LESSON 3

Objective

Translate a geometric figure on a coordinate system.

Common Core State Standards

- **8.G.3** Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

Geometry

Translations (Slides): The Traveling Triangle

A *translation* is a transformation that moves each point of a figure the same distance and in the same direction. The figure that is created is congruent to the original figure and has the same orientation. This lesson allows students to visualize the "movement" as a figure is translated several times.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *Does the figure you formed by translating (sliding) the figure look the same as the original figure? How is it like the original (pre-image)? How is it different?*
- **Ask:** *What does it mean for a figure to maintain its orientation as it slides?*
- **Ask:** *How will sliding a figure down 1 unit and right 2 units change the coordinates of the vertices?* Elicit that the *x*-value will increase by 2 while the *y*-value decreases by 1.

Solve It

Reread the problem with students. Ask them to explain how the figure in the story problem was translated from one position to the next.

More Ideas

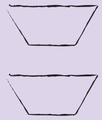
For other ways to teach about translations—

- Have students assemble a figure from AngLegs® pieces and use it to demonstrate a translation by tracing it, moving it in a prescribed way, tracing it again, and so forth.
- Have students place a Centimeter Cube at (0, 0) on grid paper and translate the cube to (8, 12) by moving it in steps of "up 3 and right 2."

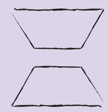
Formative Assessment

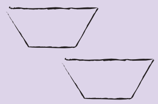
Have students try the following problem.

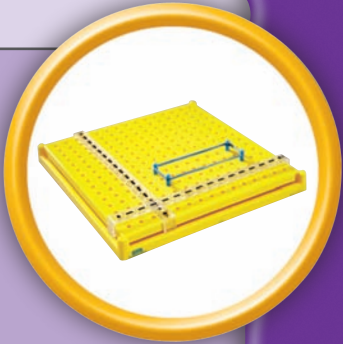
Which of the following diagrams does not show a translation?

A. 

B. 

C. 

D. 



Try It! 45 minutes | Pairs

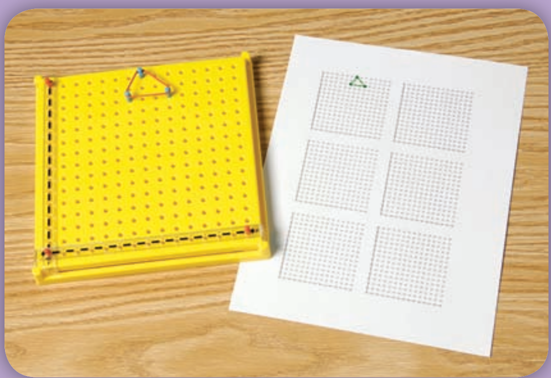
Here is a problem about translations (slides).

Marielle made a flipbook, a type of simple animation, in art class. Each drawing in the book shows the same object in a slightly different position. When the pages are flipped, the object appears to move. Marielle wants to make a flipbook that shows a triangle moving from the top center of the page to the lower right. What will her book look like?

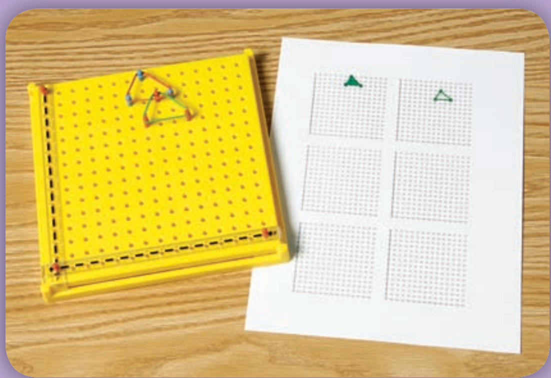
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials. Have students set up the pegboard for Quadrant I graphing.

Materials

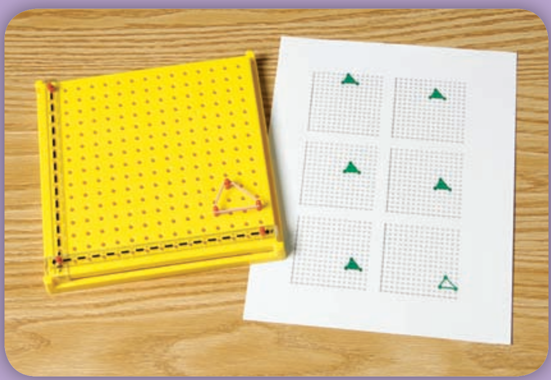
- XY Coordinate Pegboard
- Mini Dot Paper Grids (BLM 8; 1 per pair)
- card stock
- glue stick
- scissors
- marker



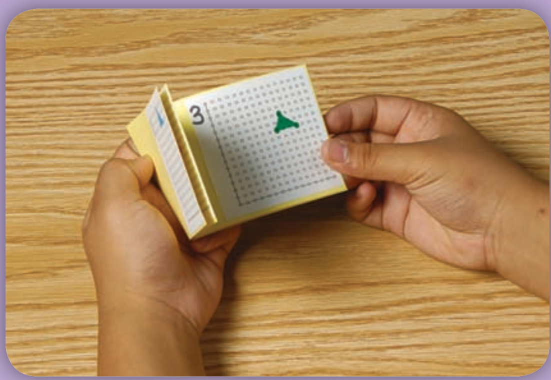
1. Have students use blue pegs to plot the following three points to form a triangle: (6, 12), (7, 14), and (9, 12). Have them connect the pegs with a rubber band. Then have them transfer the triangle to the first grid on the BLM. They may color in the triangle.



2. Have students “slide” each vertex of the triangle down 2 spaces and right 1 space. Have them use red pegs to mark the new vertices and stretch a rubber band around them. Have students remove the first triangle and then transfer the new triangle to the second grid on the BLM.



3. Repeat the procedure until all six grids have a triangle plotted on them.



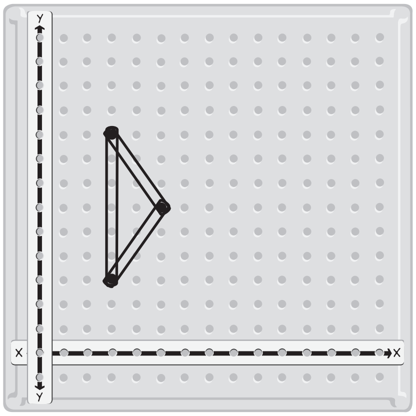
4. Have students number the grids in order, cut them out, and glue each one to the upper right-hand corner of a card. Students should stack the cards in order and flip them with their thumb to create a “traveling triangle.”

Answer Key

Use an XY Coordinate Pegboard to model the triangle. Write the coordinates of the vertices. Translate the original triangle and write the coordinates of the vertices of each new triangle.

(Check students' work.)

1.



vertices of triangle (3, 3), (5, 6), (3, 9)

Slide 2 units right (5, 3), (7, 6), (5, 9)

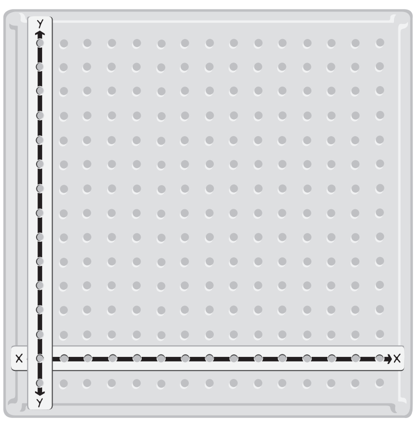
Slide 4 units right, 1 unit down (7, 2), (9, 5), (7, 8)

Slide 5 units right, 3 units up (8, 6), (10, 9), (8, 12)

Using an XY Coordinate Pegboard, model the rectangle with the given vertices. Translate the original rectangle. Sketch the translation and write the coordinates of the new rectangle.

(Check students' models.)

2. (2, 1), (2, 6), (5, 1), (5, 6)



Slide 3 units right (5, 1), (5, 6), (8, 1), (8, 6)

Slide 1 unit down (2, 0), (2, 5), (5, 0), (5, 5)

Slide 2 units right, 4 units up (4, 5), (4, 10), (7, 5), (7, 10)

Name the coordinates of each vertices after the translation described.

3. translate the triangle 4 units right

(2, 5) (6, 5)
(3, 1) (7, 1)
(5, 5) (9, 5)

4. translate the triangle 2 units left and 2 units up

(4, 0) (2, 2)
(6, 7) (4, 9)
(3, 5) (1, 7)

5. translate the triangle 6 units right and 3 units down

(7, 9) (13, 6)
(6, 10) (12, 7)
(9, 5) (15, 2)

Answer Key

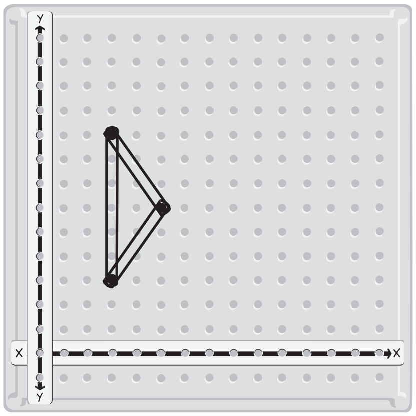
Challenge! Describe how to find the new location of a point that is translated when you do not have a coordinate grid in front of you.

Challenge: (Sample) Add the right or subtract the left movement to the *x*-coordinate and add the up or subtract the down movement to the *y*-coordinate.

Name ___________________________

Use an XY Coordinate Pegboard to model the triangle. Write the coordinates of the vertices. Translate the original triangle and write the coordinates of the vertices of each new triangle.

1.



vertices of triangle

____

Slide 2 units right

____

Slide 4 units right, 1 unit down

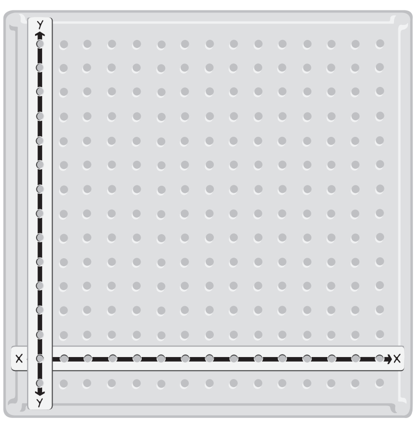
____

Slide 5 units right, 3 units up

____

Using an XY Coordinate Pegboard, model the rectangle with the given vertices. Translate the original rectangle. Sketch the translation and write the coordinates of the new rectangle.

2. (2, 1), (2, 6), (5, 1), (5, 6)



Slide 3 units right

____

Slide 1 unit down

____

Slide 2 units right, 4 units up

____

Name the coordinates of each vertices after the translation described.

3. translate the triangle 4 units right

(2, 5) _________

(3, 1) _________

(5, 5) _________

4. translate the triangle 2 units left and 2 units up

(4, 0) _________

(6, 7) _________

(3, 5) _________

5. translate the triangle 6 units right and 3 units down

(7, 9) _________

(6, 10) _________

(9, 5) _________

Name ____________________________________

Challenge! Describe how to find the new location of a point that is translated when you do not have a coordinate grid in front of you.

Name ______________________________