

LESSON 9.3 Area of Composite Figures

 **FL** 7.G.2.6

Solve real-world and mathematical problems involving area, ... of ... objects composed of triangles, quadrilaterals, polygons, ...



ESSENTIAL QUESTION

How do you find the area of composite figures?

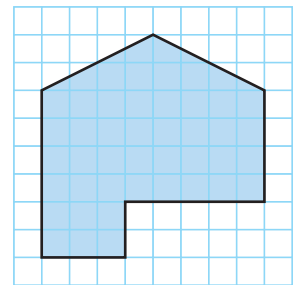
EXPLORE ACTIVITY



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Exploring Areas of Composite Figures

Aaron was plotting the shape of his garden on grid paper. While it was an irregular shape, it was perfect for his yard. Each square on the grid represents 1 square meter.



- A** Describe one way you can find the area of this garden.

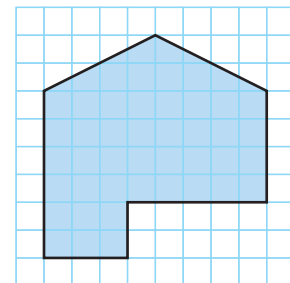
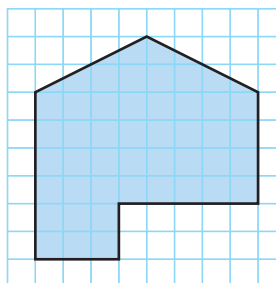
- B** The area of the garden is _____ square meters.

- C** Compare your results with other students. What other methods were used to find the area?

- D** How does the area you found compare with the area found using different methods?

Reflect

1. Use dotted lines to show two different ways Aaron's garden could be divided up into simple geometric figures.





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Finding the Area of a Composite Figure

A composite figure is made up of simple geometric shapes. To find the area of a composite figure or other irregular-shaped figure, divide it into simple, nonoverlapping figures. Find the area of each simpler figure, and then add the areas together to find the total area of the composite figure.

Use the chart below to review some common area formulas.

Shape	Area Formula
triangle	$A = \frac{1}{2}bh$
square	$A = s^2$
rectangle	$A = \ell w$
parallelogram	$A = bh$
trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$



Animated Math

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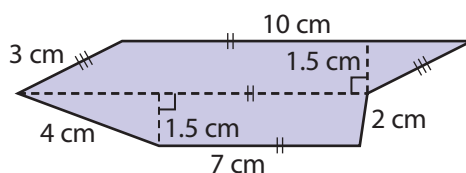
EXAMPLE 1



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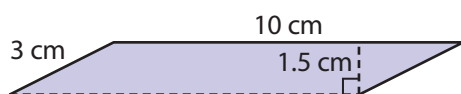
Find the area of the figure.

STEP 1 Separate the figure into smaller, familiar figures: a parallelogram and a trapezoid.



STEP 2 Find the area of each shape.

Area of the Parallelogram



$$\text{base} = 10 \text{ cm}$$

$$\text{height} = 1.5 \text{ cm}$$

Use the formula.

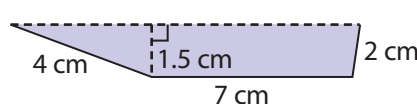
$$A = bh$$

$$A = 10 \cdot 1.5$$

$$A = 15$$

The area of the parallelogram is 15 cm^2 .

Area of the Trapezoid



$$\text{base}_1 = 7 \text{ cm} \quad \text{base}_2 = 10 \text{ cm}$$

$$\text{height} = 1.5 \text{ cm}$$

Use the formula.

$$A = \frac{1}{2}h(b_1 + b_2)$$

$$A = \frac{1}{2}(1.5)(7 + 10)$$

$$A = \frac{1}{2}(1.5)(17) = 12.75$$

The area of the trapezoid is 12.75 cm^2 .

The top base of the trapezoid is 10 cm since it is the same length as the base of the parallelogram.

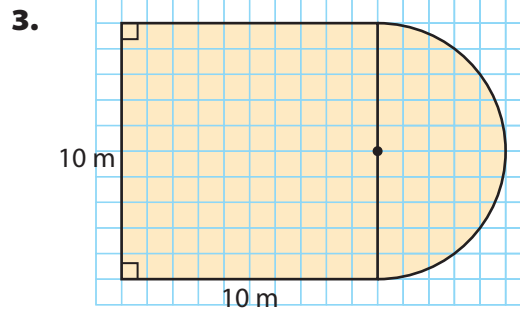
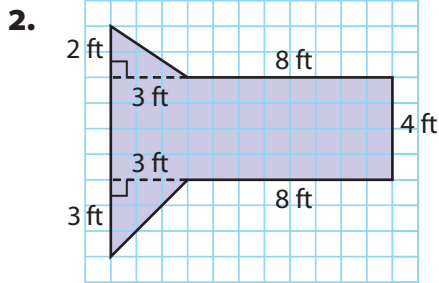
STEP 3 Add the areas to find the total area.

$$A = 15 + 12.75 = 27.75 \text{ cm}^2$$

The area of the figure is 27.75 cm^2 .

YOUR TURN

Find the area of each figure. Use 3.14 for π .



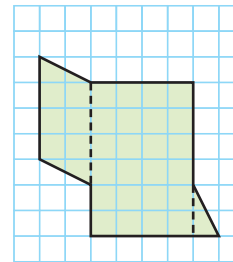
Using Area to Solve Problems

EXAMPLE 2



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A banquet room is being carpeted. A floor plan of the room is shown at right. Each unit represents 1 yard. The carpet costs \$23.50 per square yard. How much will it cost to carpet the room?



STEP 1 Separate the composite figure into simpler shapes as shown by the dashed lines: a parallelogram, a rectangle, and a triangle.

STEP 2 Find the area of the simpler figures. Count units to find the dimensions.

Parallelogram

$$A = bh$$

$$A = 4 \cdot 2$$

$$A = 8 \text{ yd}^2$$

Rectangle

$$A = \ell w$$

$$A = 6 \cdot 4$$

$$A = 24 \text{ yd}^2$$

Triangle

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

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

$$A = 1 \text{ yd}^2$$

STEP 3 Find the area of the composite figure.

$$A = 8 + 24 + 1 = 33 \text{ square yards}$$

STEP 4 Calculate the cost to carpet the room.

$$\text{Area} \cdot \text{Cost per yard} = \text{Total cost}$$

$$33 \cdot \$23.50 = \$775.50$$

The cost to carpet the banquet room is \$775.50.



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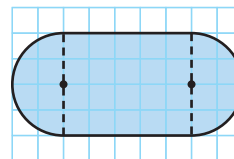
Math Talk

Mathematical Practices

Describe how you can estimate the cost to carpet the room.

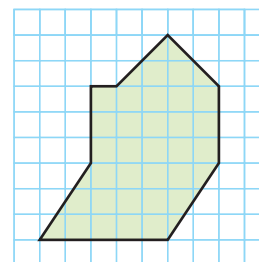
YOUR TURN

4. A window is being replaced with tinted glass. The plan at the right shows the design of the window. Each unit length represents 1 foot. The glass costs \$28 per square foot. How much will it cost to replace the glass? Use 3.14 for π .



Guided Practice

1. A tile installer plots an irregular shape on grid paper. Each square on the grid represents 1 square centimeter. What is the area of the irregular shape? (Explore Activity, Example 2)



STEP 1 Separate the figure into a triangle, a _____, and a parallelogram.

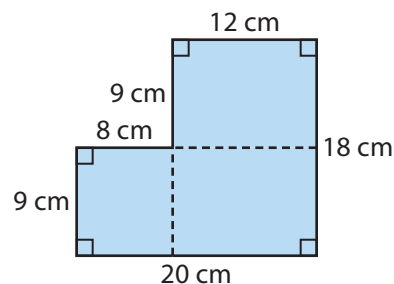
STEP 2 Find the area of each figure.

triangle: ____ cm^2 ; rectangle: ____ cm^2 ; parallelogram: ____ cm^2

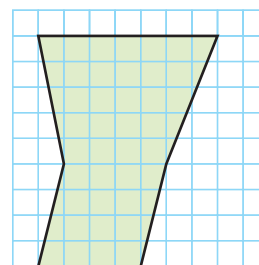
STEP 3 Find the area of the composite figure: ____ + ____ + ____ = ____ cm^2

The area of the irregular shape is ____ cm^2 .

2. Show two different ways to divide the composite figure. Find the area both ways. Show your work below. (Example 1)



3. Sal is tiling his entryway. The floor plan is drawn on a unit grid. Each unit length represents 1 foot. Tile costs \$2.25 per square foot. How much will Sal pay to tile his entryway? (Example 2)



ESSENTIAL QUESTION CHECK-IN

4. What is the first step in finding the area of a composite figure?

9.3 Independent Practice



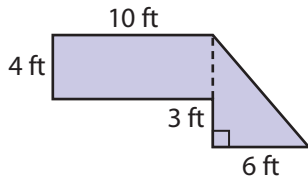
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5. A banner is made of a square and a semicircle. The square has side lengths of 26 inches. One side of the square is also the diameter of the semicircle. What is the total area of the banner? Use 3.14 for π .

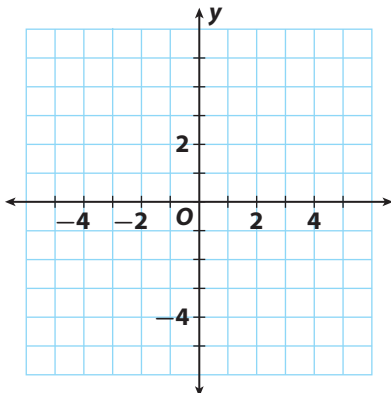
6. **Multistep** Erin wants to carpet the floor of her closet. A floor plan of the closet is shown.



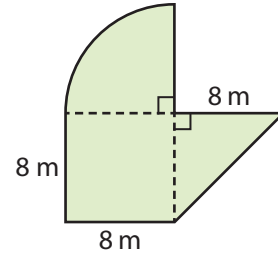
- a. How much carpet does Erin need?

- b. The carpet Erin has chosen costs \$2.50 per square foot. How much will it cost her to carpet the floor?

7. **Multiple Representations** Hexagon $ABCDEF$ has vertices $A(-2, 4)$, $B(0, 4)$, $C(2, 1)$, $D(5, 1)$, $E(5, -2)$, and $F(-2, -2)$. Sketch the figure on a coordinate plane. What is the area of the hexagon?

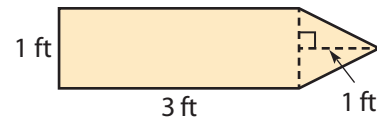


8. A field is shaped like the figure shown. What is the area of the field? Use 3.14 for π .



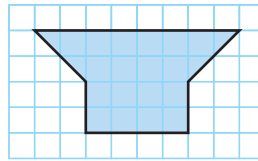
9. A bookmark is shaped like a rectangle with a semicircle attached at both ends. The rectangle is 12 cm long and 4 cm wide. The diameter of each semicircle is the width of the rectangle. What is the area of the bookmark? Use 3.14 for π .

10. **Multistep** Alex is making 12 pennants for the school fair. The pattern he is using to make the pennants is shown in the figure. The fabric for the pennants costs \$1.25 per square foot. How much will it cost Alex to make 12 pennants?

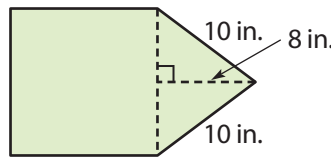


11. **Reasoning** A composite figure is formed by combining a square and a triangle. Its total area is 32.5 ft^2 . The area of the triangle is 7.5 ft^2 . What is the length of each side of the square? Explain.

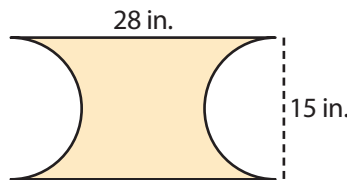
- 12. Represent Real-World Problems** Christina plotted the shape of her garden on graph paper. She estimates that she will get about 15 carrots from each square unit. She plans to use the entire garden for carrots. About how many carrots can she expect to grow? Explain.



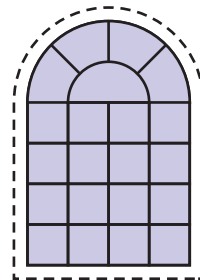
- 13. Analyze Relationships** The figure shown is made up of a triangle and a square. The perimeter of the figure is 56 inches. What is the area of the figure? Explain.



- 14. Critical Thinking** The pattern for a scarf is shown at right. What is the area of the scarf? Use 3.14 for π .



- 15. Persevere in Problem Solving** The design for the palladium window shown includes a semicircular shape at the top. The bottom is formed by squares of equal size. A shade for the window will extend 4 inches beyond the perimeter of the window, shown by the dashed line around the window. Each square in the window has an area of 100 in^2 .



- a.** What is the area of the window? Use 3.14 for π .
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- b.** What is the area of the shade? Round your answer to the nearest whole number.
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