Kit: $3.00

RAFT IDEAS

Topics: Reflection, Graphing, Art

Materials List

- ✓ Mylar sheet with reflective coating, ~15 cm (6”) x 15 cm (6”)
- ✓ Tube, plastic bottle, or other cylinder about 4 cm (1½”) in diameter
- ✓ Tape
- ✓ Copies of a blank square grid, a blank curved grid, and a grid pattern with a house (pages 3 & 4) or other simple pattern

This activity can be used to teach:
CO Math Standard 4: Shape, Dimension, and Geometric Relationships

- Reflection
- Graphing Coordinate Pairs

Grades: 4, 5
CO Math Standard 1: Number Sense, Properties, and Operations

- Graphing Coordinate Pairs

Grades: 6, 7

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2875 Blake Street • Denver, CO 80205

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.

Assembly

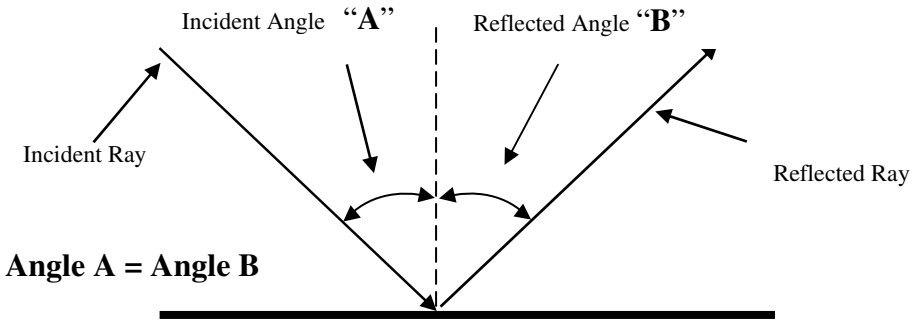
1. Wrap and tape the 15 cm x 15 cm (6” x 6”) reflective Mylar sheet around the tube, bottle, or cylinder starting at the bottom smoothing out any wrinkles. Only part of the cylinder will be covered by the section, creating a cylindrical mirror.

To Do and Notice

1. Draw the house pattern from the square grid onto the curved grid by mapping points on the square grid to the equivalent points on the curved grid. Demonstrating the process to the students first is a very important step for student success.
2. Transferring the pattern requires patience and skill in using coordinate pairs. Use a pencil first and then once the pattern is transferred correctly, retrace the pattern in ink. For younger students, beginning with an even simpler pattern may be a better choice.
3. Place the cylindrical mirror onto the circle which is printed at the center of the curved grid. Look into the mirror. The house now appears recognizable and similar to the drawing on the square grid.

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 reflected from flat mirrors look like the real objects, are undistorted. When the mirror is curved, as are mirrors in a fun house, the reflections become distorted. Students may notice that the image of the house, when viewed in the curved mirror, is reversed from the original, and that the grid numbers and letters are backward. In flat and positively curved (convex) mirrors, such as cylindrical mirrors, images are always reversed left/right. Negatively curved (concave) mirrors, such as the bowl of a reflective spoon, can have un-reversed images. (A parabolic mirror, a special case of a concave mirror, can make a perfect real image.)



Written by RAFT Education Department
Anamorphic Art activity by Don Rathjen

Students rarely have the opportunity to graph using a non-linear grid. In this lesson, students work backwards, distorting the image onto the curved grid so that the image will appear "normal" when viewed with a curved mirror. The coordinates are the same as for a square grid, but with one set of lines being curved. Transferring the pattern onto the curved 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 this curved 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 may 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; 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 17th and 18th 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 curved grid.

Web Resources (Visit www.raft.net/more for how-to videos and more ideas!)
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/