LESSON 5

Objective

Draw shapes on a coordinate grid and describe their properties.

Common Core State Standards

- **6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Geometry

Shapes in the Coordinate Plane

Many concepts of geometry can be illustrated on a coordinate grid. Viewing a shape on a coordinate grid helps students identify such properties of the shape as the number and lengths of its sides, the relationships between its sides, and in some cases the measures of its angles. Students who know these properties will more readily understand the formulas for area and perimeter.

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

Talk About It

Discuss the Try It! activity.

- **Ask:** *What do you notice about the coordinates for the square?*
- **Ask:** *How does the coordinate grid help you describe the shapes?*
- Compare the square and the rhombus.
- Compare the square and the triangle.

Solve It

Reread the problem with students. Have students talk about the arrangement of the furniture using coordinates. Have them talk about how the grid helps Beth describe the placement and shape of each piece of furniture.

More Ideas

For other ways to teach about shapes in the coordinate plane—

- Have students make polygons on a Geoboard and describe the shapes using coordinates. Ask them to compare the lengths of the sides and the angles and the relationships between the sides of each figure as they describe it.
- Use AngLegs® and a 4-Quadrant Graph (BLM 12) to make squares, rhombuses, rectangles, parallelograms, and triangles. Tell students to move the shapes around the four quadrants and name the coordinates of each new position.

Formative Assessment

Have students try the following problem.

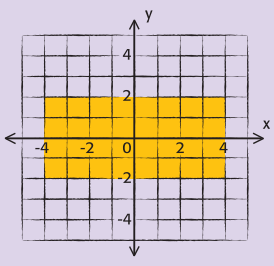
If the shape is moved up two units, what coordinates describe the shape after the move?

A. Rhombus; (–2, 2), (–2, –2), (2, 2), and (2, –2)

B. Rhombus; (–4, 2), (–4, –2), (6, 2), and (6, –2)

C. Rectangle; (–4, 4), (–4, 0), (4, 4), and (4, 0)

D. Rectangle; (–2, 2), (–2, –2), (6, 2), and (6, –2)



Try It! 30 minutes | Groups of 4

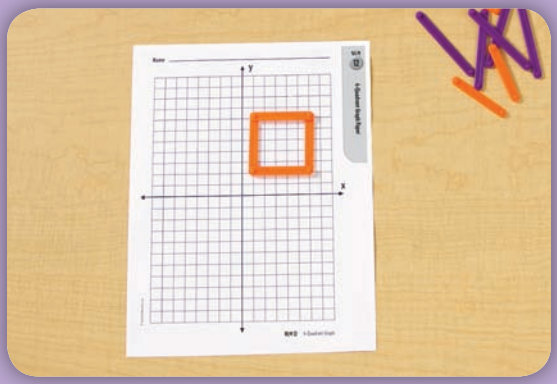
Here is a problem about drawing and describing shapes in the coordinate plane.

Beth is making a record of how the furniture on her patio is positioned. She divides the patio into quadrants and uses a 4-quadrant grid to show the placement of the furniture. She has a square chair, a triangular stool, and a table shaped like a rhombus. Show how the positions and shapes of the pieces of furniture might be represented on the grid.

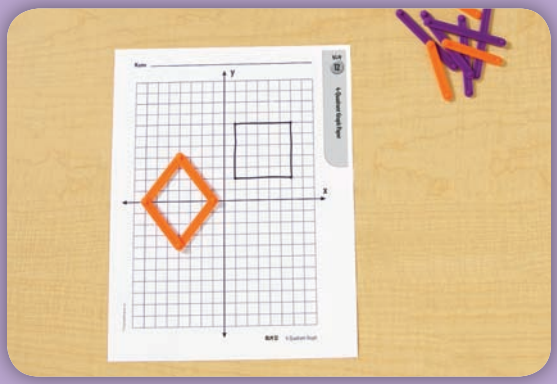
Introduce the problem. Then have students do the activity to solve the problem. Distribute AngLegs, graph paper, and pencils to students. Explain to students that the endpoints of the AngLegs are represented by the raised circles, not the extreme ends.

Materials

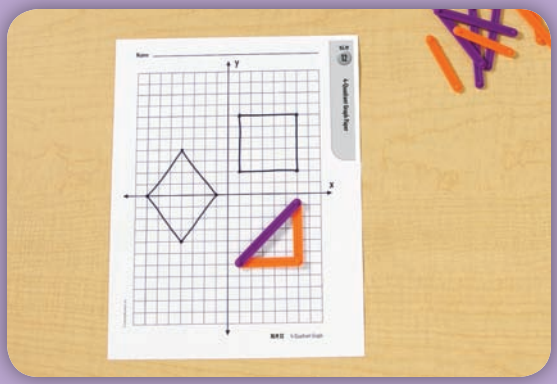
- AngLegs® (orange and purple only: one set per group)
- 4-Quadrant Graph Paper (BLM 12; 1 per group)
- pencils (1 per group)



1. Have students use an AngLegs piece to show a segment connecting points (1, 2) and (1, 7). **Say:** *This segment is one side of the square chair. Complete the chair so that it is positioned completely inside the first quadrant. Draw the shape.* Discuss with students how they found the additional coordinates.



2. Say: *One vertex of the rhombus-shaped table is at point (–4, 4) and another is at (–4, –4).* Have students connect the sides to make the rhombus. **Ask:** *What are the other coordinates of the rhombus?*



3. Have students use an AngLegs piece to show a segment connecting points (6, –1) and (6, –6). **Say:** *This segment is one side of the stool. Complete the stool so that there is a right angle at (6, –6).*

⚠ Look Out!

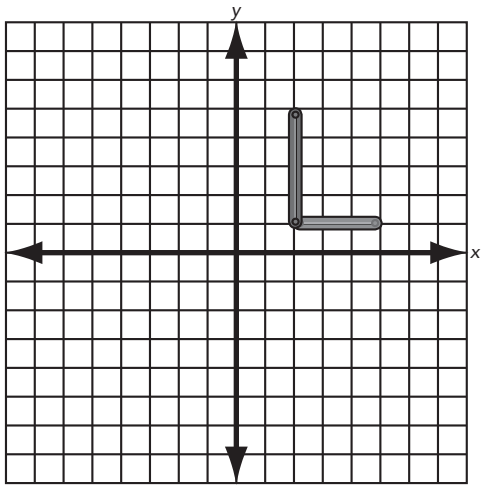
Some students might have difficulty determining how to connect the points correctly. If students use diagonals to stabilize the rhombus and square, remind them that only the sides of each shape are supposed to be represented; not the diagonals.

Answer Key

Use AngLegs® and graph paper to model each shape in a coordinate plane. Part of the shape is shown. Name the coordinates of the vertices that complete the shape.

(Check students' work.)

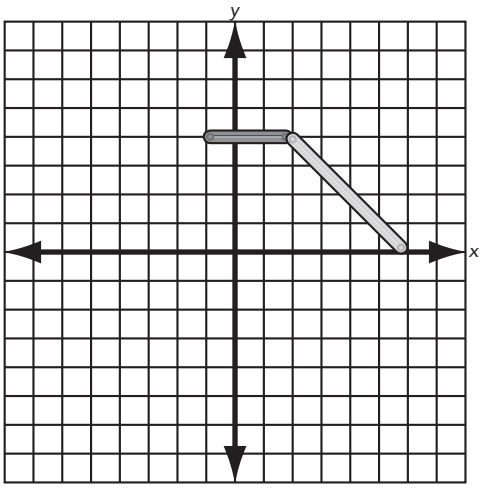
1. rectangle with vertices at (2, 1) and (2, 5)



The other vertices are at

(5, 1) and (5, 5)

2. isosceles trapezoid with short base 3 units, long base 11 units

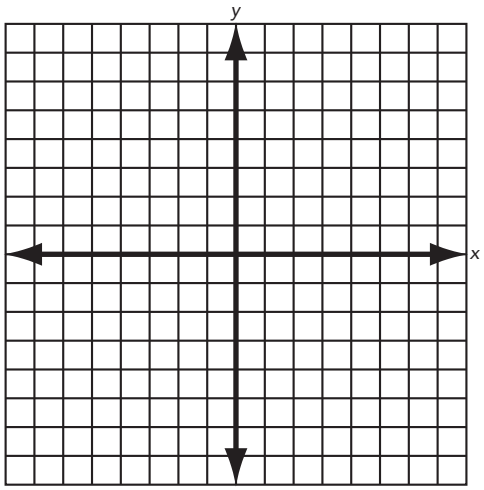


The vertices of the long base are

(–5, 0) and (6, 0)

Using AngLegs, model each shape. Sketch the model. Name the vertices.

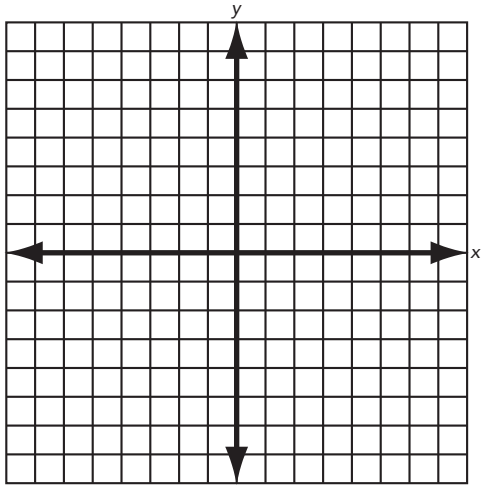
3. square in the second quadrant that has sides 5 units long



The vertices of the square are

Students' models will vary.

4. rectangle in the third and fourth quadrants, 7 units by 4 units



The vertices of the rectangle are

Students' models will vary.

Answer Key

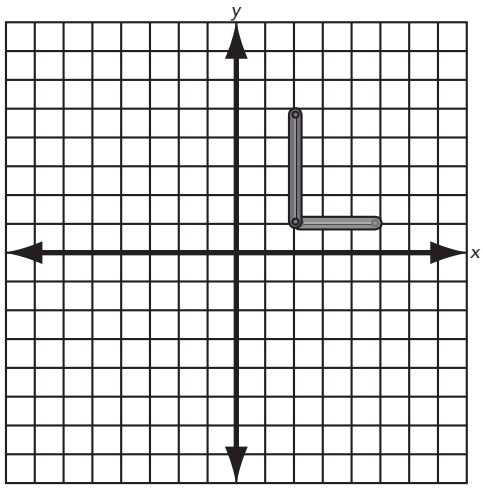
Challenge! If a rectangle has one vertex at (4, 4) and its opposite vertex is at (–5, –5), in what quadrants is the rectangle? Draw a picture to help.

Challenge: (Sample) The rectangle will be in all four quadrants.

Name _____

Use AngLegs® and graph paper to model each shape in a coordinate plane. Part of the shape is shown. Name the coordinates of the vertices that complete the shape.

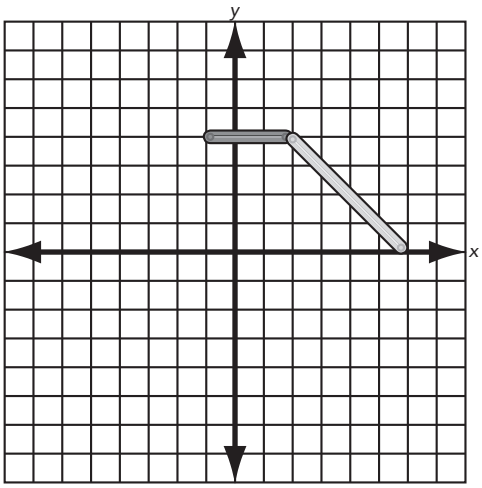
1. rectangle with vertices at (2, 1) and (2, 5)



The other vertices are at

_____ .

2. isosceles trapezoid with short base 3 units, long base 11 units

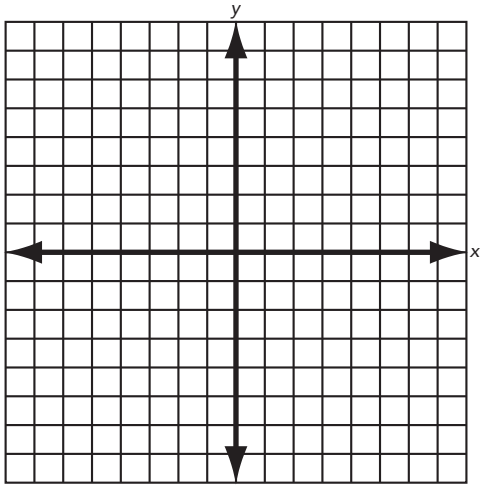


The vertices of the long base are

_____ .

Using AngLegs, model each shape. Sketch the model. Name the vertices.

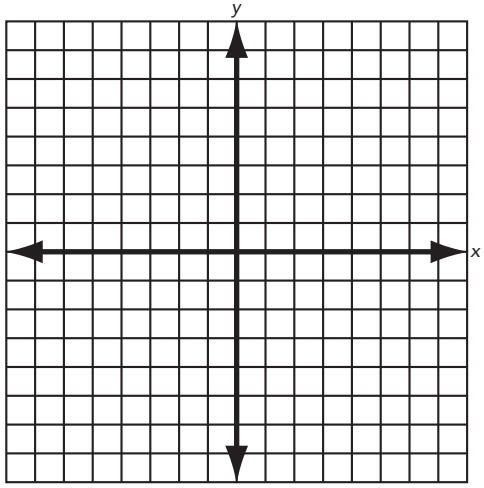
3. square in the second quadrant that has sides 5 units long



The vertices of the square are

_____ .

4. rectangle in the third and fourth quadrants, 7 units by 4 units



The vertices of the rectangle are

_____ .

Name _____

Challenge! If a rectangle has one vertex at (4, 4) and its opposite vertex is at (–5, –5), in what quadrants is the rectangle? Draw a picture to help.

Name _____