check that the sides are equal in length, and that the angles are all the same (each should be 60 degrees). Label each vertex (A, B, C).

2. Draw a rectangle to represent the laser's placement along one of the sides of the triangle. The laser should point (as if firing the beam) toward a vertex.



3. At each vertex, draw a line that represents where you think the mirror should stand so that the laser beam will complete the equilateral triangle. This is called the "mirror line." Use your protractor to mark and measure angles for the mirror lines.



4. Place the mirrors along the mirror lines, so that they stand vertically on each line.

5. With the binder clip holding the laser horizontally and in the "on" position, place the laser on the triangle in the rectangle you drew in step 2.

6. The "laser triangle" is complete when the beam strikes the backside of the laser pointer. Ask your teacher for help seeing the laser beam.

7. Adjust the mirror angles and/or the laser pointer until the laser completes the equilateral triangle. Mark the final positions of the mirrors on the graph paper.

Explain

1. What are the lengths of the equilateral triangle sides?

2. What are the angles between each side?

Mirrors

3. What is the angle between the mirrors and the sides of the triangle at Vertex A? Vertex B? Vertex C?

Elaborate: Make a Retro-Reflector

1. Read the StarDate script "Receding Moon". Then explore the McDonald Laser Ranging Station web site (http://www.csr.utexas.edu/mlrs/).

2. After reading the "Receding Moon" script, predict the path of each incident ray (ray A, B, and C). What do the reflected rays have in common?

3. Make a corner-cube retro-reflector with your three front-silvered mirrors and test it using your laser pointer or a flashlight.

Flat Retro-reflector: Draw the reflection ray

The dotted line represents the incident ray's path before striking the retro-reflector. The solid black lines represent mirrors at 90 degree angles (perpendicular).