MODULE 12-AREA,SURFACE AREA,AND VOLUME.

LESSON -3-AREA OF COMPOSITE FIGURES

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Learning Objective

Students will find the area of composite figures

I'm finished when...

Success Criteria

I can recall the areas of square and rectangles
I can develop strategy to find area of composite figures
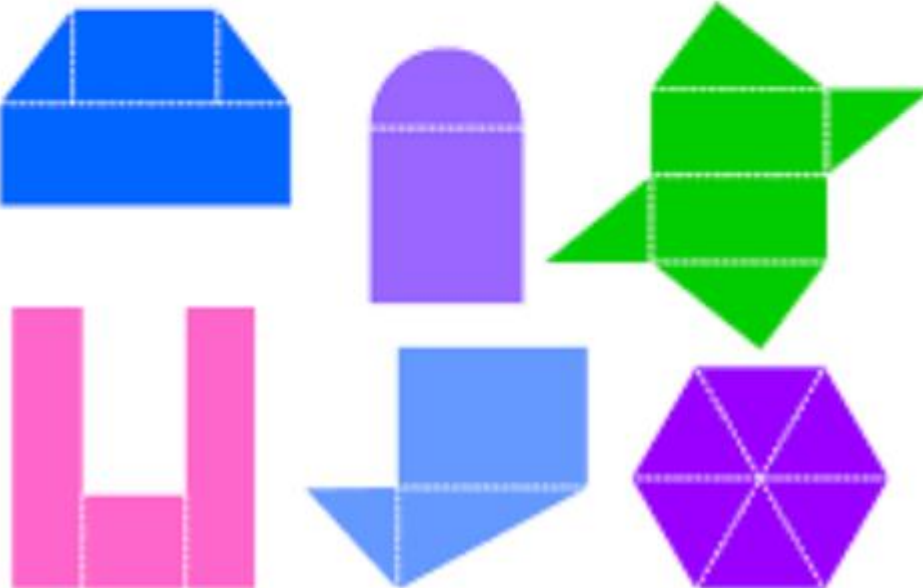
Vocabulary

Area
Composite Figure

composite figure

A figure that is composed of a variety of two-dimensional shapes.

Composite figures are often split into their component shapes to calculate area.

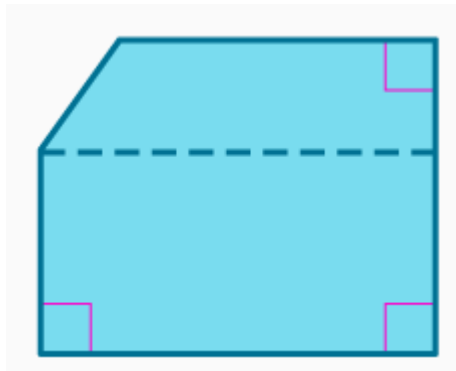### examples

Starter Activity.

Warm Up

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

1. square with side length 13 inches

2. trapezoid with height 5 centimeters and bases 8 centimeters and 10 centimeters

3. semicircle with radius 15 feet

4. parallelogram with height 2 meters and base 7 meters

5. The semicircle above the free throw line on a basketball court has a diameter of 12 feet. What is the area of the semicircle?

Learn – Area of Composite Figures

A composite figure is made up of two or more shapes. To find the area of a composite figure, decompose the figure into shapes with area you know how to find .Then find the sum of those areas

When analyzing the structure of a composite figure, look for shapes like the ones below into which you can decompose the composite figure
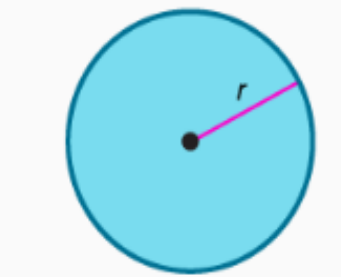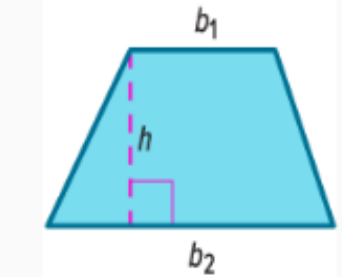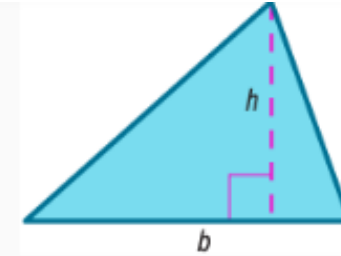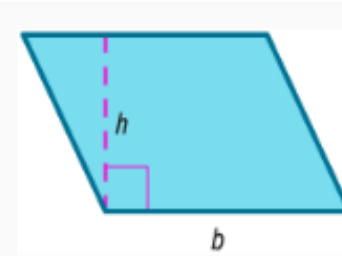
| circle |
| parallelogram |
| trapezoid |
| triangle |
| $A = \frac{1}{2}bh$ |
| $A = \pi r^2$ |
| $A = \frac{1}{2}h(b_1 + b_2)$ |
| $A = bh$ |

Example 1 · Area of Composite Figures

Ayanna is painting a sign made from a piece of reclaimed wood with the dimensions shown. What is the area of the sign?

Step 1 Decompose the figure into smaller figures.

The figure is a pentagon that is composed of a rectangle and a triangle.

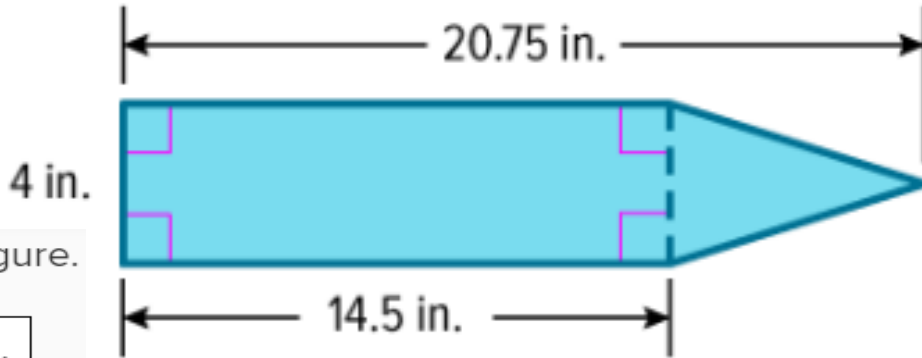Drag the values to show the measures of each figure.

| 4 in. | 6.25 in. | 14.5 in. | 20.75 in. |

rectangle length:

rectangle width:

triangle base:

triangle height:

20.75 in.

4 in.

14.5 in.

Example 1·Area of Composite Figures

Ayanna is painting a sign made from a piece of reclaimed wood with the dimensions shown. What is the area of the sign?

Step 2 Find the area of each figure.

Enter the correct measures to find the area of each figure.
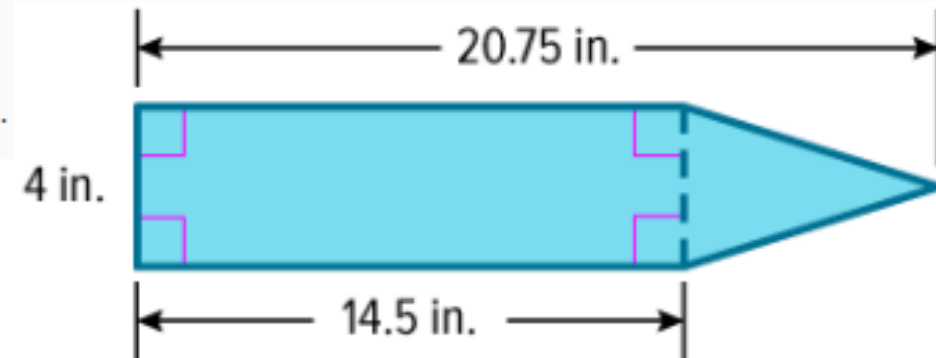
Find the area of the rectangle.

$$A = \ell \cdot w$$

$$= \boxed{}$$

Find the area of the triangle.

$$A = \tfrac{1}{2}b \cdot h$$

$$= \boxed{}$$

Step 3 Find the area of the composite figure.

The area of the rectangle is 58 square inches. The area of the triangle is 12.5 square inches. Find the sum of the areas to find the area of the composite figure.

So, the area of the composite figure is $58 + 12.5$ or $\boxed{}$ square inches.

20.75 in.

4 in.

14.5 in.

Learn-Area of Shaded Regions

Find the Area of a Shaded Region

Example 2 · Area of Shaded Regions

Find the Area of the Shaded region. Use 3.14 for pi .Round to the nearest hundredth if necessary?

Step 1 Find the area of the entire figure.

The entire figure is a circle. Use the formula $A = \pi r^2$ to find the area of the circle. Round to the nearest hundredth.
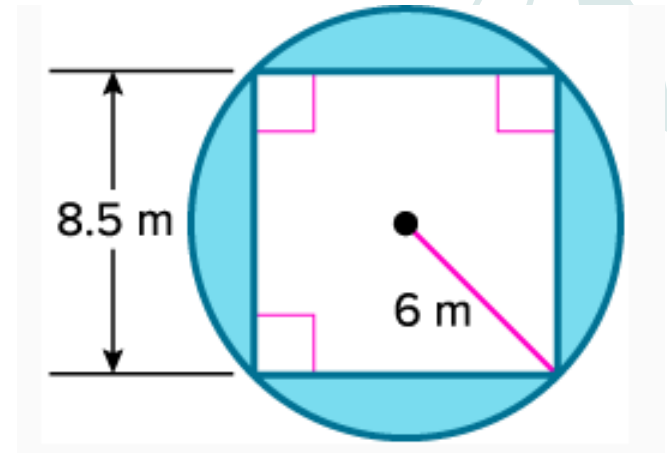
$A = \pi r^2$ Area of entire figure, a circle.

$A \approx 3.14 \cdot 6^2$ Replace π with 3.14 and r with 6.

$A \approx 113.04$ Simplify.

The area of the circle is approximately ☐ square meters.

Step 2 Find the unshaded area.

The unshaded area is in the shape of a square. Use the formula $A = s^2$ to find the area of the square with side length s. The length of one side is 8.5 meters.

$A = s^2$ Area of unshaded region, a square.

$A = 8.5^2$ Replace s with 8.5.

$A = 72.25$ Simplify.

The area of the white space is ☐ square meters.

8.5 m

6 m

Example 2 · Area of Shaded Regions

Find the Area of the Shaded region. Use 3.14 for pi .Round to the nearest hundredth if necessary?

Step 3 Find the area of the shaded region.

The area of the circle is about 113.04 square meters. The area of the square is 72.25 square meters. Subtract the area of the square from the area of the circle to find the approximate area of the shaded region.

Because $113.04 - 72.25 =$ [   ] , the area of the shaded region is approximately [   ] square meters.

8.5 m

6 m
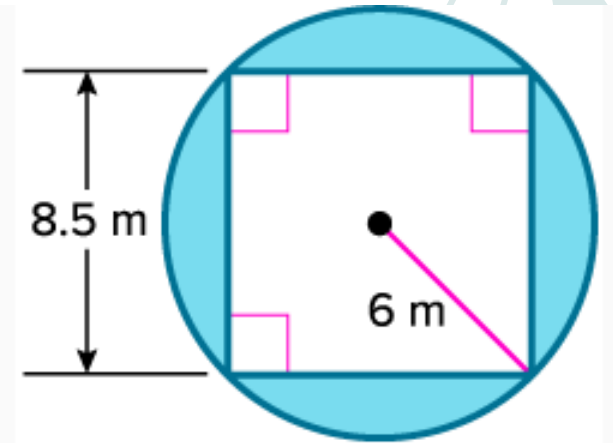
Example 4 ·Use Circumference to find the Area

The exact circumference of a circle is 32 pi inches. What is the approximate area of the circle. Round to the nearest hundredth if necessary?

Step 1 Find the radius.

Use the circumference formula to find the radius of the circle.

$$C = 2\pi r \qquad \text{Circumference of a circle}$$
$$32\pi = 2\pi r \qquad \text{Replace } C \text{ with } 32\pi.$$
$$\frac{32\pi}{2\pi} = \frac{2\pi r}{2\pi} \qquad \text{Division Property of Equality; Divide each side by } 2\pi.$$
$$16 = r \qquad \text{Simplify.}$$

The radius of the circle is ⬚ inches.

Step 2 Find the area.

The radius of the circle is 16 inches.

$$A = \pi r^2 \qquad \text{Area of a circle}$$
$$A \approx 3.14 \cdot 16^2 \qquad \text{Replace } \pi \text{ with 3.14 and } r \text{ with 16.}$$
$$A \approx 803.84 \qquad \text{Simplify.}$$

So, the approximate area of the circle is ⬚ square inches.

Apply -ART

The members of the local community center are planning on using ceramic tiles to create a mosaic on the side of the building. One tile covers 2.5 square feet. How many tiles are needed to make the mosaic?
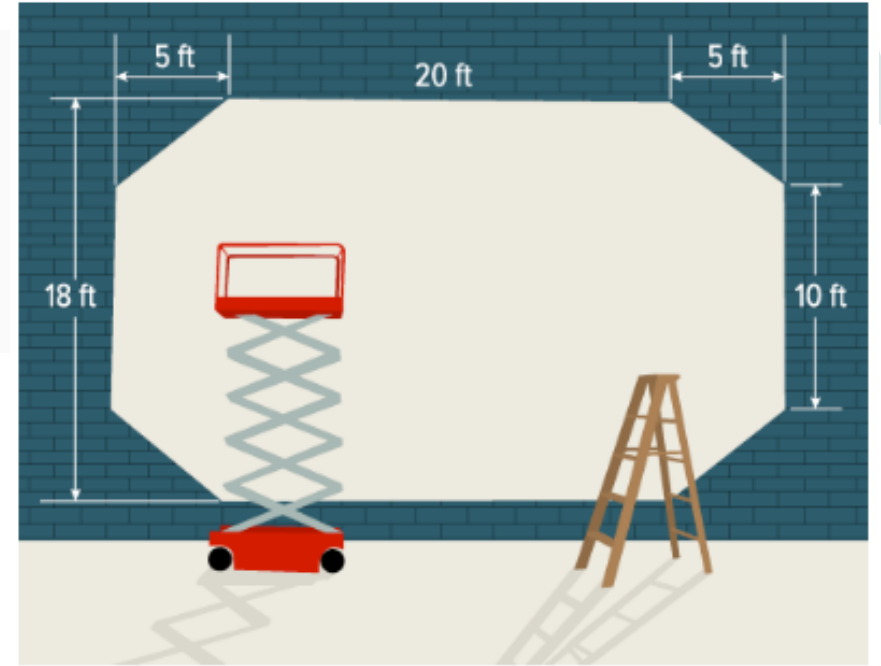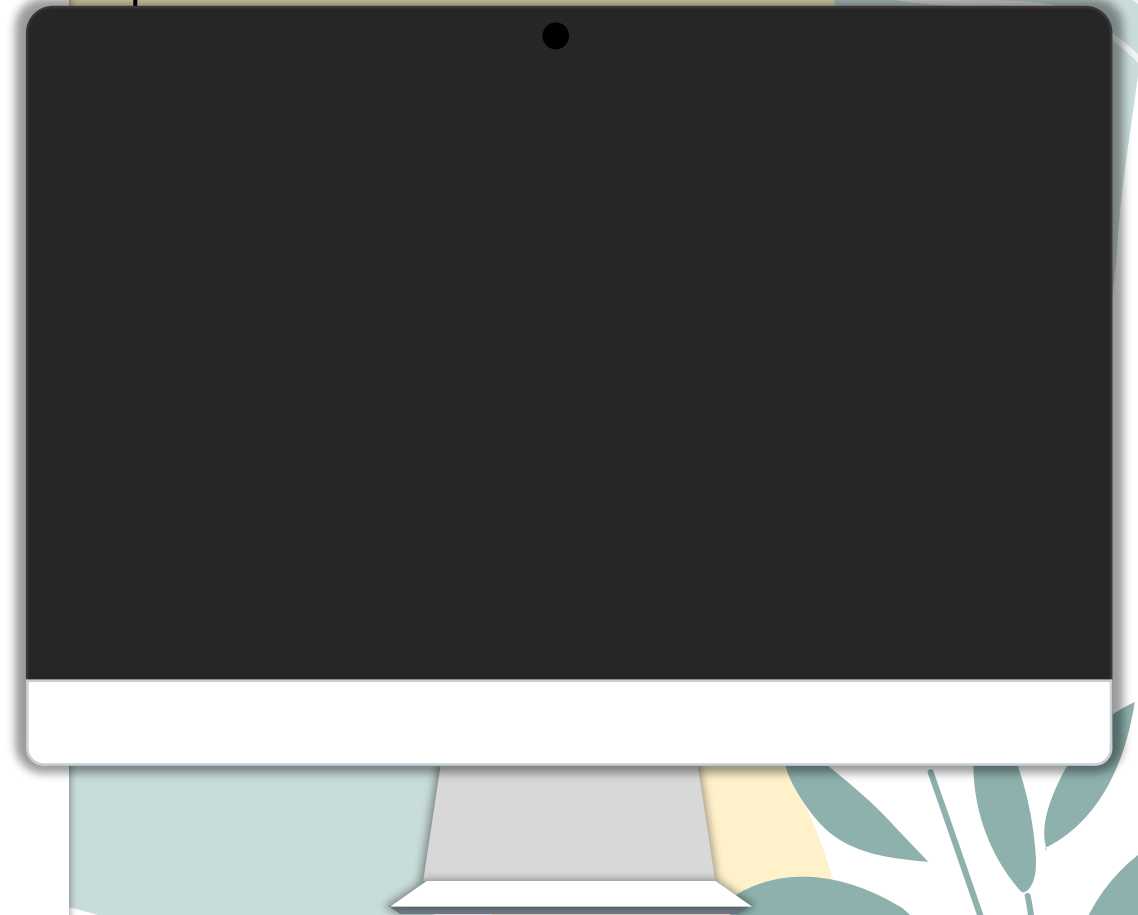
Add images.

Images are a big part of any slideshow presentation. They help your audience connect with your ideas on a more emotional level.
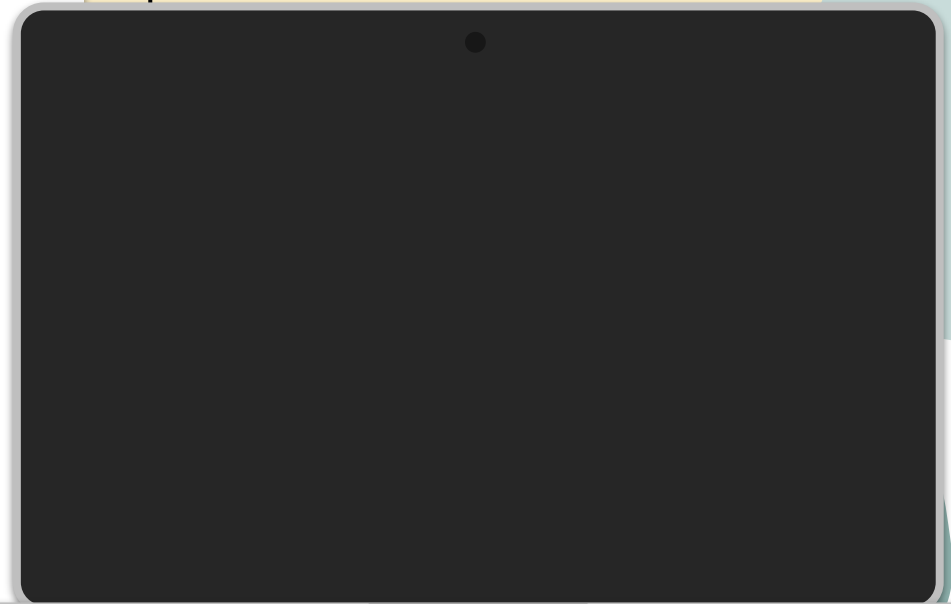
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If you are presenting a website, an internet product or an app, you can place a screenshot of it here.

Add your title here.

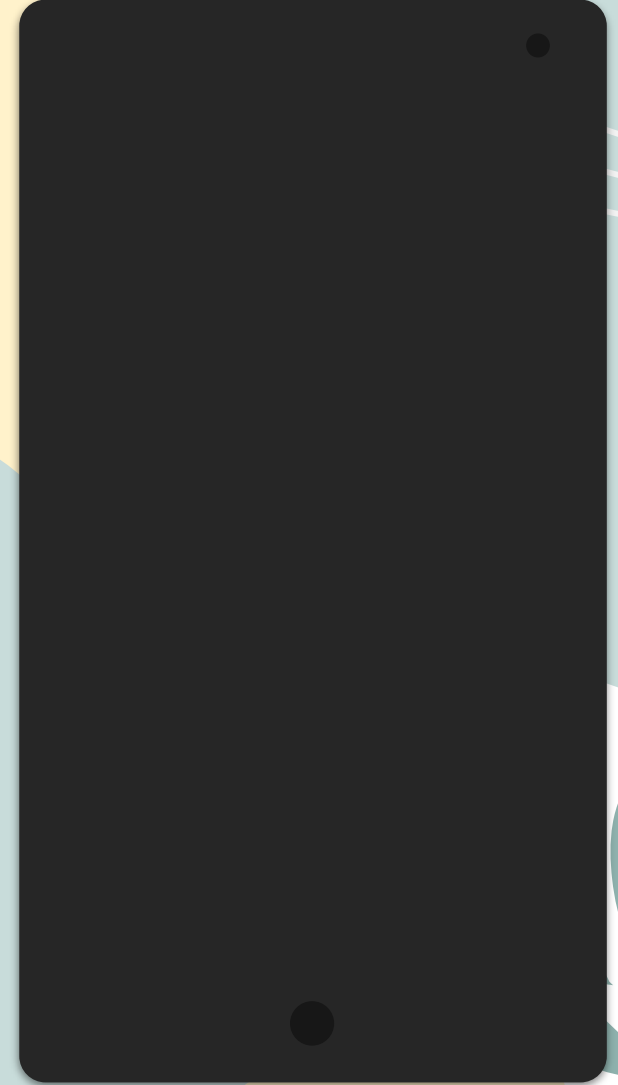If you are presenting a website, an internet product or an app, you can place a screenshot of it here.
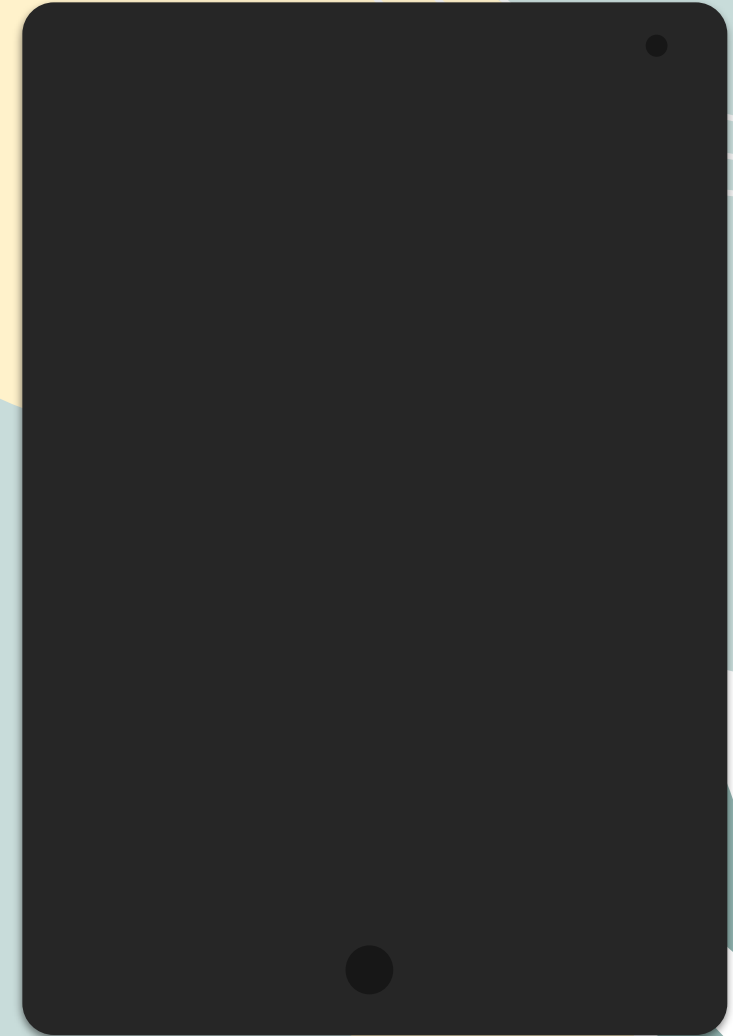
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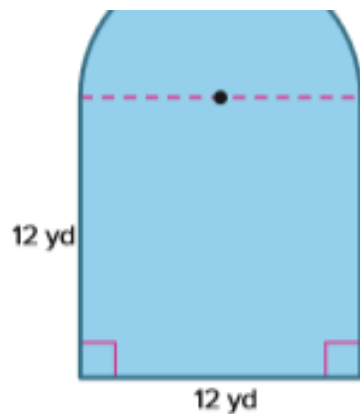
Add your title here.

If you are presenting a website, an internet product or an app, you can place a screenshot of it here.

Thank you!

12 yd

12 yd

SOLUTION:
The figure is composed of a rectangle and a semicircle. Find the area of each figure.

Rectangle
$A = \ell w$
$\quad = 12 \cdot 12$
$\quad = 144$

Semicircle
$A = \dfrac{1}{2}\pi r^2$

$\quad = \dfrac{1}{2} \cdot 3.14 \cdot 6^2$

$\quad = 56.25$

Find the area of the composite figure.
$144 + 56.25 = 200.52$
So, the area of the composite figure is about 200.52 square yards.
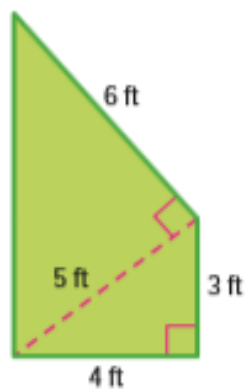
SOLUTION:
The figure is composed of two triangles. Find the area of each figure.

Triangle 1

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

$$= \frac{1}{2} \cdot 5 \cdot 6$$

$$= 15$$

Triangle 2

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

$$= \frac{1}{2} \cdot 4 \cdot 3$$

$$= 6$$

Find the area of the composite figure.

$15 + 6 = 21$

So, the area of the composite figure is 21 square feet.
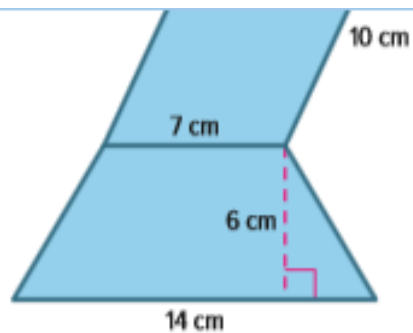
SOLUTION:
The figure is composed of a parallelogram and a trapezoid. Find the area of each figure.

Parallelogram
$A = bh$
$\quad = 10 \cdot 5$
$\quad = 50$

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

$\quad = \dfrac{1}{2} \cdot 6(7 + 14)$

$\quad = \dfrac{1}{2} \cdot 6(21)$

$\quad = 63$

Find the area of the composite figure.
$50 + 63 = 113$
So, the area of the composite figure is 113 square centimeters.

Find the area of the figure. If necessary, use 3.14 for π and round to the nearest hundredth.
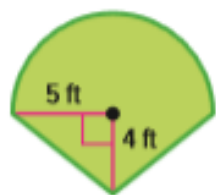
SOLUTION:
The figure is composed of a triangle and a semicircle. Find the area of each figure.

Triangle

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

$\quad = \dfrac{1}{2} \cdot 4 \cdot 10$

$\quad = 20$

Semicircle

$A = \dfrac{1}{2}\pi r^2$

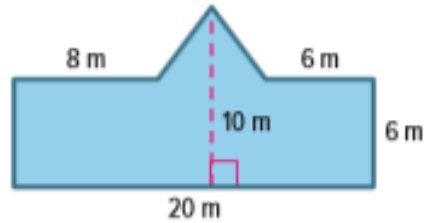$\quad = \dfrac{1}{2} \cdot 3.14 \cdot 5^2$

$\quad = 39.25$

Find the area of the composite figure.
$20 + 39.25 = 59.25$
So, the area of the composite figure is about 59.25 square feet.

Exercise 5

Find the area of the figure. If necessary, use 3.14 for π and round to the nearest hundredth.

SOLUTION:
The figure is composed of a triangle and a rectangle. Find the area of each figure.

Triangle

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

$$= \frac{1}{2} \cdot 6 \cdot 4$$

$$= 12$$

Rectangle

$A = \ell w$

$= 6 \cdot 20$

$= 120$

Find the area of the composite figure.
12+ 120 = 132
So, the area of the composite figure is about 132 square meters.
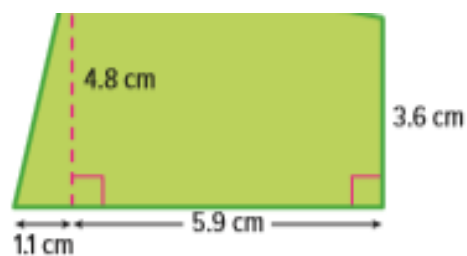
SOLUTION:
The figure is composed of a triangle and a trapezoid. Find the area of each figure.

Triangle

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

$$= \frac{1}{2} \cdot 1.1 \cdot 4.8$$

$$= 2.64$$

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

$$= \frac{1}{2} \cdot 5.9(4.8 + 3.6)$$

$$= \frac{1}{2} \cdot 5.9(21)$$
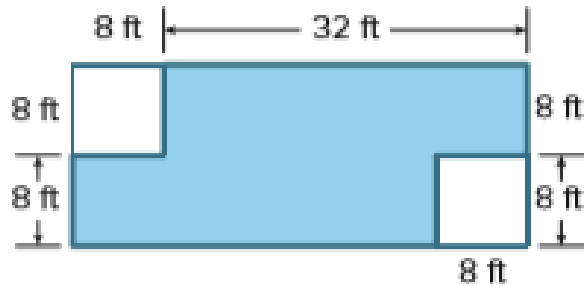
$$= 24.70$$

Find the area of the composite figure.
2.64 + 24.70 = 27.42
So, the area of the composite figure is 27.42 square centimeters.

Exercise 7

Find the area of the shaded region.

SOLUTION:

Find the area of the entire figure.

$A = \ell w$ Area of entire figure, a rectangle

$\quad = 40 \cdot 16$ Replace ℓ with 40 and w with 16.

$\quad = 640$ Simplify.

Find the two unshaded areas. The unshaded area is two squares with same the side length.

$A = s^2$ Area of unshaded region, a square

$\quad = (8)^2$ Replace s with 9.

$\quad = 64$ Simplify.

The area of unshaded areas is 64 + 64 or 128.

The area of the shaded region is 640 − 128 or 512 square feet.

Exercise 8

Open Response Find the area of the shaded region.

20 cm

16 cm

40 cm
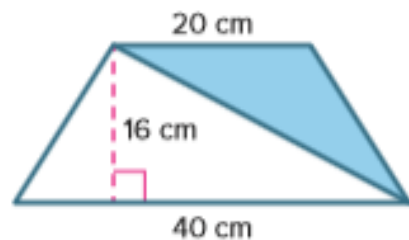
SOLUTION:

Find the area of the entire figure.

$A = \dfrac{1}{2}h(b_1 + b_2)$ Area of entire figure, a trapezoid

$= \dfrac{1}{2}(16)(20 + 40)$ Replace h with 16, b_1 with 20, and b_2 with 40.

$= \dfrac{1}{2}(16)(60)$ Add.

$= 480$ Simplify.

Find unshaded area.

$A = \dfrac{1}{2}bh$ Area of unshaded region, a triangle

$= \dfrac{1}{2} \cdot 40 \cdot 16$ Replace b with 40 and h with 16.

$= 320$ Simplify.

The area of the shaded region is $480 - 320$ or 160 square centimeters.

Alonzo needs to sod his backyard. The figure shows the measurements of the area of his yard which he intends to sod of sod covers 400 square feet. How many full pallets of sod will Alonzo need to have enough for his entire yard?
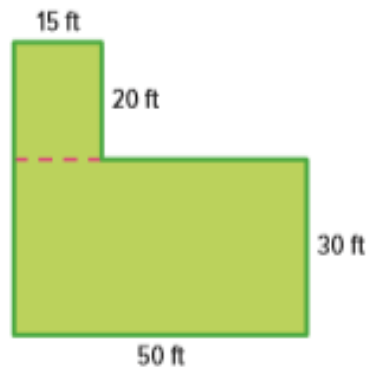
SOLUTION:
The figure is composed of two rectangles. Find the area of each figure.

Rectangle 1
$A = \ell w$
   $= 15 \cdot 20$
   $= 300$

Rectangle 2
$A = \ell w$
   $= 50 \cdot 30$
   $= 1{,}500$
The area of the composite figure is $300 + 1{,}500$ or $1{,}800$ square feet.

Find the number of full pallets Alonzo will need.
$1{,}800 \div 400 = 4.5$
Because Alonzo needs full pallets round 4.5 to 5. He will need 5 pallets.

2.5 ft   2.5 ft

SOLUTION:
The figure is composed of a trapezoid and two trapezoids with the same dimensions. Find the area of each figure.

Trapezoids 1 and 2

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

$$= \frac{1}{2} \cdot 2(3 + 3)$$

$$= \frac{1}{2} \cdot 2(6)$$

$$= 6$$

Trapezoid 3

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

$$= \frac{1}{2} \cdot 2(8 + 6)$$

$$= \frac{1}{2} \cdot 2(14)$$

$$= 14$$

The area of the composite figure is $6 + 6 + 14$ or 26 square feet.

The total cost is $26 \times \$42.50$ or $\$1,105.00$.

Exercise 11

Reason Inductively Write an argument explaining how you can find the area of the shaded figure.
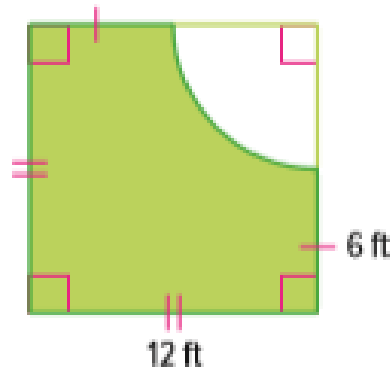
SOLUTION:

First, find the area of the square.

$A = 12 \times 12$ or 144 ft^2

Then find the area of the quarter circle.

$A = \dfrac{1}{4}(3.14 \times 6 \times 6)$ or 28.26 ft^2

Subtract the area of the quarter circle from the area of the square.

$144 \text{ ft}^2 - 28.26 \text{ ft}^2 = 115.74 \text{ ft}^2$

Exercise 12

Create Write and solve a real-world problem that involves finding the area of a composite figure.

SOLUTION:

Sample answer: A family is buying a cover for their swimming pool. The cover costs $2.95 per square foot. How much will the cover cost? Round to the nearest dollar.
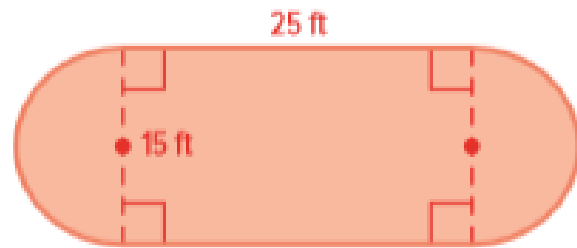
The area of the rectangle is 15 × 25 or 375 ft^2. The area of the circle is 3.14 × 7.5 × 7.5 or 176.625 ft^2. The total area is 375 ft^2 + 176.625 ft^2 or 551.625 ft^2. The total cost is $2.95 × 551.625 or $1,627.

Exercise 13

Reason Abstractly Suppose a swimming pool is in the shape of a composite figure that has a curved side that is not a semicircle. Explain how you could estimate the area of the swimming pool.
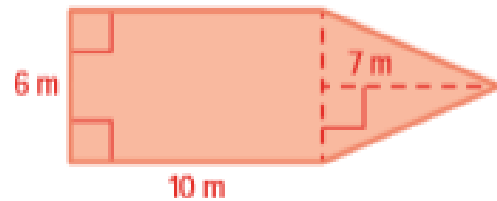
SOLUTION:

Sample answer: Use polygons to approximate the shape of the curved side of the swimming pool

Exercise 14

Draw and label a composite figure that involves a rectangle and triangle. Then find the area of the figure.

SOLUTION:
Sample answer:

The area of the rectangle is 6 × 10 or 60 m^2. The area of the triangle is $\frac{1}{2}$ (6)(7) or 21 m^2. The total area is 60 m^2 + 21 m^2 or 81 m^2.