

11.2

Perimeter and Area in the Coordinate Plane

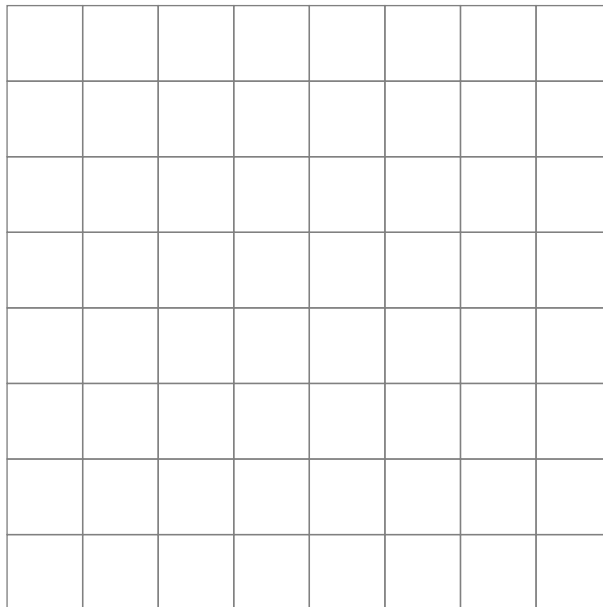
For use with Exploration 11.2

Essential Question How can you find the perimeter and area of a polygon in a coordinate plane?

1 EXPLORATION: Finding the Perimeter and Area of a Quadrilateral

Work with a partner.

- a. On the centimeter graph paper, draw quadrilateral $ABCD$ in a coordinate plane. Label the points $A(1, 4)$, $B(-3, 1)$, $C(0, -3)$, and $D(4, 0)$.



- b. Find the perimeter of quadrilateral $ABCD$.

- c. Are adjacent sides of quadrilateral $ABCD$ perpendicular to each other? How can you tell?

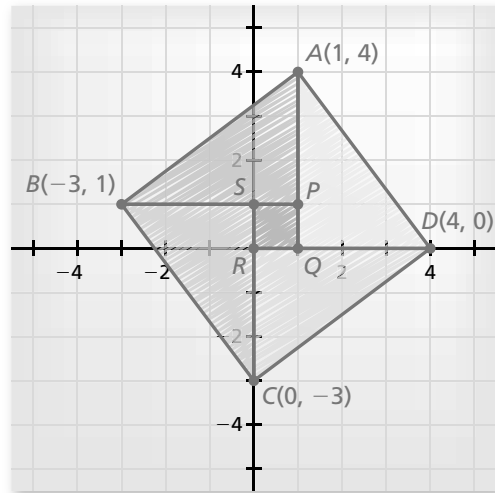
- d. What is the definition of a square? Is quadrilateral $ABCD$ a square? Justify your answer. Find the area of quadrilateral $ABCD$.

11.2 Perimeter and Area in the Coordinate Plane (continued)

2 EXPLORATION: Finding the Area of a Polygon

Work with a partner.

- a. Quadrilateral $ABCD$ is partitioned into four right triangles and one square, as shown. Find the coordinates of the vertices for the five smaller polygons.
- b. Find the areas of the five smaller polygons.



Area of Triangle BPA :

Area of Triangle AQP :

Area of Triangle DRC :

Area of Triangle CSB :

Area of Square $PQRS$:

- c. Is the sum of the areas of the five smaller polygons equal to the area of quadrilateral $ABCD$? Justify your answer.

Communicate Your Answer

- 3. How can you find the perimeter and area of a polygon in a coordinate plane?
- 4. Repeat Exploration 1 for quadrilateral $EFGH$, where the coordinates of the vertices are $E(-3, 6)$, $F(-7, 3)$, $G(-1, -5)$, and $H(3, -2)$.

11.2

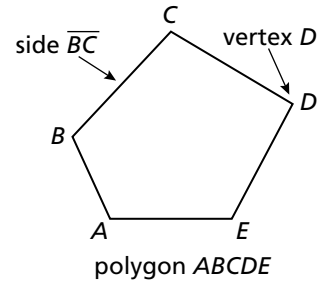
Practice

For use after Lesson 11.2

Core Concepts

Polygons

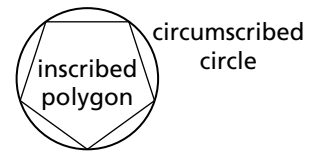
In geometry, a figure that lies in a plane is called a plane figure. Recall that a *polygon* is a closed plane figure formed by three or more line segments called *sides*. Each side intersects exactly two sides, one at each *vertex*, so that no two sides with a common vertex are collinear. You can name a polygon by listing the vertices in consecutive order.



Notes:

Inscribed Polygon

A polygon is an **inscribed polygon** when all its vertices lie on a circle. The circle that contains the vertices is a **circumscribed circle**.



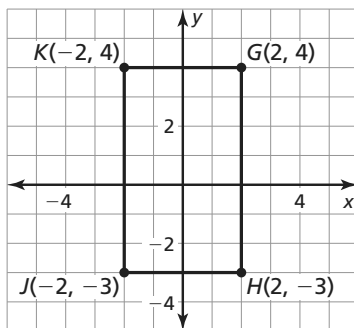
Notes:

Worked-Out Examples

Example #1

Find the perimeter of the polygon with the given vertices.

$G(2, 4)$, $H(2, -3)$, $J(-2, -3)$, $K(-2, 4)$



$$KG = |-2 - 2| = |-4| = 4$$

$$GH = |4 - (-3)| = |4 + 3| = 7$$

$$HJ = |2 - (-2)| = |2 + 2| = 4$$

$$JK = |-3 - 4| = |-7| = 7$$

$$KG + GH + HJ + JK = 4 + 7 + 4 + 7 = 22$$

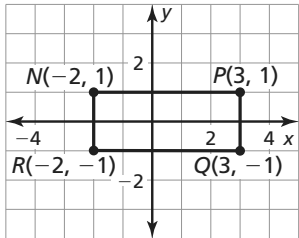
The perimeter of quadrilateral $KGHJ$ is 22 units.

11.2 Practice (continued)

Example #2

Find the area of the polygon with the given vertices.

$N(-2, 1)$, $P(3, 1)$, $Q(3, -1)$, $R(-2, -1)$



Length: $RQ = |3 - (-2)| = |3 + 2| = 5$

Width: $PQ = |1 - (-1)| = |1 + 1| = |2| = 2$

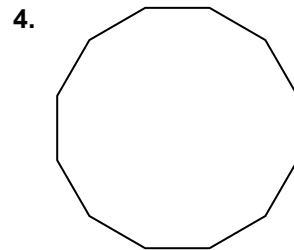
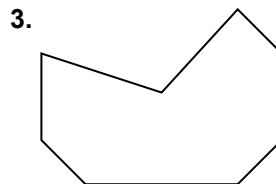
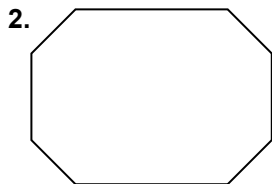
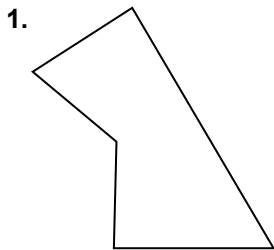
Area = lw

$= 5 \cdot 2 = 10$

The area of quadrilateral $NPRQ$ is 10 square units.

Practice A

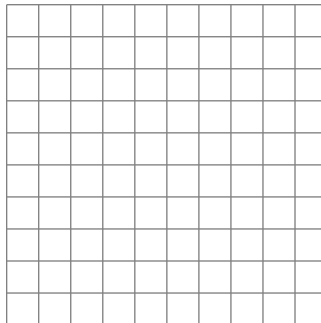
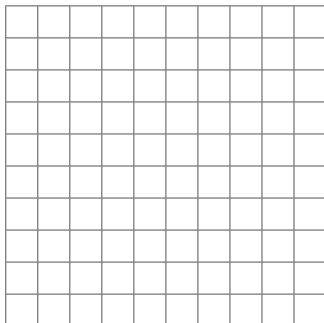
In Exercises 1–4, classify the polygon by the number of sides. Tell whether it is *convex* or *concave*.



In Exercises 5–8, find the perimeter and area of the polygon with the given vertices.

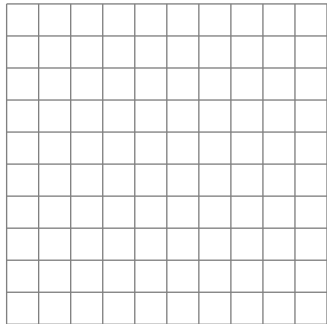
5. $X(2, 4)$, $Y(0, -2)$, $Z(2, -2)$

6. $P(1, 3)$, $Q(1, 1)$, $R(-4, 2)$

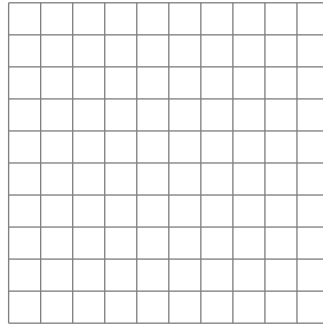


11.2 Practice (continued)

7. $J(-4, 1), K(-4, -2), L(6, -2), M(6, 1)$



8. $D(5, -3), E(5, -6), F(2, -6), G(2, -3)$

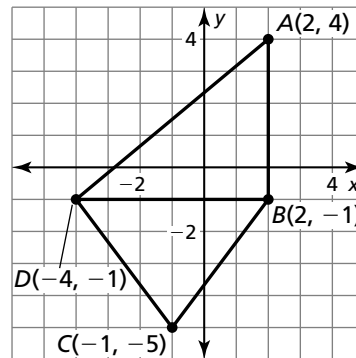


In Exercises 9–14, use the diagram.

9. Find the perimeter of $\triangle ABD$.

10. Find the perimeter of $\triangle BCD$.

11. Find the perimeter of quadrilateral $ABCD$.



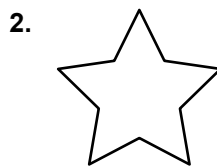
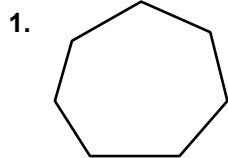
12. Find the area of $\triangle ABD$.

13. Find the area of $\triangle BCD$.

14. Find the area of quadrilateral $ABCD$.

Practice B

In Exercises 1 and 2, classify the polygon by the number of sides. Tell whether it is *convex* or *concave*.



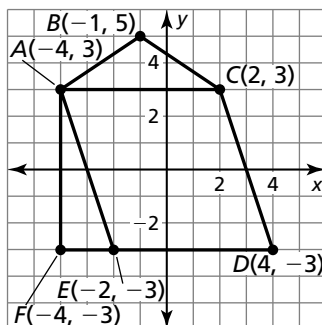
3. Find the perimeter of quadrilateral $ABCD$ with vertices $A(-2, -2)$, $B(-1, 3)$, $C(5, 3)$, and $D(4, -2)$.

In Exercises 4 and 5, find the area of the polygon with the given vertices.

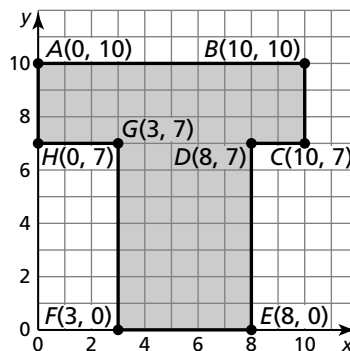
4. $P(1, 1)$, $Q(-2, 1)$, $R(-1, -4)$ 5. $A(3, 7)$, $B(5, 7)$, $C(3, -7)$, $D(5, -7)$

In Exercises 6–10, use the diagram.

6. Find the perimeter of $\triangle ABC$.
7. Find the perimeter of quadrilateral $ACDE$.
8. Find the area of $\triangle ABC$.
9. Find the area of quadrilateral $ACDE$.



10. Find the area of pentagon $ABCDF$.
11. You are buying tile for your bathroom floor and baseboards for your bathroom walls. In the figure, the entire polygon represents the layout of the floor. Each unit in the coordinate plane represents 1 foot.



- a. Find the area of the floor.
 - b. Find the perimeter of the floor.
 - c. The cost of the baseboard is \$2 per foot. The cost of the tile is \$2.50 per square foot. Find the total cost to buy tile and baseboards for your bathroom.
12. You and your friend go for a walk around town. You walk 0.8 mile east and then 1.5 miles south. You then return to where you started. How far do you travel during your entire walk?