

# Coordinate Shape Lab

Use coordinate differences and the distance formula to measure shapes.

HIGH SCHOOL • HSG-GPE.B.7

**CCSS.Math.Content.HSG-GPE.B.7** "Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. \*"

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## MEASURE ON THE GRID

For a horizontal or vertical side, subtract the matching coordinates to find its length. For a slanted side, use distance  $= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ . Add all side lengths for perimeter, and use  $\text{area} = \text{length} \times \text{width}$  for rectangles or  $\text{area} = \frac{1}{2} \times \text{base} \times \text{height}$  for triangles.

## WORKED EXAMPLE

A rectangle has vertices (11, 13), (17, 13), (17, 19), and (11, 19). Find its perimeter and area.

1. Horizontal side length  $= 17 - 11 = 6$ .
2. Vertical side length  $= 19 - 13 = 6$ .
3. Perimeter  $= 2(6 + 6) = 24$ .
4. Area  $= 6 \times 6 = 36$ .

**Answer: Perimeter = 24 units; area = 36 square units.**

## PRACTICE 6 problems

- 1** A rectangle has vertices (0, 0), (5, 0), (5, 3), and (0, 3). Find its perimeter.

ANSWER \_\_\_\_\_

- 2** A triangle has vertices (0, 0), (8, 0), and (0, 5). Find its area.

ANSWER \_\_\_\_\_

- 3** A triangle has vertices (0, 0), (3, 0), and (3, 4). Find its perimeter.

ANSWER \_\_\_\_\_

- 4** A rectangle has vertices (-1, 2), (6, 2), (6, 5), and (-1, 5). Find its area.

ANSWER \_\_\_\_\_

- 5** A triangle has vertices (1, 1), (7, 1), and (1, 7). Find its area.

ANSWER \_\_\_\_\_

- 6** A parallelogram has vertices (0, 0), (4, 0), (6, 3), and (2, 3). Find its perimeter.

ANSWER \_\_\_\_\_

## APPLY IT Show your work

- 1** For a student film festival, a rectangular projection screen is placed on a coordinate grid with corners  $(2, -3)$ ,  $(11, -3)$ ,  $(11, 3)$ , and  $(2, 3)$ . How many square units of screen material are needed, and how many units of border are needed around the screen?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** The art club designs a triangular backdrop with vertices  $(-5, 2)$ ,  $(7, 2)$ , and  $(7, 7)$ . How many square units of fabric are needed, and how many units of edging are needed around the triangle?

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

An L-shaped game zone has vertices, in order,  $(0, 0)$ ,  $(8, 0)$ ,  $(8, 2)$ ,  $(3, 2)$ ,  $(3, 6)$ , and  $(0, 6)$ . Find its perimeter and area. Explain how you found the area.

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## PART 1 • PRACTICE

| # | PROBLEM                                                                              | ANSWER                                   |
|---|--------------------------------------------------------------------------------------|------------------------------------------|
| 1 | A rectangle has vertices (0, 0), (5, 0), (5, 3), and (0, 3). Find its perimeter.     | <b>16 units</b>                          |
| 2 | A triangle has vertices (0, 0), (8, 0), and (0, 5). Find its area.                   | <b>20 square units</b>                   |
| 3 | A triangle has vertices (0, 0), (3, 0), and (3, 4). Find its perimeter.              | <b>12 units</b>                          |
| 4 | A rectangle has vertices (-1, 2), (6, 2), (6, 5), and (-1, 5). Find its area.        | <b>21 square units</b>                   |
| 5 | A triangle has vertices (1, 1), (7, 1), and (1, 7). Find its area.                   | <b>18 square units</b>                   |
| 6 | A parallelogram has vertices (0, 0), (4, 0), (6, 3), and (2, 3). Find its perimeter. | <b><math>8 + 2\sqrt{13}</math> units</b> |

## PART 2 • APPLY IT

- 54 square units of screen material; 30 units of border** The screen is 9 units wide and 6 units tall. Its area is  $9 \times 6$ , and its perimeter is  $2(9 + 6)$ .
- 30 square units of fabric; 30 units of edging** The triangle has a base of 12 units and a height of 5 units, so its area is  $\frac{1}{2} \times 12 \times 5$ . Its side lengths are 12, 5, and 13 units.

## CHALLENGE

**Perimeter = 28 units; area = 28 square units. One method is  $8 \times 6 - 5 \times 4 = 48 - 20 = 28$ .**

Accept equivalent exact forms for the radical perimeter, such as  $2\sqrt{13} + 8$ . Require square units for area and units for perimeter.