

# RAFT IDEAS

Topics: Reflection,  
Graphing, Art

## Materials List

- ✓ Mylar sheet approx. 15 cm (6") x 15 cm (6")
- ✓ Plastic bottle or other cylinder about 4 cm (1-1/2 inches) in diameter
- ✓ Tape
- ✓ Photocopies of a grid pattern with house, blank square grid, and blank curved grid.

This Activity can be used to teach:

- Reflection (CA Science Standards: Grade 3, 2.b; Grade 7, 6.f and 6.g)
- Graphing Coordinate Pairs (CA Math Standards: Grade 4, Measurement & Geometry, 2.0)

## Anamorphic Art

Science, Math, and Art all in One Activity!



In this unique interdisciplinary activity, students use science, math, and art skills to create an image on a curved grid. The resulting image appears distorted and may be difficult to recognize... **until it is viewed with a cylindrical mirror!** The image that “magically” appears is just science, math, and art all mixed together with a mirror.

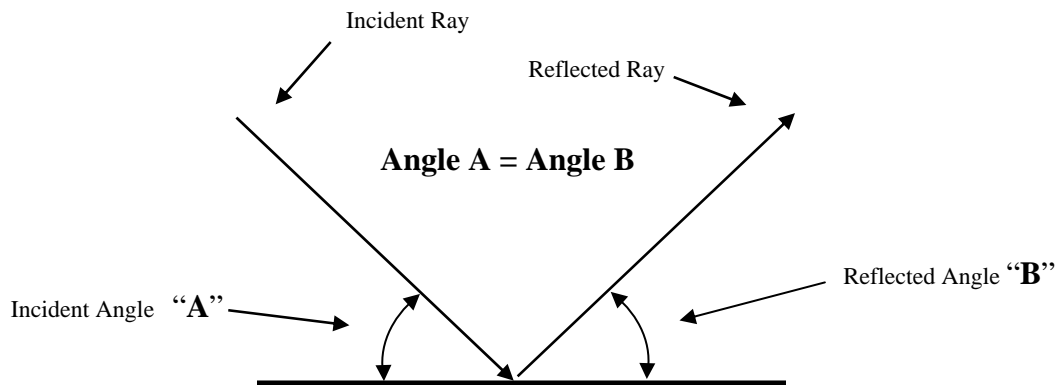
### To Do and Notice

1. Draw the house pattern from the square grid onto the circular grid by mapping points on the square grid to the equivalent points on the circular grid. **\*(See Teacher Note)**
2. Roll the Mylar sheet around the cylinder and secure it with tape, creating a cylindrical mirror.
3. Place the cylindrical mirror onto the circle which is printed on the curved grid. Look into the mirror. The house now appears as a normal house, just as it does on the square grid.

**\*Teacher Note:** Transferring this pattern requires patience and skill in using coordinate pairs. Using a curved grid can be difficult and frustrating at first. For younger students, beginning with an even simpler pattern may be a good choice. Demonstrating the process first is very important for student success.

### The Science Behind the Activity

The basic scientific rule for mirrors is “angle in, angle out” or “the angle of incidence is equal to the angle of reflection.” Images from flat mirrors appear as the real objects. When the mirror is curved, like mirrors in a fun house, images become distorted. Students may notice that the image of the house when viewed in the curved mirror is reversed from the original, and also, that the grid numbers and letters are backward. In all mirrors, flat and curved, images are reversed.



Students rarely get the opportunity to graph using a non-linear grid. In this lesson, students work backwards, distorting the image on the curved (polar) grid so that it appears “normal” in a curved mirror. The coordinates are the same as for a square grid, but with one of the sets of lines curved, the experience is new for the students. Transferring the pattern onto the polar grid requires patience and skill in using coordinate pairs. Using a curved grid can be difficult and frustrating at first; but students will soon become comfortable with polar graphing. Demonstrating the process first is very important for student success.

Historically, when a new material or process is developed (such as glass and silver-coating processes), many facets of society show interest: Political leaders find ways to use the technology for military uses and espionage; Scientists run experiments to understand the technology, use the technology in new investigations, and invent scientific instruments; and artists use the technology as a new medium of artistic expression. Anamorphic art has a long history, having roots in cultures from around the world, including China, England, France, and the Netherlands. Distorted images were used for everything from amusing royalty to carrying secret messages and concealing political allegiances (such as in England during the 17<sup>th</sup> and 18<sup>th</sup> centuries). During the Victorian era, anamorphic art and viewers were popular parlor items, and eventually they became inexpensive toys for children.

### **Taking it Further**

- Students can extend this activity by coloring in their house and adding features such as curtains and shrubs.
- Students can extend their learning further by drawing a picture (image) of their choice onto the blank square grid, and then transferring that picture to the curved grid.
- Students can experiment to discover how to write their names so that they appear as “normal” writing in the curved mirror. It might help to break this down into two parts, first write the name so that it can be read with a flat mirror, and then transfer the writing to the circular grid.

### **Web Resource:**

The following website has descriptions, with images, that explains the anamorphosis process. There is also a link for a free software download, for Windows, which will carry out several different anamorphic transformations on digital images: <http://myweb.tiscali.co.uk/artofanamorphosis/what-is.html>

Interesting illustrations of distorted images can be found at: <http://www.anamorphosis.com/>



