

Area and Perimeter of Composite Figures on the Coordinate Plane

LEARNING GOALS

In this lesson, you will:

- Determine the perimeters and the areas of composite figures on a coordinate plane.
- Connect transformations of geometric figures with number sense and operations.
- Determine the perimeters and the areas of composite figures using transformations.

KEY TERM

- composite figures

Did you ever think about street names? How does a city or town decide what to name their streets?

Some street names seem to be very popular. In the United States, almost every town has a Main Street. But in France, there is literally a Victor Hugo Street in every town!

Victor Hugo was a French writer. He is best known for writing the novels *Les Misérables* and *Notre-Dame de Paris*, better known as *The Hunchback of Notre Dame* in English.

If you were in charge of naming the streets in your town, what names would you choose? Would you honor any people with their own streets?

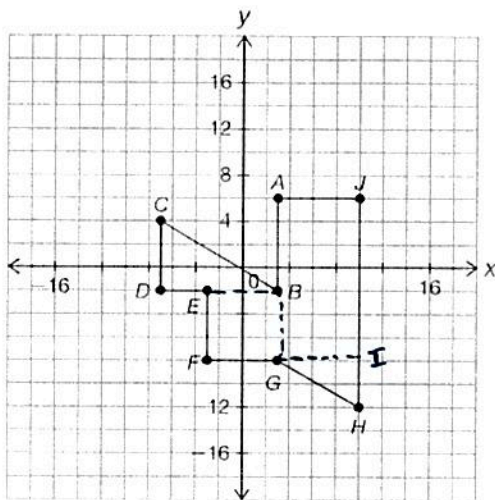
PROBLEM 1 Breakin' It Down



Now that you have determined the perimeters and the areas of various quadrilaterals and triangles, you can use this knowledge to determine the perimeters and the areas of *composite figures*. A **composite figure** is a figure that is formed by combining different shapes. To determine the area of a composite figure, divide it into basic shapes.



1. A composite figure is graphed on the coordinate plane shown.



Determine the perimeter of the composite figure. Round to the nearest tenth if necessary.

horizontals and verticals:

$$CD = 6 \quad FG = 6 \quad AB = 8$$

$$OE = 4 \quad HJ = 18$$

$$EF = 6 \quad AJ = 7$$

* remaining segments (use pythagorean theorem)

$$BC^2 = CD^2 + DB^2$$

$$BC^2 = 6^2 + 10^2$$

$$BC^2 = 36 + 100$$

$$BC = \sqrt{136}$$

$$GH^2 = GI^2 + HI^2$$

$$GH^2 = 7^2 + 4^2$$

$$GH^2 = 49 + 16$$

$$GH = \sqrt{65}$$

$$P = AB + BC + CD + DE + EF + FG + GH + HJ + JA$$

$$P = 8 + \sqrt{136} + 6 + 4 + 6 + 6 + \sqrt{65} + 18 + 7$$

$$P = 74.7$$

2. Draw line segments on the composite figure to divide the figure. Determine the area of the composite figure. Round to the nearest tenth if necessary.

2 triangle, 1 square, 1 rectangle

$$A_{\triangle BCD} = \frac{1}{2}(10)(6) = 30$$

$$A_{\triangle GHI} = \frac{1}{2}(7)(4) = 14$$

$$A_{\square AGIV} = 14(7) = 98$$

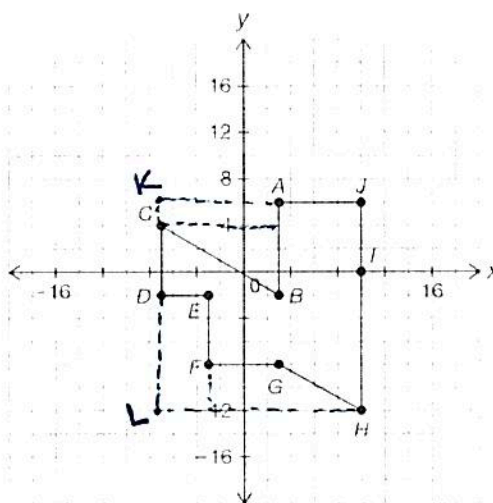
$$A_{\square EFGH} = 6^2 = 36$$

$$A = 30 + 14 + 98 + 36$$

$$A = 178 \text{ units}^2$$

3. Draw line segments on the composite figure to divide the figure differently from how you divided it in Question 2. Determine the area of the composite figure. Round to the nearest tenth if necessary.

Remember to use all of your knowledge about distance, area, perimeter, transformations, and the Pythagorean Theorem to make your calculations more efficient!



$$\text{whole rectangle } A = (18)(17) = 306$$

$$\text{top rectangle } A = 10(2) = 20$$

$$\text{top triangle } A = \frac{1}{2}(10)(6) = 30$$

$$\text{bottom rectangle } A = (10)(4) = 40$$

$$\text{bottom trapezoid } A = \frac{1}{2}(6+13)(4) = 38$$

$$A = 306 - (20+30+40+38)$$

$$306 - 128 = 178 \text{ units}^2$$

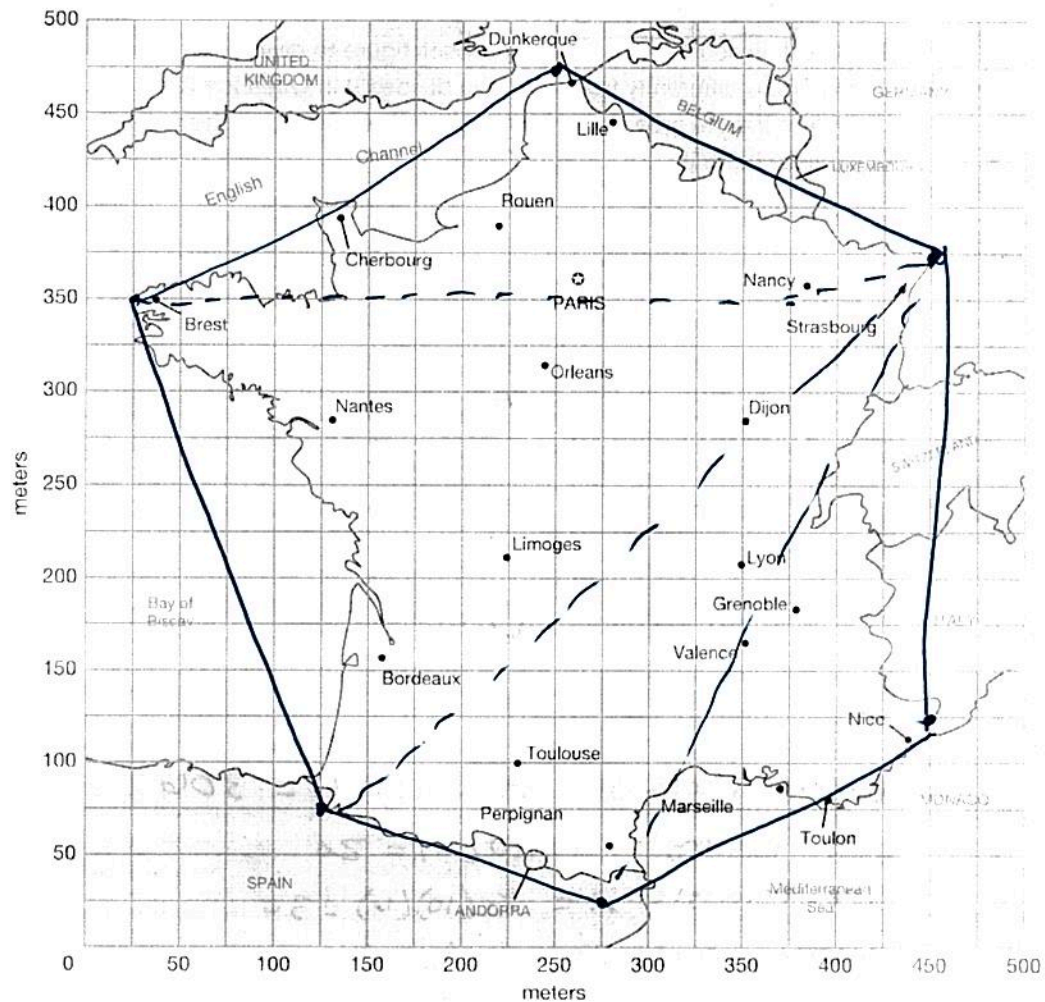


4. How does the area in Question 2 compare to the area in Question 3? Explain your reasoning.

PROBLEM 2 Is France Hexagonal?



1. Draw a hexagon to approximate the shape of France. Use the hexagon for Questions 2 and 3.



2. Which of the following statements is true?

- ☐ The coastline of France is greater than 5000 kilometers.
- ☐ The coastline of France is less than 5000 kilometers.
- ☐ The coastline of France is approximately 5000 kilometers.

Can you
divide the hexagon into
more than one shape?



3. Which of the following statements is true?

- ☐ The area of France is greater than 1,000,000 square kilometers.
- ☐ The area of France is less than 1,000,000 square kilometers.
- ☐ The area of France is approximately 1,000,000 square kilometers.

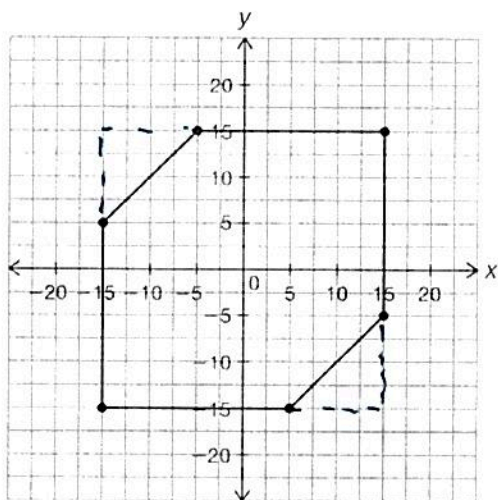


4. If the population of France is approximately 118.4 people per square mile, how many people live in the country of France?

Talk the Talk



Draw line segments on the composite figure to divide the figure into familiar shapes two different ways, and then determine the area of the composite figure each way to show the area remains unchanged.



$$\text{Square } A = 30^2 = 900$$

$$\text{triangles } A = \frac{1}{2}(10)(10) = 50$$

$$A = 900 - (50 + 50) = 800$$



Be prepared to share your solutions and methods.