Warm Up

The large, boldfaced equilateral triangle represents the 3-mirror system of a kaleidoscope. The shaded triangle represents the object inside your kaleidoscope. Reflect the shaded triangle in all the mirrors, then reflect all the reflections to generate an overall pattern.
Roadside Symmetry.

1. Road signs give us different kind of information. Many road signs exemplify some symmetry.

(a) Determine which signs below have symmetry. For the signs with symmetry, draw their axis or axes of symmetry. For the signs without symmetry, circle the parts of the sign that are not symmetrical. You can use your Reflect-It mirror to help you find the axes of symmetry.
(b) The sign below indicates the way to a hospital. You can use your Reflect-It mirror to generate the whole picture using only part of the image because of symmetry. Use the Reflect-It mirror to find different ways to generate the whole hospital sign. Can multiple angles generate the complete sign? Find the smallest angle that generates the complete sign? Draw onto your hospital sign where you placed your Reflect-It mirror.

180° and 90° can both make the image, 90° is the smallest.

(c) It is possible to use parts of one image to create another using your Reflect-It mirror. Using your Reflect-It mirror, can you use the image of the hospital sign to create the red-cross sign below? If so, draw onto your hospital sign where you placed your Reflect-It mirror to do so.
Toothpick Polygons.

2. All the angles of regular polygons are equal in measure and all the sides are equal in length.

(a) Position your Reflect-It mirror to form a 60° angle. Place the toothpick between the faces of the mirror until you generate an equilateral triangle. Describe your results and draw a sketch of how you placed the toothpick.

(b) Reposition your Reflect-It mirror to form a 45° angle. Place the toothpick between the faces of the mirror until you generate a square. Describe your results and draw a sketch of how you placed the toothpick.

(c) What mirror setting should you use to form a hexagon? Describe your results and draw a sketch of how you placed the toothpick?

30°, we would normally get a dodecagon (12-sided polygon), but forming a 30°-60°-90° triangle with the toothpick and mirrors gives a hexagon.