Unit 22

Area of Parallelograms and Triangles

Standard

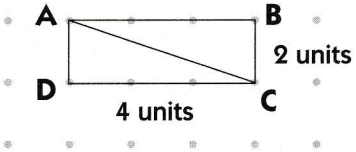
Geometry

Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

Model the Skill

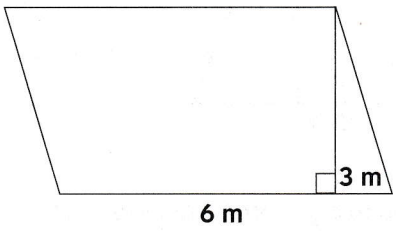
- Draw the following figure on the board.

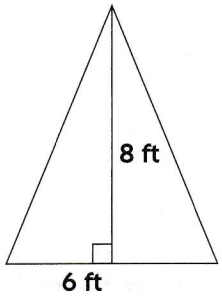


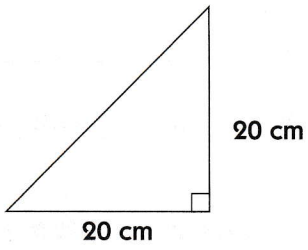
- **Say**: *Today we are going to be finding the area of triangles and parallelograms. Look at the rectangle ABCD. What is the length of this rectangle?* (4 units) *What is the width?* (2 units). *If the formula for the area of a rectangle is* A = l *x* w, *what is the area of this rectangle? (8 square units)*
- **Ask**: *If the line AC cuts the rectangle ABCD in half, what do you think the area of the triangle ACD is?* (half of the area of the rectangle, or 4 square units)
- **Say**: *We use the formula* A = *1/2 x* b *x* h *to find the area of a triangle. What is the base of this triangle ADC?* (4 units) *What is the height?* (2 units). *Use the formula to find the area.*
- Assist students in using the formula to find the area of the triangle and compare it to their prediction of 4 square units.
- Assign students the appropriate practice pages to support their understanding of the skill.

Assess the Skill

Use the following problems to pre-/post-assess students' understanding of the skill.







Name _____

Find the area of each figure.

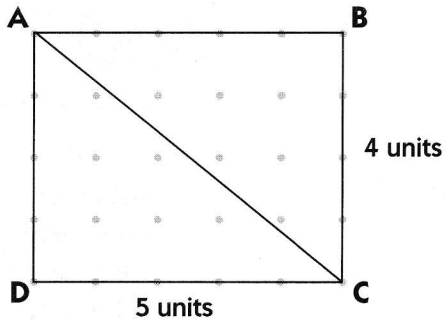
1 Rectangle ABCD

Area = base x height ($A = bh$)

$A = 5 \times 4$

$A =$ _____ square units

Think: The base of a rectangle is its length. The height is its width.

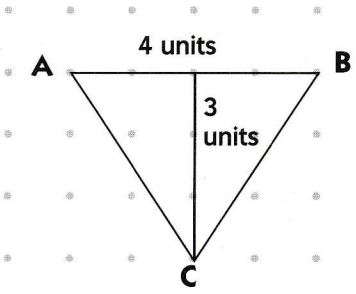


2 Triangle ABC

Area = $\frac{1}{2}$ base x height ($A = \frac{1}{2}bh$)

$A = \frac{1}{2}(4 \times 3)$

$A =$ _____ square units

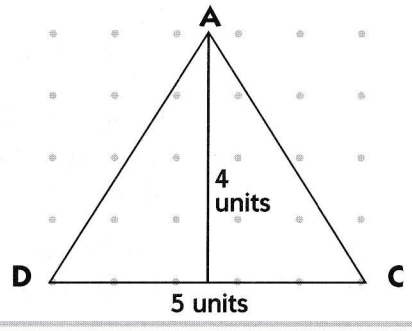


3 Triangle ADC

Area = $\frac{1}{2}$ base x height ($A = \frac{1}{2}bh$)

$A = \frac{1}{2}(5 \times 4)$

$A =$ _____ square units

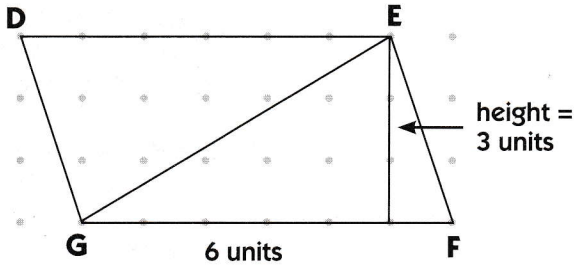


4 Parallelogram DEFG

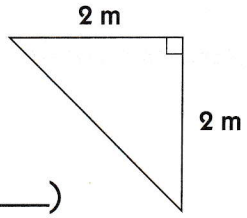
Area = bh

$A =$ _____ x _____

$A =$ _____ square units



5 Triangle DEG

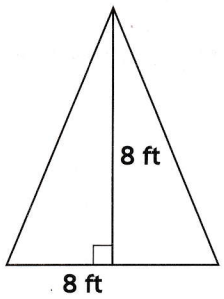


$A = \frac{1}{2}bh$

$A = \frac{1}{2}$ (_____ x _____)

$A =$ _____ square meters

6



$A = \frac{1}{2}bh$

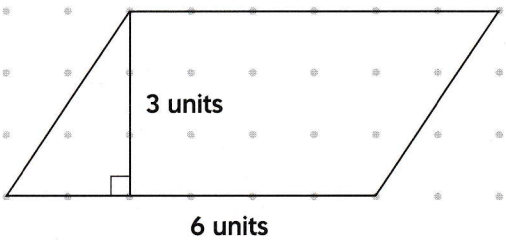
$A = \frac{1}{2}$ (_____ x _____)

$A =$ _____ square feet

☆ **Look at Problem 4. Show how to make a rectangle with a base of 6 and height of 3 (Hint: Cut and rearrange the parallelogram.)**

Use the formula $A = bh$ to find the area of each parallelogram.

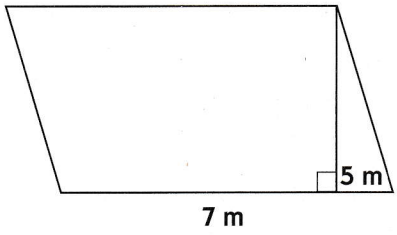
❶



$A = 6 \times$ _____

$A =$ _____ square units

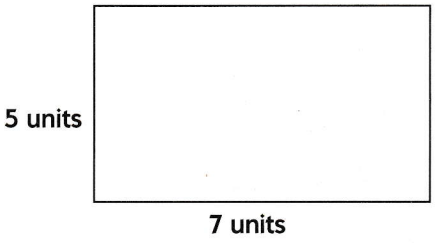
❷



$A =$ _____ $\times$ _____

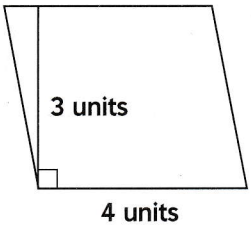
$A =$ _____ square meters

❸



$A =$ _____

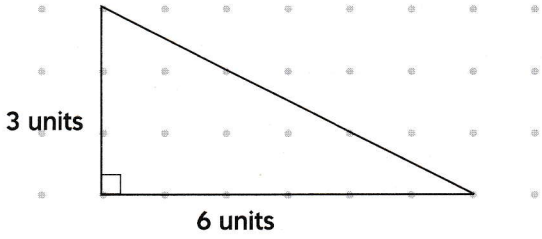
❹



$A =$ _____

Use the formula $A = \frac{1}{2}bh$ to find the area of each triangle.

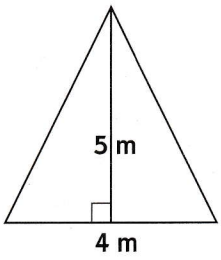
❺



$A = \frac{1}{2}(6 \times$ _____$)$

$A =$ _____ square units

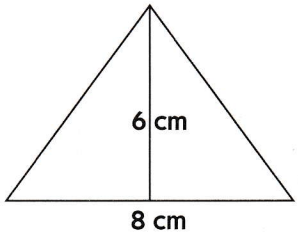
❻



$A =$ _____ $\times$ _____

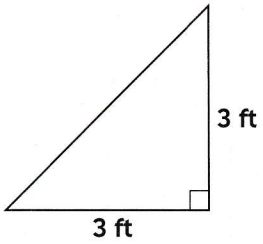
$A =$ _____ square meters

❼



$A =$ _____

❽



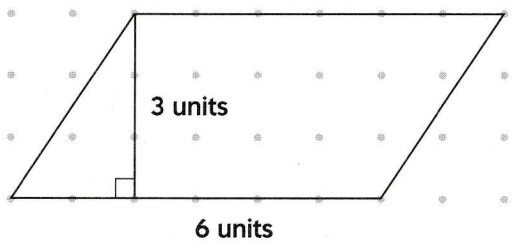
$A =$ _____

☆ **Tell why the area of a triangle is one half the area of a parallelogram with the same base and height.**

Name _____

Use the formula $A = bh$ to find the area of each parallelogram.

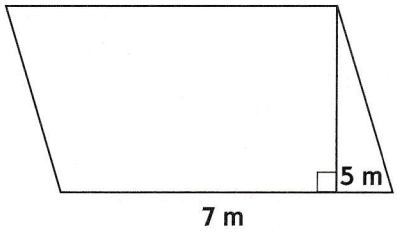
1



$A = 6 \times$ _____

$A =$ _____ square units

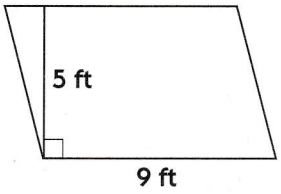
2



$A =$ _____ $\times$ _____

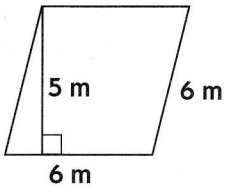
$A =$ _____ square meters

3



$A =$ _____

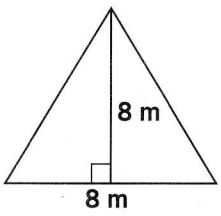
4



$A =$ _____

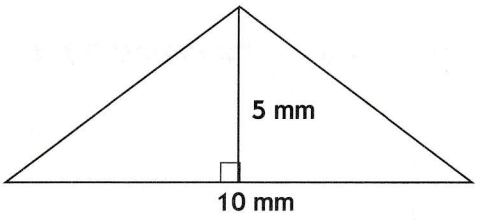
Use the formula $A = \frac{1}{2}bh$ to find the area of each triangle.

5



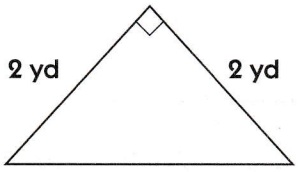
$A =$ _____

6



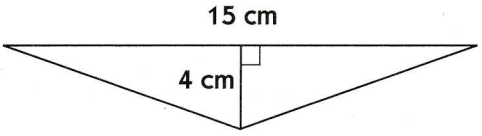
$A =$ _____

7



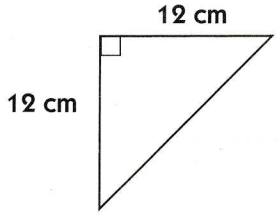
$A =$ _____

8



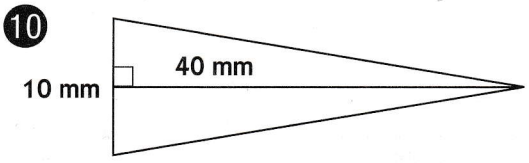
$A =$ _____

9



$A =$ _____

10

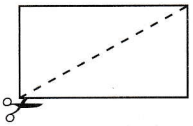


$A =$ _____

☆ **Write the steps you took to solve Problem 5. Did you write your answer in square meters? Explain why or why not.**

Solve.

1. Darren cut along a diagonal line across a sheet of paper to make a triangle. The paper was 10 inches long and 8 inches wide. What is the area of the triangle he created?



A = _____

2. Jaya has a 10 cm square piece of origami paper. If she folds the square into 4 equal triangles, what will be the area of each triangle?

A = _____

3. The sailboat has 1 large sail and 1 small sail. The large sail is 24 feet tall. The base of the sail is 12 feet long. What is the area of the large sail?

A = _____

4. The triangle cookie-cutter has a base of 10 centimeters and a height of 8 centimeters. What is the area of each triangle cookie?

A = _____

5. The quilt has 5 parallelograms. Each parallelogram has a base of 10 inches and a height of 7 inches. What area of the quilt is covered by the parallelograms?

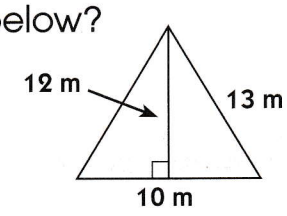
A = _____

6. The parallelogram has a height of 14 centimeters and a base of 3 centimeters. What is the area?

A = _____

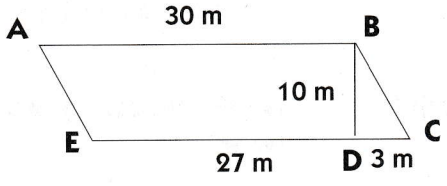
Circle the letter for the correct answer.

7. Which is the area of the triangle below?



a) 60 square meters
b) 65 square meters
c) 120 square meters
d) 130 square meters

8. Which is the area of the figure BCD below?



a) 300 square meters
b) 150 square meters
c) 15 square meters
d) 30 square meters

Unit 23

Draw Polygons on the Coordinate Plane

Standard

Geometry

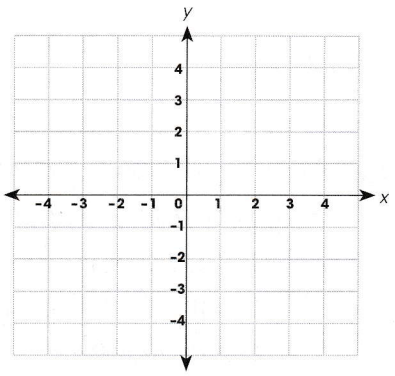
Solve real-world and mathematical problems involving area, surface area, and volume.

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.

Model the Skill

- Draw the coordinate plane, and write the following set of coordinates on the board.

  (2, 3), (2, –3), (–2, –3), (–2, 3)



- **Say**: *Today we are going to be graphing polygons on the coordinate plane. Look at this set of ordered pairs. Each gives us the coordinates for a specific point on the plane. Plot each point. Then connect the points so that each point represents a vertex.*
- Assist students in plotting each point and then connecting the points to make a rectangle. Remind students that the coordinates are always ordered (*x*, *y*).
- **Ask**: *What type of polygon do you see?* (rectangle)
- Assign students the appropriate practice pages to support their understanding of the skill.

Assess the Skill

Use the following problems to pre-/post-assess students' understanding of the skill.

- Ask students to predict which quadrant(s) the shape will be in as well as what types of polygons the coordinates will yield. Then ask them to plot and graph each polygon using the following sets of coordinates.

  (1, 3), (1, 1), (3,1)

  (1, 4), (1, –4), (–2, 4), (2, –4)

  (4, –10), (–10, 4), (4, 10)

  (3, 2), (2, –3), (–3, –3), (–2, 2)

  (–3, –1), (–1, –4), (–5, –4)

  (10, –1), (1, –1), (1, –10), (10, –10)

Graph the ordered pairs. Then connect the points in order to form a polygon.

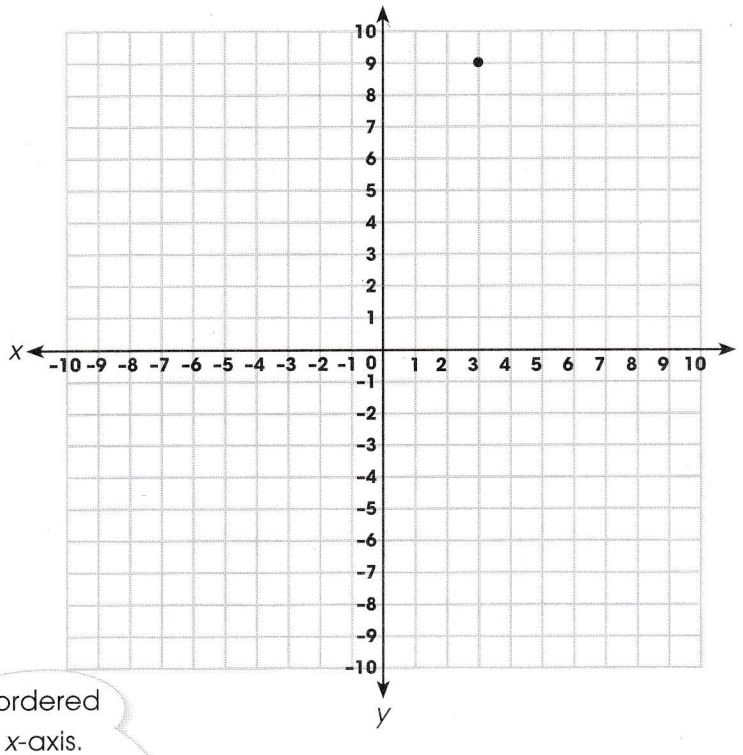
1 Ordered pairs:

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

What polygon did you draw?

_____

Remember: The first number in an ordered pair represents *x*.



2 Ordered pairs:

(–6, –2), (–8, –7), (–3, –7)

What polygon did you draw?

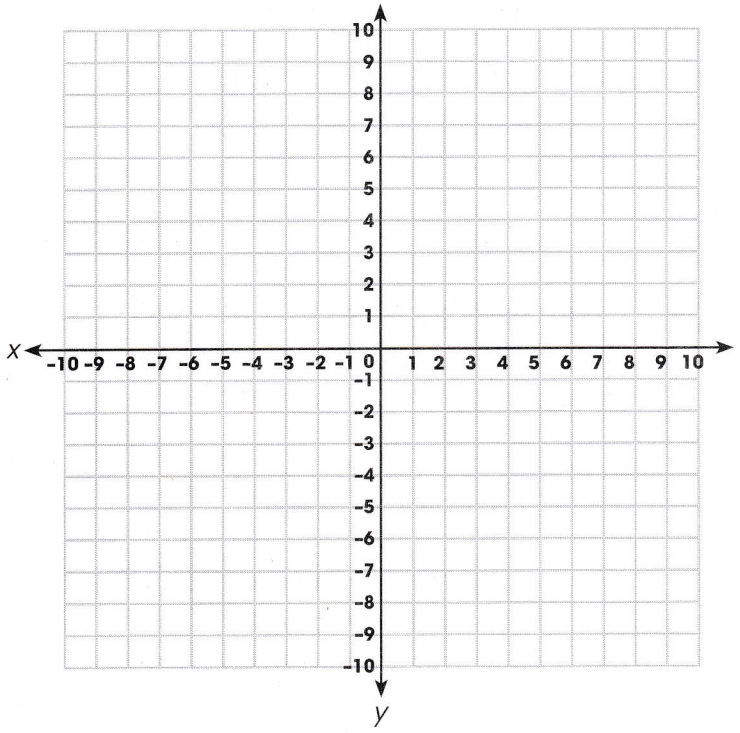
_____

Remember: To graph an ordered pair, first move across the *x*-axis. Then move up or down the *y*-axis.

3 Complete the coordinates to draw a square on the grid below.

(–5, 4), (5, 4), (5, –6), (___, ___)

Think: What ordered pair represents the point for the fourth vertex?



4 Draw another square on the grid. What are the coordinates of its vertices?

(___, ___), (___, ___), (___, ___), (___, ___)

☆ **Look at the coordinates for Problem 3. Tell how you know the figure is a square.**

 Name _____

Graph the ordered pairs. Then connect the points in order to form a polygon.

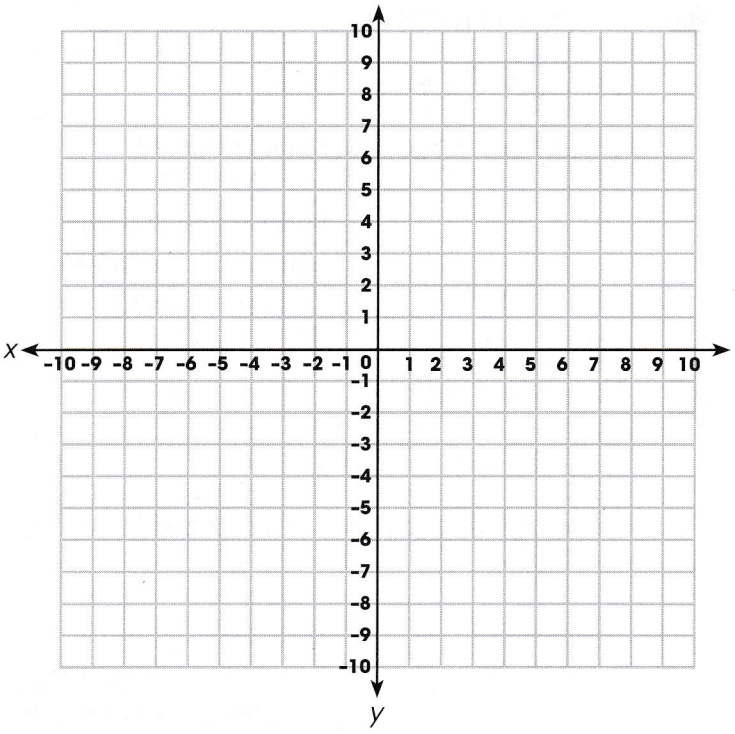
❶ Ordered pairs:

(4, 4), (7, 4), (1, –2), (9, –2)

What polygon did you draw?

_____

Think: Each point represents a vertex. A quadrilateral has 4 vertices. What type of quadrilateral is this?



❷ Ordered pairs:

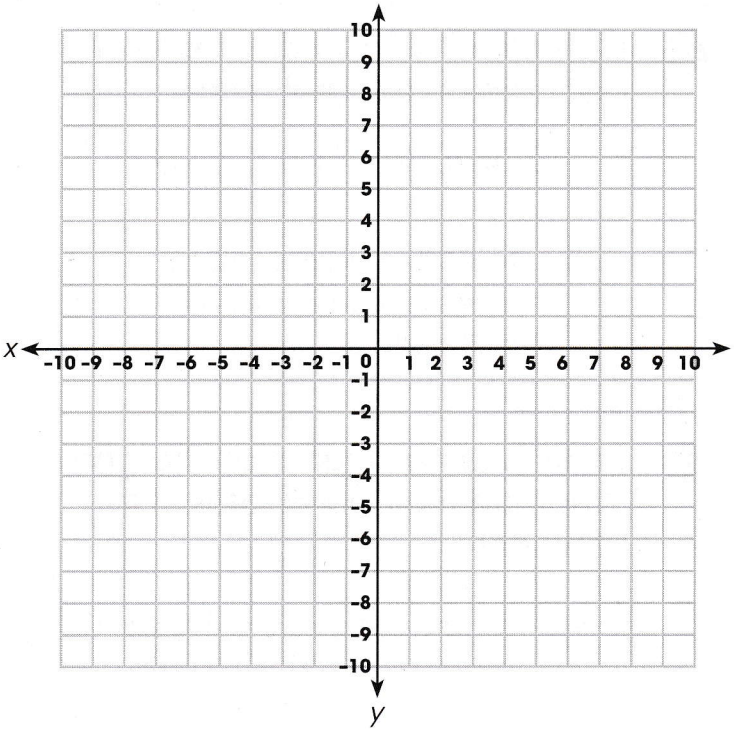
(–3, –2), (–3, –6), (–6, –6), (–6, –2)

What polygon did you draw?

_____

❸ Complete the coordinates to draw a square on the grid below.

(–7, –4), (–7, –8), (__, __), (__, __),



❹ Draw a triangle in the second quadrant. Write the coordinates of its vertices.

(__, __), (__, __), (__, __)

Think: The ordered pairs in the 2nd quadrant are (–, +).

☆ **Tell how you found the missing coordinates for the rectangle in Problem 3.**

Graph the ordered pairs. Then connect the points in order to form a polygon.

1. Ordered pairs:

   (–7, 6), (–3, 6), (–5, 1), (–9, 1)

   What polygon did you draw?

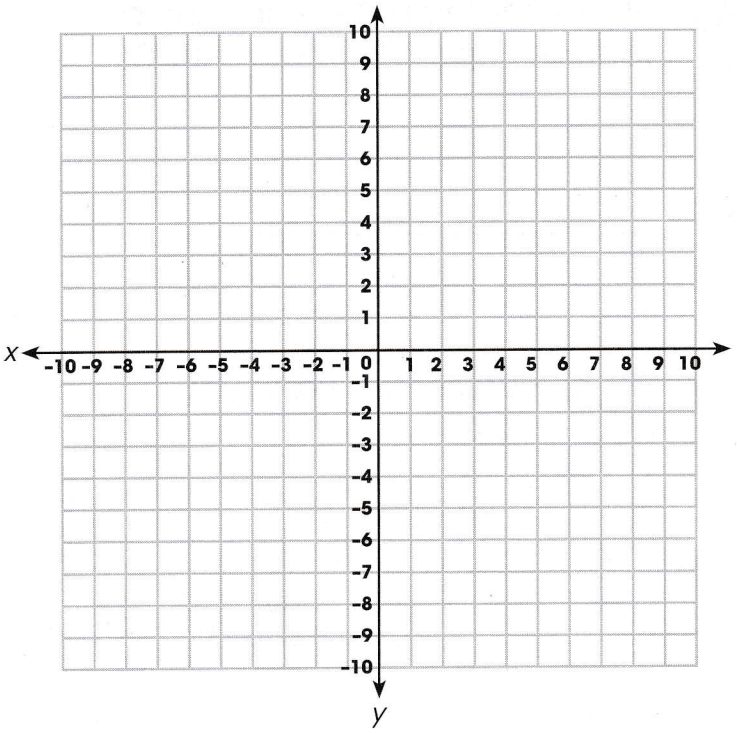
   _____

2. Ordered pairs:

   (2, –3), (2, –7), (7, –5)

   What polygon did you draw?

   _____



3. Complete the coordinates to draw a square on the grid.

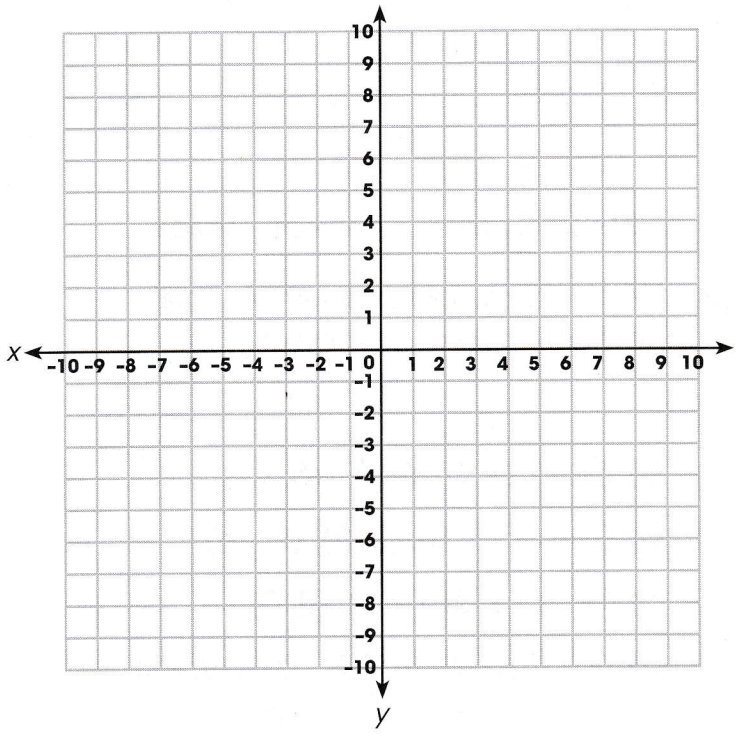
   (-5, -2), (-5, -6), (___, ___), (___, ___),

4. Draw a square in the second quadrant with one vertex at (-8, 6). List the coordinates for the other 3 vertices.

   _____

5. Move the square you drew for Problem 4 across the y-axis into the first quadrant. List the new coordinates.

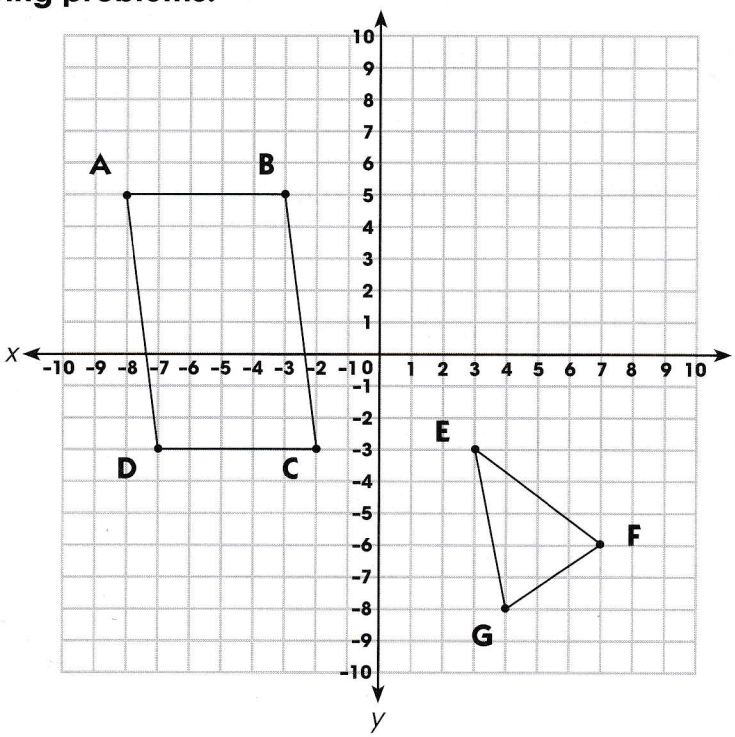
   _____



☆ **Explain what you notice about the coordinates for the square in Problems 4 and 5.**

 Name _____

Solve. Use the coordinate plane for the following problems.



1. What ordered pairs represent the vertices of parallelogram ABCD?

_____

2. (3, –3) represents a vertex of what shape?

_____

3. Draw a square in the first quadrant. List the coordinates of its vertices.

_____

4. List the coordinates for the shape in the fourth quadrant.

_____

Circle the letter for the correct answer.

5. Which ordered pairs show the vertices of a rectangle?

   a) (3, 2), (2, 5), (4, 5), (5, 4)

   b) (5,–6), (5, 8), (2, 8), (2, –6)

   c) (6, 6), (3, 3), (9, 9), (0, 0)

   d) (–11, 5), (–6, 5), (–3, –3), (–9, –3)

6. Which pair of points are exactly 5 units apart?

   a) Points E and F

   b) Points G and F

   c) Points A and D

   d) Points D and C