LESSON 19

Geometry

Reflections on a Coordinate Grid

Every ordered pair on a coordinate grid is at the intersection of a vertical and a horizontal line. These lines can be used as lines of reflection. A point and its reflection are the same distance from a line of reflection, but on opposite sides of that line of reflection. If a line of reflection is a vertical line, then a point and its reflection have the same *y*-coordinate. If a line of reflection is a horizontal line, then a point and its reflection have the same *x*-coordinate.

Try It! *Perform the Try It! activity on the next page.*

Objective

Reflect points over a line in the first quadrant of a coordinate grid.

Skills

- Locating and marking points on a coordinate grid
- Naming points on a coordinate grid
- Finding the reflections of points on a coordinate grid

NCTM Expectations

Geometry

- Describe location and movement using common language and geometric vocabulary.
- Make and use coordinate systems to specify locations and to describe paths.
- Predict and describe the results of sliding, flipping, and turning two-dimensional shapes.

Talk About It

Have students look at the grids used in the Try It! activity.

- **Ask:** *What are the coordinates of the vertices of the triangle?*
- **Ask:** *What are the coordinates of the vertices of the reflected triangle?* Have students compare the two sets of coordinates. **Ask:** *What is different between the sets of coordinates? What is the same?*
- **Ask:** *How can you verify that the reflection is correct?*

Solve It

With students, reread the problem. Suppose Evan decided to flip his triangle over a horizontal line at $y = 6$. What happens to the ordered pair (6, 6)? Find the vertices of this reflected triangle.

More Ideas

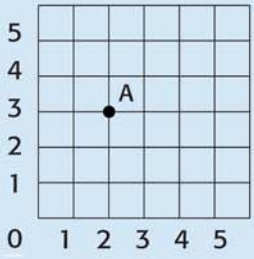
For other ways to teach about coordinate grids—

- Have students make coordinate grids on grid paper and flip Pattern Blocks over lines, recording the locations of the original and reflected shapes.
- Have students draw simple pictures on Coordinate Grids (BLM 10) and then draw the reflection over a line.
- Have students use a compass to mark reflected points: place the stationary tip on the reflection line, mark a point on one side of the line, and "flip" the compass to mark the reflection on the other side.

Standardized Practice

Have students complete the following activity.

Point S is located at (7, 1). What are the coordinates of the point reflected over the vertical line at x = 5? What are the coordinates of the point reflected over the horizontal line at y = 4?



Try It! 30 minutes | Groups of 3 or 4

Here is a problem using a coordinate grid.

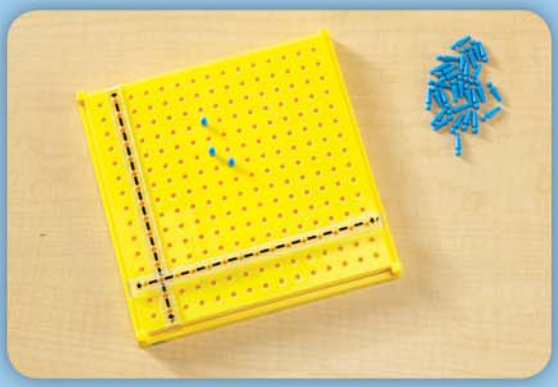
Evan wants to flip a triangular chalk drawing over the other side of his driveway, but he is not sure where to draw the lines. He makes a coordinate grid and marks the vertices at (5, 7), (5, 9), and (6, 6). He draws a vertical line at x = 4 on the grid. What are the coordinates of the vertices of the reflected triangle?

Introduce the problem. Then have students do the activity to solve the problem.

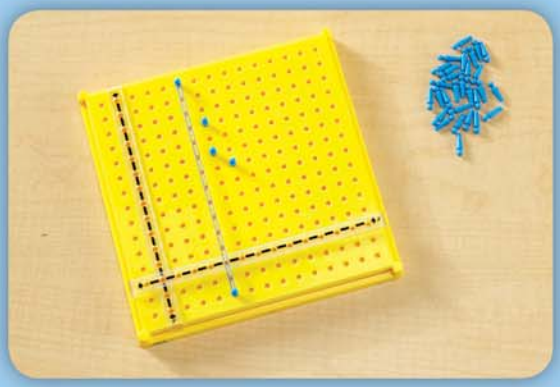
Follow the steps below to show Evan how to flip his chalk drawing.

Materials

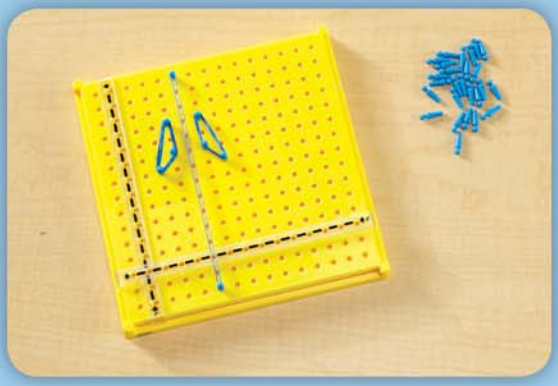
- *XY* Coordinate Pegboard and pegs
- rubber bands
- white paper



1. Slide the bars that represent the horizontal and vertical number lines so the intersection of these lines is near the bottom left of the grid. Place pegs to represent the vertices of Evan's triangle.



2. Place a peg at the bottom-most hole of the column of pegs representing $x = 4$. Place a peg at the upper-most hole of the column of pegs representing $x = 4$. Stretch a rubber band around these two pegs. This rubber band represents the line of reflection.



3. Pick one of the three vertices of Evan's triangle. Place a peg in a location with the same *y*-coordinate and with *x*-coordinate the same distance from, but on the other side of, the line of reflection. Repeat for the other two vertices. Stretch rubber bands around the pegs representing the original triangle and around the pegs representing the reflected triangle. Are the triangles reflections of each other over the line $x = 4$?

⚠ Look Out!

Watch out for students who change both coordinates when reflecting a point over a vertical or horizontal line. Remind them that a reflection over a horizontal line has the same *x*-coordinate as the original point.