LESSON 3

The Number System

4-Quadrant Graphing

Students build upon their experiences with integers and graphing points in the first quadrant to graph points in the coordinate plane. They become familiar with all four quadrants by locating and plotting points and giving directions from one point to the next. These skills are useful in coordinate geometry and in graphing equations.

Objective

Graph points in the coordinate plane.

Common Core State Standards

- **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- **6.NS.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- **6.NS.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *When you use an ordered pair to describe a position, which coordinate is related to the east and west directions? To the north and south directions?*
- **Ask:** *Why does Quadrant II have a negative x-coordinate and a positive y-coordinate?*
- **Ask:** *If you make Alison's house the origin, what are the coordinates of the school?*

Solve It

Reread the problem with students. Have students write the directions from school to Alison's house, from Alison's house to the movie theater, and from the movie theater to Janet's house. Have students identify the coordinates and quadrant of each location.

More Ideas

For other ways to teach graphing points in the coordinate plane—

- Make a series of steps for students to follow, such as *place a peg at (–3, 0), move 4 units right and 5 units down; then move 2 units right and 8 units up.* For each step, have students place a peg and write the coordinates for the location that they have arrived at.
- Extend the lesson by having students graph various landmarks around the school, such as buildings, parks, and offices. Give coordinates and have students locate the landmark on a pegboard or graph grid. Then have students write instructions on how to move from one landmark to another.

Formative Assessment

Have students try the following problem.

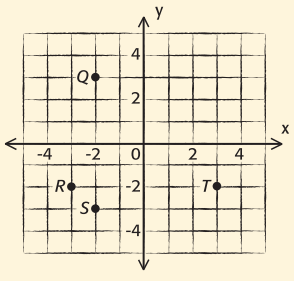
Which point is at (–3, –2)?

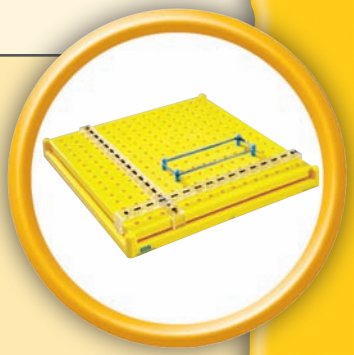
A. Point *Q*

B. Point *R*

C. Point *S*

D. Point *T*





Try It! 20 minutes | Pairs

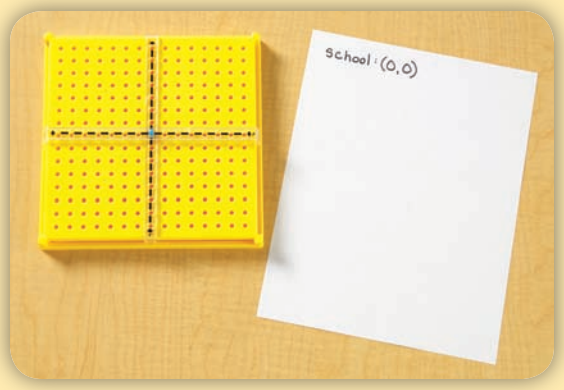
Here is a problem about graphing points in the coordinate plane.

Janet is going to Alison's house after school. Then they are going to the movie theater. Alison uses a grid to make a map for Janet. School is located at the origin. Each unit is one block. Directions east of the school are positive x-coordinates, north are positive y-coordinates, west are negative x-coordinates, and south are negative y-coordinates. Alison's house is 4 blocks east and 3 blocks south of school. Janet's house is 2 blocks west and 7 blocks south of school. The theater is 7 blocks west and 9 blocks north of Alison's house. What does the map look like?

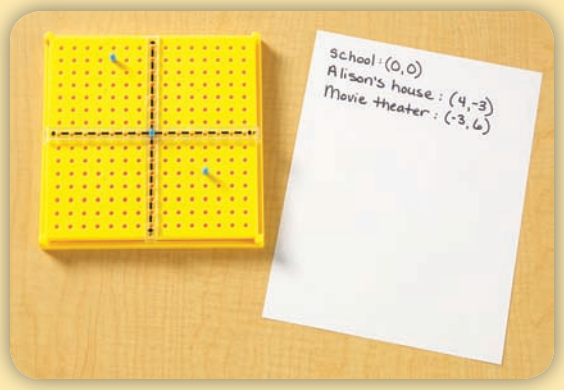
Introduce the problem. Then have students do the activity to solve the problem. Distribute pegboards, pegs, rubber bands, paper, and pencils. Draw a coordinate plane on the board, label the *x*- and *y*-axes, and label each quadrant with its number and sign pair, e.g., Quadrant II (–, +).

Materials

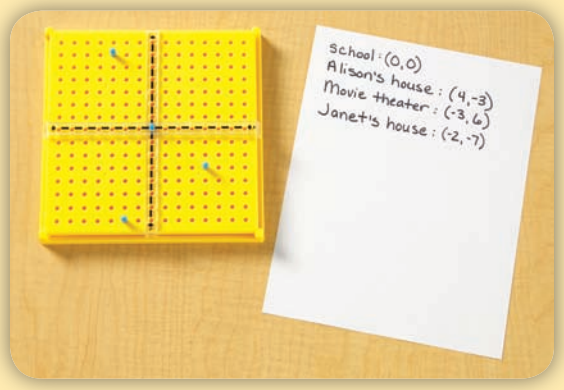
- XY Coordinate Pegboards (1 per pair)
- paper (1 sheet per pair)
- pencils (1 per pair)



1. Say: *Look at the coordinate plane on the board.* **Ask:** *What is the origin of the coordinate plane?* Guide students to mark the origin of the pegboard with a peg.



2. Have students locate and place a peg at Alison's house (4, –3). **Ask:** *What quadrant is Alison's house in?* **Say:** *Write the ordered pair describing the location of Alison's house.* Have students locate and place a peg at the movie theater (–3, 6). **Ask:** *What quadrant is the movie theater in?* **Say:** *Write the ordered pair describing the location of the movie theater.*



3. Have students locate and place a peg at Janet's house (–2, –7). **Ask:** *What quadrant is Janet's house in?* **Say:** *Write the ordered pair describing the location of Janet's house.*

⚠ Look Out!

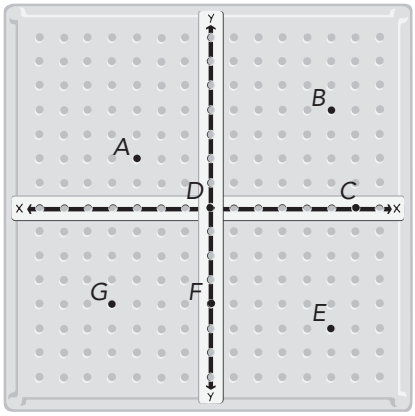
If students are confused about the directions, have them label the axes of the pegboard *North, South, East,* and *West* using masking tape. Explain that any location northeast of school is in Quadrant I, any location northwest is in Quadrant II, any location southwest is in Quadrant III, and any location southeast is in Quadrant IV.

Answer Key

Use an XY Coordinate Pegboard to plot each point. Write the ordered pair for each labeled point.

(Check students' work.)

1.



A (–3, 2) B (5, 4)

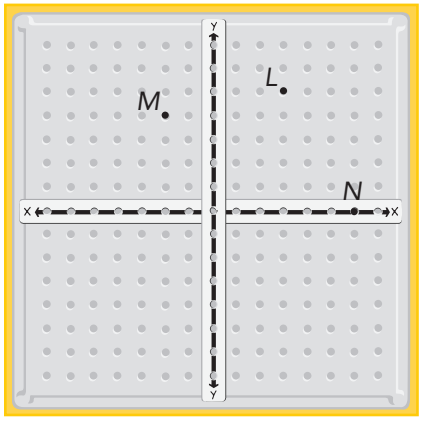
C (6, 0) D (0, 0)

E (5, –5) F (0, –4)

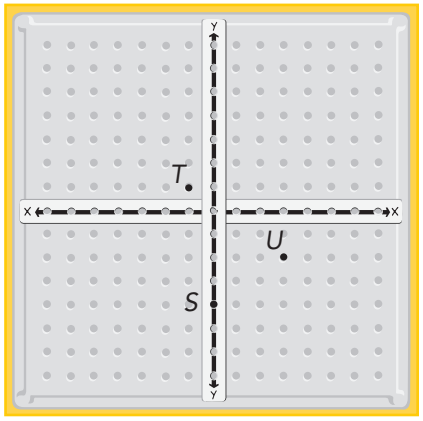
G (–4, –4)

Using an XY Coordinate Pegboard, plot the ordered pairs. Sketch the points on the graph below. Label the points.

2. *L* (3, 5) *M* (–2, 4) *N* (6, 0)



3. *S* (0, –4) *T* (–1, 1) *U* (3, –2)



Graph and label each ordered pair on the coordinate plane.

4.

A (–1, 2) *B* (3, 0)

C (4, 6) *D* (1, –5)

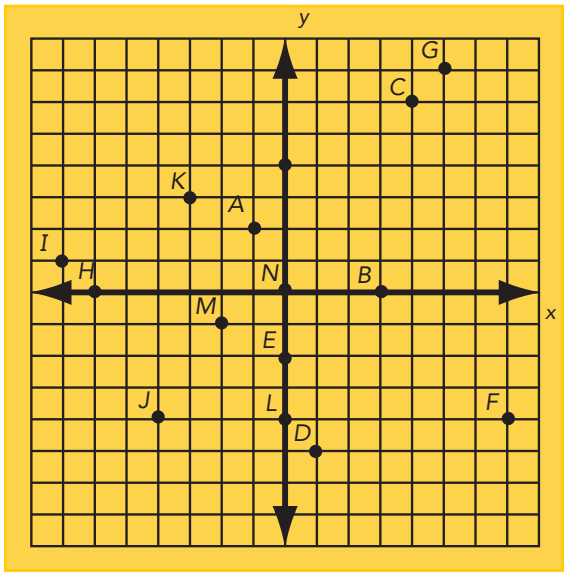
E (0, –2) *F* (7, –4)

G (5, 7) *H* (–6, 0)

I (–7, 1) *J* (–4, –4)

K (–3, 3) *L* (0, –4)

M (–2, –1) *N* (0, 0)



Answer Key

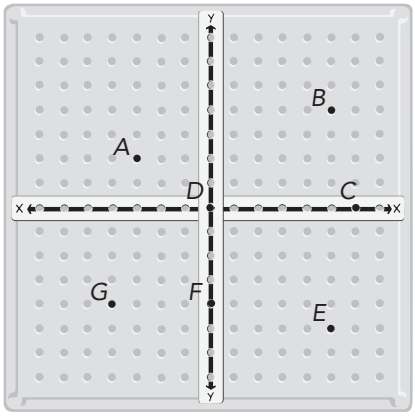
Challenge! Identify the signs of the ordered pairs in each quadrant of the coordinate plane. Draw a picture to help.

Challenge: (Sample) In the first quadrant the signs are (+, +). In the second quadrant the signs are (–, +). In the third quadrant the signs are (–, –). In the fourth quadrant the signs are (+, –).

Name _____

Use an XY Coordinate Pegboard to plot each point. Write the ordered pair for each labeled point.

1.



A _____ *B* _____

C _____ *D* _____

E _____ *F* _____

G _____

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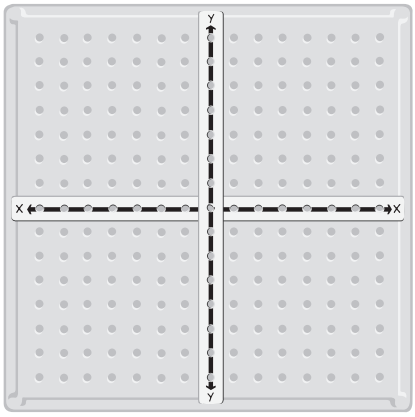
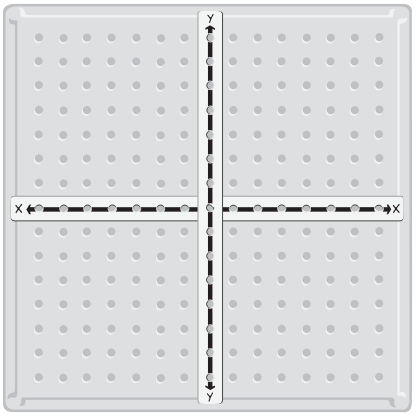


3. *S* (0, –4) *T* (–1, 1) *U* (3, –2)



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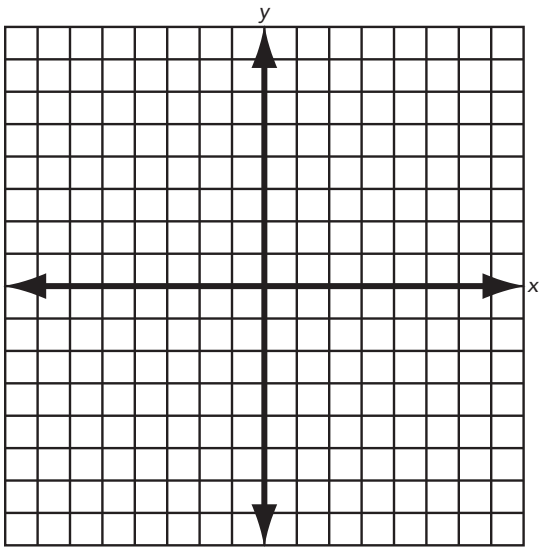
G (5, 7) *H* (–6, 0)

I (–7, 1) *J* (–4, –4)

K (–3, 3) *L* (0, –4)

M (–2, –1) *N* (0, 0)



Name _____

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