

# RAFT IDEAS

## Topics:

Light, Reflections, Angles

## Materials List

- ✓ Two rectangular pieces of cardboard, cut to the same size
- ✓ Two pieces of mylar, cut the same size as the cardboard
- ✓ Double stick tape
- ✓ Masking or cellophane tape
- ✓ Optional: Page of simple and complex shapes and images to explore - both symmetrical (e.g., circle, square, star) and asymmetrical
- ✓ Optional: Protractor

This activity can be used to teach:

Common Core Math:

- Angles (Grade 4, Measurement and Data.5-7, Grade 4, Geometry, 1)
- Symmetry (Grade 4, Geometry, 3)
- Problem Solving and Reasoning (Math Practices Grades 3-8)

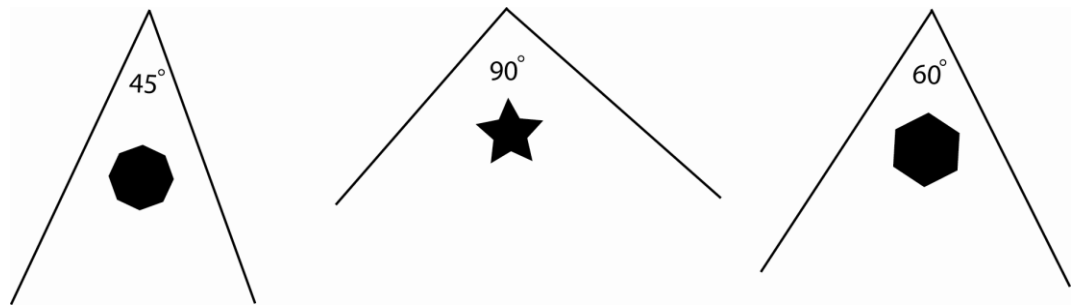
Next Generation Science Standards:

- Reflection (Grade 4, Physical Science 4-2)
- Waves are reflected, absorbed, or transmitted (Physical Science 4-2)



# Hinged-Mirror Kaleidoscope

A different angle on the geometry of reflections



This easy-to-create hinged mirror allows students to explore simple geometry and the science of light and reflections.

## Assembly

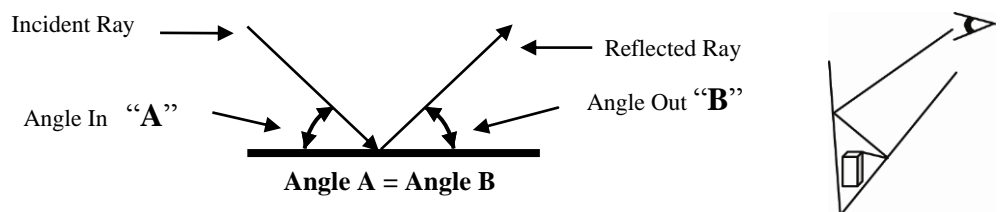
1. Create two mirrors by taping the mylar to the cardboard with double stick tape. (Keep the mylar as flat as possible and avoid touching the mirror surface.)
2. Hinge the two mirrors together with a piece of tape so that when the two mirrors are folded closed the mylar is on the inside.

## To Do and Notice

1. Explore different shapes and images while varying the angle of the mirrors. See above for examples.
2. Identify how many different images of an object appear depending on the angle between the two mirrors. Optional: Measure the angle between the mirrors and establish a relationship between the angle and the number of images that is seen
3. Students studying geometric optics can draw the light paths to better understand the relationship between the angle between the mirrors and the number of images.

## The Science Behind the Activity

We see an object when light reflected or emitted from the object travels to our eye. When an object is between the two hinged mirrors; light from the object bounces back and forth between the mirrors before it reaches the eye. The general rule for a reflected ray is “angle in = angle out”. (See illustrations)



An image is formed each time the light bounces off a mirror. The number of images that you see in the mirrors depends on the angle that the mirrors form. As you make the angle between the mirrors smaller, the light reflects back and forth more times, and you see more images.

**Web Resources** (Visit [www.raft.net/raft-idea?isid=103](http://www.raft.net/raft-idea?isid=103) for more resources!)

- Activities with reflections: [www.exploratorium.edu/snacks/iconreflection.html](http://www.exploratorium.edu/snacks/iconreflection.html)