

Polygon Map Math

Use coordinates to find area and perimeter.

HIGH SCHOOL • MA.912.GR.3.4

MA.912.GR.3.4 "Use coordinate geometry to solve mathematical and real-world problems on the coordinate plane involving perimeter or area of polygons."

NAME _____

DATE _____

MEASURE FROM COORDINATES

Find area by splitting a polygon into rectangles, triangles, or other shapes with known formulas. For perimeter, add all side lengths. Horizontal and vertical lengths come from coordinate differences, and slanted lengths use $\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$.

WORKED EXAMPLE

Find the area of the kite with vertices (12, -7), (16, -3), (12, 2), and (8, -3).

1. The vertical diagonal from (12, -7) to (12, 2) has length 9.
2. The horizontal diagonal from (8, -3) to (16, -3) has length 8.
3. The diagonals are perpendicular, so area = $\frac{1}{2}(9)(8) = 36$.

Answer: 36 square units

PRACTICE 6 problems

- 1** A rectangle has vertices (1, 4), (1, 10), (6, 10), and (6, 4). Find its area and perimeter.

ANSWER _____

- 2** Find the area of the triangle with vertices (-4, 0), (4, 0), and (0, 6).

ANSWER _____

- 3** A parallelogram has vertices (7, -2), (11, 1), (9, 7), and (5, 4). Find its area and perimeter.

ANSWER _____

- 4** Find the area and perimeter of the trapezoid with vertices (-6, -5), (3, -5), (1, -1), and (-4, -1).

ANSWER _____

- 5** Find the perimeter of the triangle with vertices (13, 3), (13, 9), and (21, 3).

ANSWER _____

- 6** Find the area and perimeter of the polygon with vertices (-9, 11), (-5, 11), (-5, 15), (-7, 15), (-7, 13), and (-9, 13).

ANSWER _____

APPLY IT Show your work

- 1** A student design team is planning a rectangular outdoor study zone. On a map where 1 coordinate unit equals 1 meter, the corners are $(-11, 14)$, $(-4, 14)$, $(-4, 18)$, and $(-11, 18)$. How many square meters of turf are needed, and how many meters of edging are needed around the zone?

WORK SPACE

ANSWER _____

- 2** A gaming club is making a triangular floor graphic for an event. On a coordinate grid where 1 unit equals 1 foot, the vertices are $(17, -6)$, $(29, -6)$, and $(17, 3)$. How many square feet of vinyl are needed, and how many feet of LED strip are needed for the border?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A hexagonal logo has vertices $(21, -6)$, $(29, -6)$, $(33, 4)$, $(29, 14)$, $(21, 14)$, and $(17, 4)$. Find its area and perimeter. Explain how you can split the figure to find the area.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A rectangle has vertices (1, 4), (1, 10), (6, 10), and (6, 4). Find its area and perimeter.	Area = 30 square units; perimeter = 22 units
2	Find the area of the triangle with vertices (-4, 0), (4, 0), and (0, 6).	24 square units
3	A parallelogram has vertices (7, -2), (11, 1), (9, 7), and (5, 4). Find its area and perimeter.	Area = 30 square units; perimeter = $10 + 4\sqrt{10}$ units
4	Find the area and perimeter of the trapezoid with vertices (-6, -5), (3, -5), (1, -1), and (-4, -1).	Area = 28 square units; perimeter = $14 + 4\sqrt{5}$ units
5	Find the perimeter of the triangle with vertices (13, 3), (13, 9), and (21, 3).	24 units
6	Find the area and perimeter of the polygon with vertices (-9, 11), (-5, 11), (-5, 15), (-7, 15), (-7, 13), and (-9, 13).	Area = 12 square units; perimeter = 16 units

PART 2 • APPLY IT

- 28 square meters of turf; 22 meters of edging** The side lengths are 7 meters and 4 meters. Use 7×4 for area and $2(7 + 4)$ for perimeter.
- 54 square feet of vinyl; 36 feet of LED strip** The triangle has legs 12 feet and 9 feet, so its area is $\frac{1}{2}(12)(9)$. Its third side is 15 feet, so add 12, 9, and 15 for the perimeter.

CHALLENGE

Area = 240 square units; perimeter = $16 + 8\sqrt{29}$ units

Accept equivalent exact radical forms, such as $4\sqrt{10} + 10$. For the challenge area explanation, accept a central 8 by 20 rectangle plus two congruent triangles with base 20 and height 4.