

UNIT 5



Area and Volume



Essential Question

HOW can you use different measurements to solve real-life problems?



Chapter 8

Area

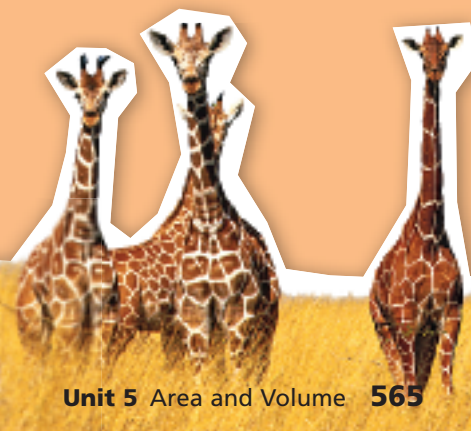
A composite figure can be decomposed into triangles and other shapes. In this chapter, you will find the area of triangles, quadrilaterals, and composite figures.



Chapter 9

Volume and Surface Area

Prisms and pyramids are examples of three-dimensional figures. In this chapter, you will find the volume and surface area of three-dimensional figures in the context of solving real-world and mathematical problems.



Chapter 8

Area



Essential Question

HOW does measurement help you solve problems in everyday life?



Common Core GPS

Content Standards

MCC6.G.1, MCC6.G.3,
MCC6.NS.8

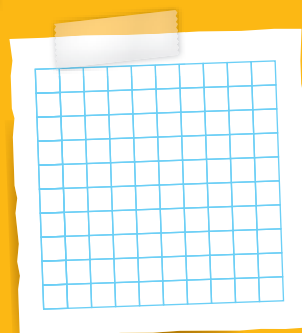
Mathematical Practices

1, 2, 3, 4, 5, 6, 7, 8



Math in the Real World

Gardens A garden designer plants dahlias in a 5 foot by 3 foot plot. What area of the garden do the dahlias cover? In the diagram below, shade the area covered by dahlias.



Area = _____

FOLDABLES[®] Study Organizer

1

Cut out the correct Foldable from the FL pages in the back of this book.

2

Place your Foldable on the Key Concept page toward the end of this chapter.

3

Use the Foldable throughout this chapter to help you learn about area.

What Tools Do You Need?



Vocabulary

base

composite figure

congruent

formula

height

parallelogram

polygon

rhombus

Review Vocabulary

Using a graphic organizer can help you to remember important vocabulary terms. Fill in the graphic organizer below for the word *area*.

Area

Definition

Units of Measure

Real-World Examples

When Will You Use This?



Play it online!



Your Turn!

You will solve this problem in the chapter.

Are You Ready?

Try the Quick Check below.
Or, take the Online Readiness Quiz.

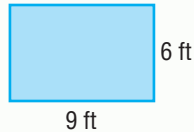


Quick Review

Common Core Review MCC4.MD.3, MCC5.NF.4

Example 1

Find the area of the rectangle.



$$\begin{aligned} A &= \ell w && \text{Area of a rectangle} \\ A &= 9 \cdot 6 && \text{Replace } \ell \text{ with 9 and } w \text{ with 6.} \\ A &= 54 && \text{Multiply.} \end{aligned}$$

The area of the rectangle is 54 square feet.

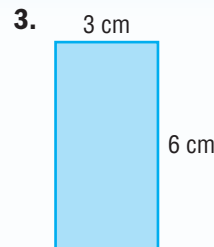
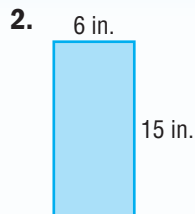
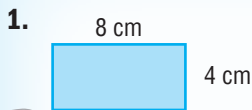
Example 2

Find $\frac{1}{2} \times 16$.

$$\begin{aligned} \frac{1}{2} \times 16 &= \frac{1}{2} \times \frac{16}{1} && \text{Write 16 as } \frac{16}{1}. \\ &= \frac{1 \times 16}{2 \times 1} && \text{Divide the numerator and the denominator by 2.} \\ &= \frac{8}{1} \text{ or } 8 && \text{Simplify.} \end{aligned}$$

Quick Check

Area Find the area of each rectangle.



Show your work.

4. The playing area of a board game is a rectangle with a length of 14 inches and a width of 20 inches. What is the area of the board game? _____

Fractions Multiply. Write in simplest form.

5. $\frac{1}{2} \times 28 =$ _____ 6. $\frac{1}{3} \times 27 =$ _____ 7. $\frac{1}{7} \times 84 =$ _____

How Did You Do?

Which problems did you answer correctly in the Quick Check?
Shade those exercise numbers below.



Inquiry Lab

Area of Parallelograms



HOW does finding the area of a parallelogram relate to finding the area of a rectangle?

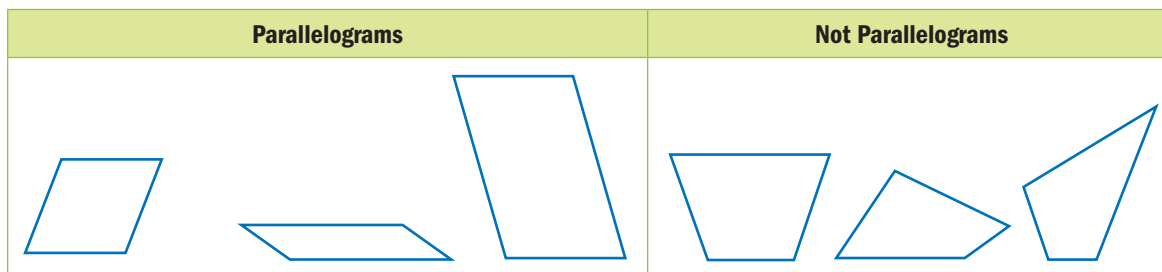


Content Standards
MCC6.G.1
Mathematical Practices
1, 2, 3, 5

Banners Elise wants to make a banner in the shape of a parallelogram. Her parallelogram has a base of 3 feet and a height of 2 feet. What is the area of her parallelogram?

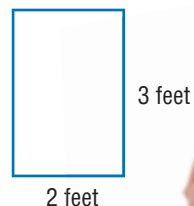
Investigation 1

Another type of quadrilateral is a *parallelogram*. A parallelogram has opposite sides parallel and congruent.

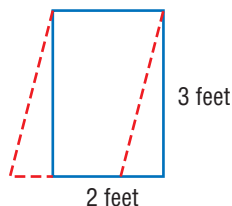


Make a parallelogram to represent Elise's banner.

Step 1 Start with a rectangle.
Trace the rectangle shown at the right.



Step 2 Cut a triangle from one side of the rectangle you traced and move it to the other side to form a parallelogram. Tape the parallelogram to the right.



The rectangle was rearranged to form the parallelogram. Nothing was removed or added, so the parallelogram has _____ area as the rectangle.

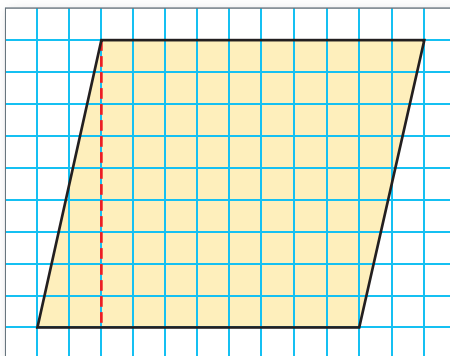
Step 3 Find the base and height of the parallelogram to find the area.
The base of the parallelogram is 2 feet and the height is 3 feet.

feet \times feet = square feet

Investigation 2

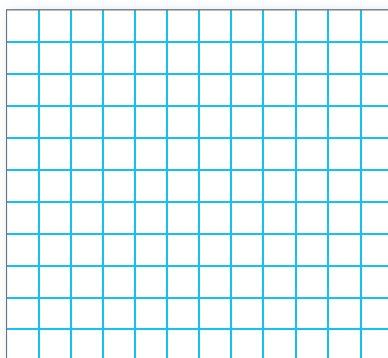
Find the area of the parallelogram below.

- Step 1** Trace the parallelogram on grid paper and cut it out.



- Step 2** Fold and cut along the dotted line.

- Step 3** Move the triangle to the right to make a rectangle. Tape the rectangle in the space provided.



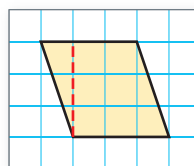
- Step 4** Count the number of square units in the rectangle.

The area is square units.

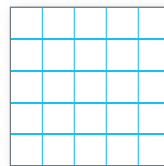
Investigation 3

Find the area of the parallelogram below.

- Step 1** Trace the parallelogram and cut it out.



- Step 2** Fold and cut along the dotted line. Then move the triangle to the right to make a rectangle. Tape it in the space provided.



- Step 3** Count the number of square units in the rectangle.

The area is square units.

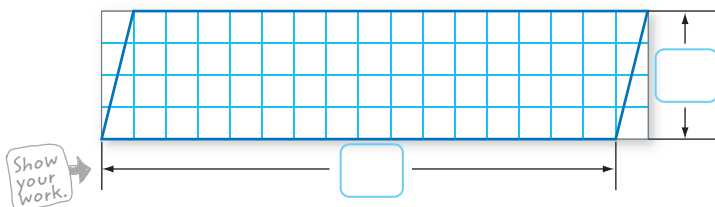


Collaborate

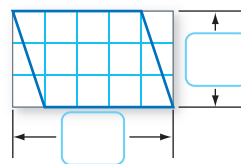


Use Math Tools Work with a partner. Find the area of each parallelogram.

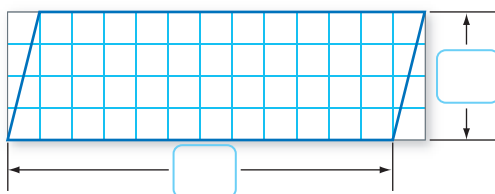
1. $A = \underline{\hspace{2cm}}$ square units



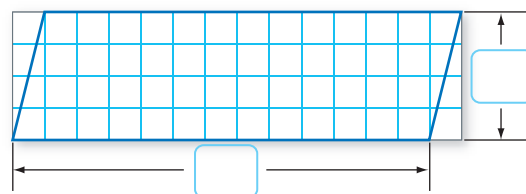
2. $A = \underline{\hspace{2cm}}$ square units



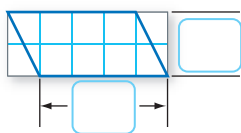
3. $A = \underline{\hspace{2cm}}$ square units



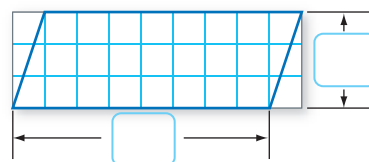
4. $A = \underline{\hspace{2cm}}$ square units



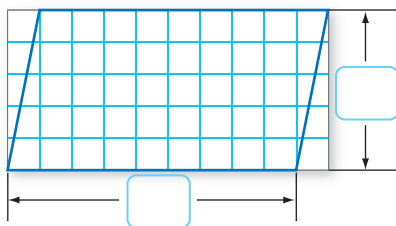
5. $A = \underline{\hspace{2cm}}$ square units



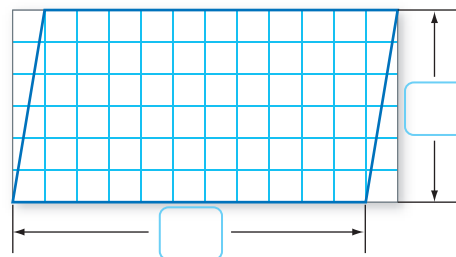
6. $A = \underline{\hspace{2cm}}$ square units



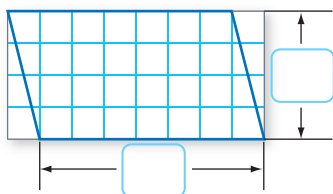
7. $A = \underline{\hspace{2cm}}$ square units



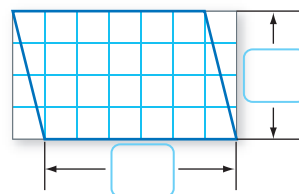
8. $A = \underline{\hspace{2cm}}$ square units



9. $A = \underline{\hspace{2cm}}$ square units



10. $A = \underline{\hspace{2cm}}$ square units





Analyze

The table shows the dimensions of several rectangles and the corresponding dimensions of several parallelograms if each rectangle was rearranged to form a parallelogram. Work with a partner to complete the table. The first one is done for you.

| | Rectangle | Length (ℓ) | Width (w) | Parallelogram | Base (b) | Height (h) | Area (units ²) |
|-----|-------------|-------------------|---------------|-----------------|--------------|----------------|----------------------------|
| | Rectangle 1 | 6 | 2 | Parallelogram 1 | 6 | 2 | 12 |
| 11. | Rectangle 2 | 12 | 4 | Parallelogram 2 | | | |
| 12. | Rectangle 3 | 7 | 3 | Parallelogram 3 | | | |
| 13. | Rectangle 4 | 5 | 4 | Parallelogram 4 | | | |
| 14. | Rectangle 5 | 10 | 6 | Parallelogram 5 | | | |
| 15. | Rectangle 6 | 6 | 4 | Parallelogram 6 | | | |
| 16. | Rectangle 7 | 15 | 9 | Parallelogram 7 | | | |
| 17. | Rectangle 8 | 9 | 3 | Parallelogram 8 | | | |



18. A rectangle was rearranged to form a parallelogram. How is the height of the parallelogram similar to and different from the width of the rectangle?

19. **Reason Inductively** Write a rule that gives the area of a parallelogram.



Reflect

20. **Reason Abstractly** If you were to draw three different parallelograms each with a base of 6 units and a height of 4 units, how would the areas compare? _____

21. **HOW** does finding the area of a parallelogram relate to finding the area of a rectangle?

Area of Parallelograms

What You'll Learn

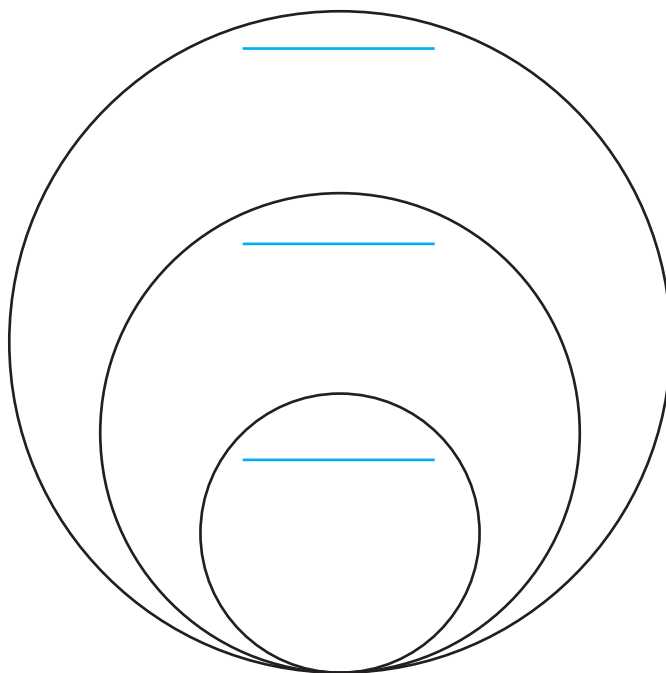
Scan the lesson. List two headings you would use to make an outline of the lesson.

- _____
- _____
- _____

Vocabulary Start-Up



A **polygon** is a closed figure formed by 3 or more straight lines. A **parallelogram** is a quadrilateral with opposite sides parallel and opposite sides the same length. A **rhombus** is a parallelogram with four equal sides. Fill in the lines in the diagram with polygon, parallelogram, or rhombus and draw an example of each.



Real-World Link

Stairs Expert skateboarders can slide down the railings of stairs safely. A parallelogram is used to build a staircase. How many sets of parallel lines are shown in the parallelogram to the right?



Essential Question

HOW does measurement help you solve problems in everyday life?



Vocabulary

polygon
parallelogram
rhombus
base
height
formula



Common Core GPS

Content Standards
MCC6.G.1

Mathematical Practices
1, 3, 4, 7



Key Concept

Area of a Parallelogram

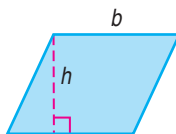


Work Zone

Words

The area A of a parallelogram is the product of its base b and its height h .

Model

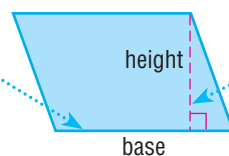


Symbols

$$A = bh$$

The area of a parallelogram is related to the area of a rectangle as you discovered in the previous Inquiry Lab.

The **base** of a parallelogram can be any one of its sides.



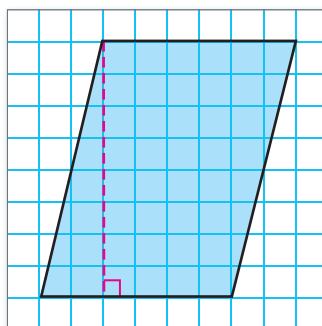
The **height** is the perpendicular distance from the base to the opposite side.

Parallelograms include special quadrilaterals, such as rectangles, squares, and rhombi.

Examples



1. Find the area of the parallelogram.



The base is 6 units, and the height is 8 units.

$$A = bh$$

Area of parallelogram

$$A = 6 \cdot 8$$

Replace b with 6 and h with 8.

$$A = 48$$

Multiply.

The area is 48 square units or 48 units².

Area Measurement

An area measurement can be written using abbreviations and an exponent of 2.

For example:

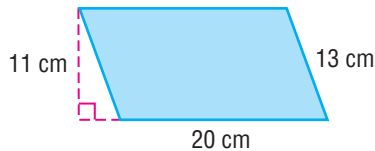
$$\text{square units} = \text{units}^2$$

$$\text{square inches} = \text{in}^2$$

$$\text{square feet} = \text{ft}^2$$

$$\text{square meters} = \text{m}^2$$

2. Find the area of the parallelogram.



Estimate $A \approx 20 \cdot 10$ or 200 cm^2

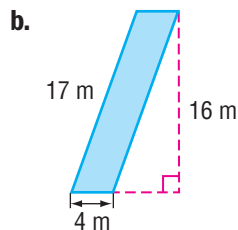
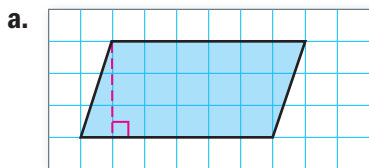
$$A = bh \quad \text{Area of parallelogram}$$

$$A = 20 \cdot 11 \quad \text{Replace } b \text{ with 20 and } h \text{ with 11.}$$

$$A = 220 \quad \text{Check for Reasonableness } 220 \approx 200 \checkmark$$

The area is 220 square centimeters or 220 cm^2 .

Got It? Do these problems to find out.



Show your work.

a. _____

b. _____

Find Missing Dimensions

A **formula** is an equation that shows a relationship among certain quantities. To find missing dimensions, use the formula for the area of a parallelogram. Replace the variables with the known measurements. Then solve the equation for the remaining variable.

Example



3. Find the missing dimension of the parallelogram.

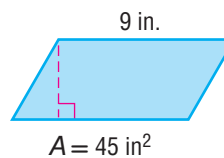
$$A = bh \quad \text{Area of a parallelogram}$$

$$45 = 9 \cdot h \quad \text{Replace } A \text{ with 45 and } b \text{ with 9.}$$

$$\frac{45}{9} = \frac{9 \cdot h}{9} \quad \text{Divide each side by 9.}$$

$$5 = h \quad \text{Simplify.}$$

So, the height is 5 inches.



Checking Your Work

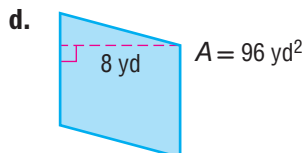
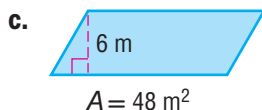
To check your work, replace b and h in the formula with 9 and 5.

$$A = bh$$

$$A = 9 \cdot 5$$

$$A = 45 \checkmark$$

Got It? Do these problems to find out.



c. _____

d. _____



Example



Height of Parallelograms

For the parallelogram formed by the area shaded black in Example 4, its height, 12 inches, is labeled outside the parallelogram.

4. Romilla is painting a replica of the national flag of Trinidad and Tobago for a research project. Find the area of the black stripe.

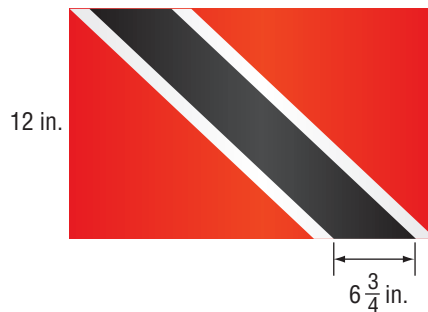
The black stripe is shaped like a parallelogram. So, use the formula $A = bh$.

$$A = bh \quad \text{Area of parallelogram}$$

$$A = 6\frac{3}{4} \cdot 12 \quad \text{Replace } b \text{ with } 6\frac{3}{4} \text{ and } h \text{ with } 12.$$

$$A = 81 \quad 6\frac{3}{4} \cdot 12 = \frac{27}{4} \cdot 12, \text{ or } 81$$

The area of the flag that is black is 81 square inches.



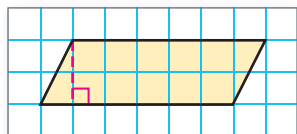
Guided Practice



Find the area of each parallelogram. (Examples 1 and 2)

1. _____

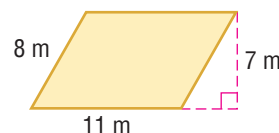
Show your work.



2. _____



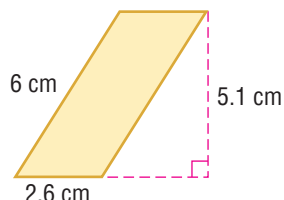
3. _____



4. Find the height of a parallelogram if its base is 35 centimeters and its area is 700 square centimeters.

(Example 3) _____

5. The size of the parallelogram piece in a set of tangrams is shown at the right. Find the area of the piece. (Example 4)



6.  **Building on the Essential Question** How are parallelograms related to triangles and rectangles?

Rate Yourself!

How confident are you about the area of parallelograms? Shade the ring on the target.



For more help, go online to access a Personal Tutor.



FOLDABLES Time to update your Foldable!

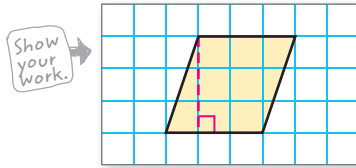
Independent Practice

Go online for Step-by-Step Solutions

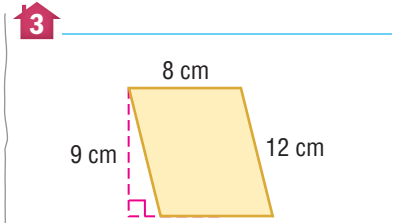


Find the area of each parallelogram. (Examples 1 and 2)

1. _____



2. base, 6 millimeters;
height, 4 millimeters



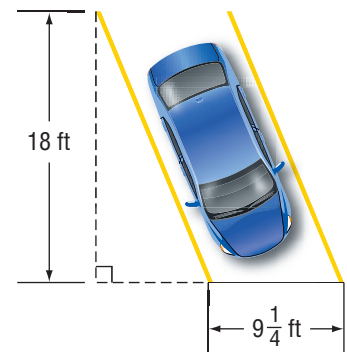
4. Find the base of a parallelogram with an area of 24 square feet and height 3 feet. (Example 3) _____

5. Find the area of the parking space shown to the right.

(Example 4) _____

6. **STEM** An architect designed three different parallelogram-shaped brick patios. Write the missing dimensions in the table.

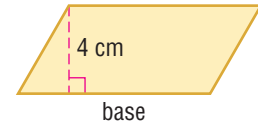
| Patio | Base (ft) | Height (ft) | Area (ft ²) |
|-------|-----------------|-----------------|-------------------------|
| 1 | $15\frac{3}{4}$ | | 147 |
| 2 | | $11\frac{1}{4}$ | $140\frac{5}{8}$ |
| 3 | $10\frac{1}{4}$ | | $151\frac{3}{16}$ |



7. The base of a building is shaped like a parallelogram. The first floor has an area of 20,000 square feet. If the base of this parallelogram is 250 feet, can its height be 70 feet? Explain.

8. **CCPS Identify Structure** Draw and label a parallelogram with a base twice as long as the height and an area less than 60 square inches. Find the area. _____

9. **CCGPS Multiple Representations** Draw five parallelograms that each have a height of 4 centimeters and different base measurements on centimeter grid paper.

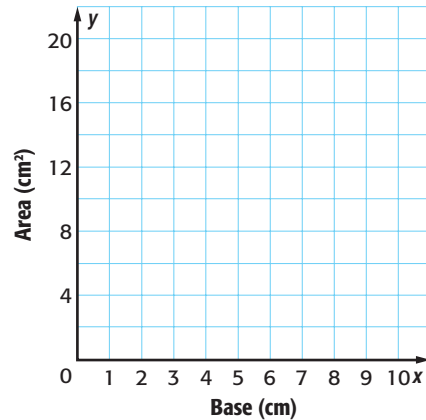


- a. **Table** Make a table with a column for base, height, and area.

| Base (cm) | Height (cm) | Area (cm ²) |
|-----------|-------------|-------------------------|
| | 4 | |
| | 4 | |
| | 4 | |
| | 4 | |
| | 4 | |



- b. **Graph** Graph the ordered pairs (base, area).

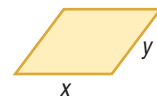
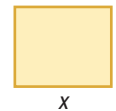


- c. **Words** Describe the graph. _____



H.O.T. Problems Higher Order Thinking

10. **CCGPS Persevere with Problems** If $x = 5$ and $y < x$, which figure has the greater area? Explain your reasoning.



11. **CCGPS Reason Inductively** Explain how the formula for the area of a parallelogram is related to the formula for the area of a rectangle.



Georgia Test Practice

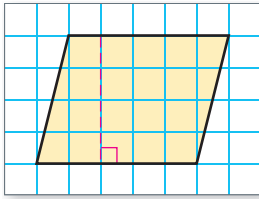
12. Robert used a piece of poster board shaped like a parallelogram to make a sign. The base of the poster board is 52 inches, and the area is 1,872 square inches. Find the height of the poster board.

- (A) 884 in. (C) 42 in.
(B) 176 in. (D) 36 in.

Extra Practice

Find the area of each parallelogram.

13. 20 units^2



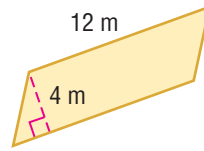
Homework Help

$$A = bh$$

$$A = 5 \cdot 4$$

$$A = 20$$

14. _____

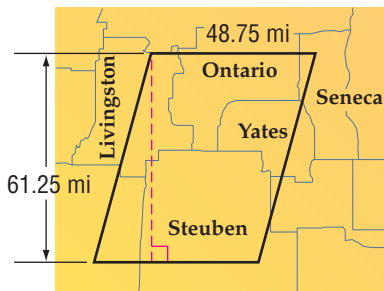


15. base, 12 inches;
height, 15 inches

16. Find the height of a parallelogram with base 6.75 meters and an area of 218.7 square meters.

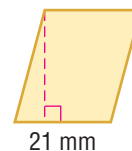
17. Find the area of a parallelogram with base 15 yards and height $21\frac{2}{3}$ yards.

18. What is the area of the region shown on the map? _____



19. What is the height of the parallelogram-shaped pattern block shown below?

$$A = 525 \text{ mm}^2$$



Draw and label each figure. Then find the area.

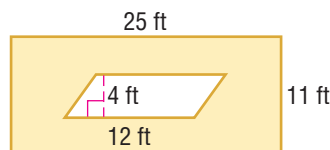
20. a parallelogram with an equal base and height and an area greater than 64 square meters

21. a parallelogram with a base four times the height and an area less than 200 square feet

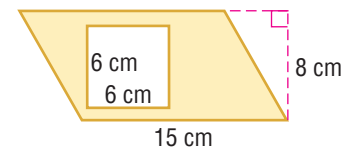
Show your work.

CCPS Identify Structure Find the area of the shaded region in each figure.

22. _____



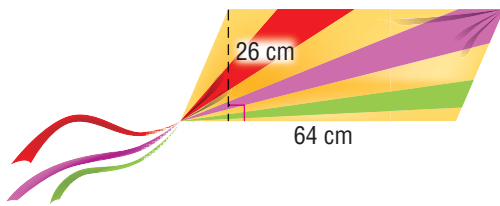
23. _____





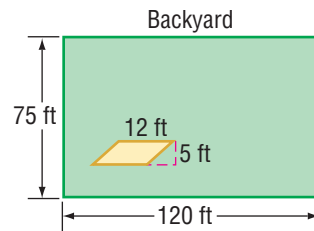
Georgia Test Practice

24. The kite is in the shape of a parallelogram. What is the area of the kite shown below?



- (A) 8.32 cm^2
- (B) 16.64 cm^2
- (C) 832 cm^2
- (D) $1,664 \text{ cm}^2$

25. A family has a flower garden in the shape of a parallelogram in their backyard. They planted grass in the rest of the yard. What is the area of the backyard that is planted with grass?



- (F) 390 sq ft
- (G) 8,940 sq ft
- (H) 9,060 sq ft
- (I) 9,144 sq ft

26. **Short Response** A wallpaper design uses 15 parallelogram-shaped pieces of paper, each with a base of 3 inches and a height of 2 inches. How much paper is used to make the 15 pieces?



Common Core Review

Draw each pair of lines. **MCC4.G.1**

27. parallel

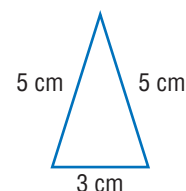
28. intersecting

29. perpendicular



30. Rosa has 22 songs in her music library. Michael has half as many. How many songs does Michael have in his music library? **MCC4.NBT.6**

31. Name and describe the figure based on the lengths of its sides. **MCC5.G.4**





HOW can you use the area of a parallelogram to find the area of a triangle?

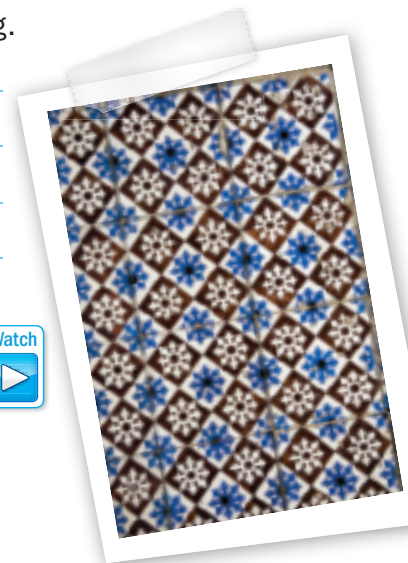


Content Standards
MCC6.G.1
Mathematical Practices
1, 3, 7, 8

Art Yurri is making a mosaic and is cutting rectangular tiles to make triangular tiles. He wants to find the area of the triangular tiles he is cutting.

What do you know? _____

What do you need to know? _____



Investigation 1



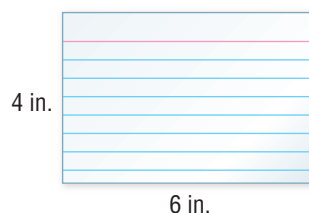
Yurri starts with a rectangular piece that is 4 inches by 6 inches, similar to the size of an index card.

Step 1 Find the area of an index card.

$$A = \text{length} \times \text{width}$$

$$A = \boxed{} \text{ inches} \times \boxed{} \text{ inches}$$

$$A = \boxed{} \text{ square inches}$$



Step 2 Use an index card. Draw a diagonal line across your index card from one corner to another. Then cut across the line. Draw the resulting figures in the space below.



Step 3 Find the area of one of the remaining triangles. The triangle is exactly half the size of the related rectangle.

So, the area of the rectangle can be divided by 2 to find the area of one triangle.

The area is $\boxed{} \div 2$, or $\boxed{}$ square inches.

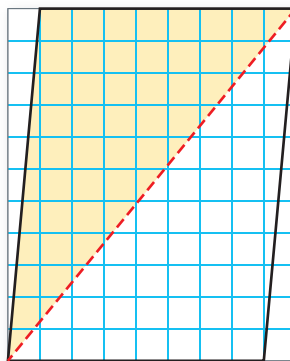
Investigation 2

You can also find the area of a triangle from the area of a related parallelogram.

Step 1 Copy the parallelogram shown on grid paper.

Step 2 Draw a diagonal as shown by the dashed line. Cut out the parallelogram. The area of the parallelogram is square units.

Step 3 Cut along the diagonal to form two triangles. Then find the area of one triangle. The triangle is half the size of the parallelogram. So, the area of the parallelogram can be divided by 2 to find the area of one triangle.

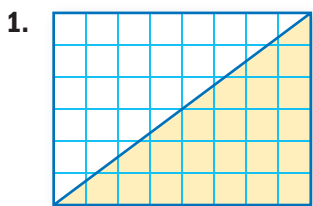


The area of one triangle is \div 2 or square units.



Collaborate

Work with a partner to find the area of each shaded triangle.

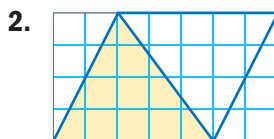


length: _____

width: _____

area: _____ \times _____ = _____

area of triangle = _____ square units

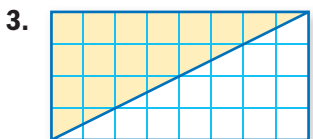


base: _____

height: _____

area: _____ \times _____ = _____

area of triangle = _____ square units

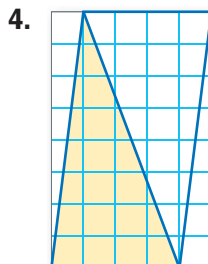


length: _____

width: _____

area: _____ \times _____ = _____

area of triangle = _____ square units



base: _____

height: _____

area: _____ \times _____ = _____

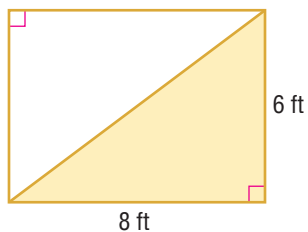
area of triangle = _____ square units



Collaborate

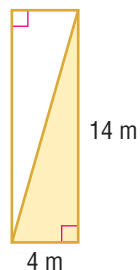
Work with a partner to find the area of each shaded triangle.

5. $A =$ _____ square feet

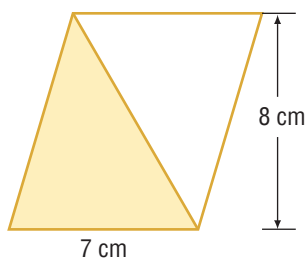


Show
your
work.

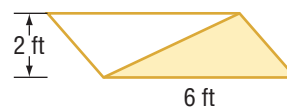
6. $A =$ _____ square meters



7. $A =$ _____ square centimeters

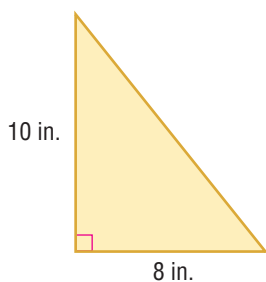


8. $A =$ _____ square feet

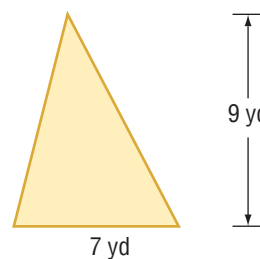


CCPS Identify Structure Draw dotted lines to show the parallelogram or rectangle that can be used to find the area of each triangle. Then find the area of each triangle.

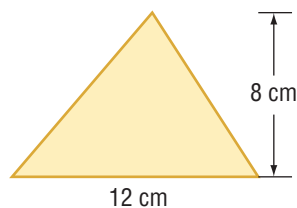
9. $A =$ _____ square inches



10. $A =$ _____ square yards



11. $A =$ _____ square centimeters



12. $A =$ _____ square feet





Analyze

The table shows the dimensions of several parallelograms. Use the area of each parallelogram to find the missing information for each triangle. Work with a partner to complete the table. The first one is already done for you.

| | Parallelogram | Base, b | Height, h | Area of Parallelogram (units squared) | Triangle created with diagonal | Base, b | Height, h | Area of Each Triangle (units squared) |
|-----|---------------|-----------|-------------|---------------------------------------|--------------------------------|-----------|-------------|---------------------------------------|
| | A | 4 | 5 | 20 | A | 4 | 5 | 10 |
| 13. | B | 4 | 6 | | B | 4 | | 12 |
| 14. | C | 2 | 5 | | C | 2 | 5 | |
| 15. | D | 3 | 4 | | D | 3 | 4 | |
| 16. | E | 6 | 3 | | E | | 3 | 9 |
| 17. | F | 8 | 5 | | F | 8 | 5 | |
| 18. | G | 5 | 7 | | G | 5 | | 17.5 |
| 19. | H | 9 | 7 | | H | 9 | 7 | |
| 20. | I | 11 | 5 | | I | 11 | 5 | |

21. **Reason Inductively** How is the area of the parallelogram related to the area of a triangle with the same base and height?



Reflect

22. **Identify Repeated Reasoning** Write a formula that relates the area A of a triangle to the lengths of its base b and height h .

23. **HOW** can you use the area of a parallelogram to find the area of a triangle?

Area of Triangles

What You'll Learn

Scan the lesson. Predict two things you will learn about finding the area of triangles.

- _____
- _____



Real-World Link



Biosphere The Biosphere 2 complex in Tucson, Arizona, researches Earth and its living systems. Sections of the building are interlocking triangles of the same size.

- There are two triangles that are outlined in the photo. They have the _____ size and the _____ shape.
- Draw the figure formed by the two triangles.



- How many small triangles make up the outlined parallelogram? How many small triangles make up each outlined triangle? _____
- Describe the relationship between the area of one outlined triangle and the area of the outlined parallelogram.

- Draw another parallelogram like the one in the photo. Separate it into two triangles. Describe the relationship between the area of one triangle and the parallelogram. _____



Essential Question

HOW does measurement help you solve problems in everyday life?



Vocabulary

congruent



Common Core GPS

Content Standards
MCC6.G.1

Mathematical Practices
1, 3, 4, 8



Key Concept

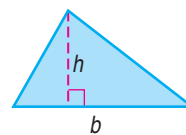
Area of a Triangle

Work Zone

Words The area A of a triangle is one half the product of the base b and its height h .

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

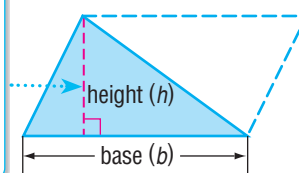
Model



Congruent figures are figures that are the same shape and size.

A parallelogram can be formed by two congruent triangles. Since congruent triangles have the same area, the area of a triangle is one half the area of the parallelogram.

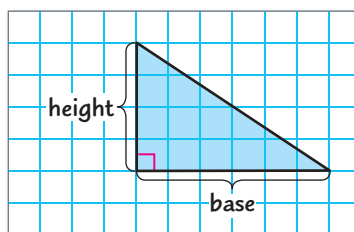
The base of a triangle can be any one of its sides. The height is the perpendicular distance from that base to the opposite vertex.



Examples



1. Find the area of the triangle.



By counting, you find that the measure of the base is 6 units and the height is 4 units.

$$A = \frac{1}{2}bh \quad \text{Area of a triangle}$$

$$A = \frac{1}{2}(6)(4) \quad \text{Replace } b \text{ with 6 and } h \text{ with 4.}$$

$$A = \frac{1}{2}(24) \quad \text{Multiply.}$$

$$A = 12 \quad \text{Multiply.}$$

The area of the triangle is 12 square units.

Mental Math

You can use mental math to multiply $\frac{1}{2}(6)(4)$. Think: Half of 6 is 3, and 3×4 is 12.

2. Find the area of the triangle.

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

Area of a triangle

$$A = \frac{1}{2}(12.1)(6.4)$$

Replace b with 12.1 and h with 6.4.

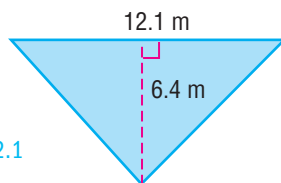
$$A = \frac{1}{2}(77.44)$$

Multiply.

$$A = 38.72$$

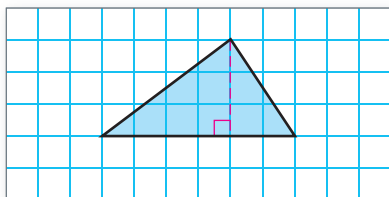
Divide. $\frac{1}{2}(77.44) = 77.44 \div 2$, or 38.72

The area of the triangle is 38.72 square meters.

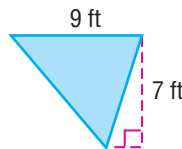


Got It? Do these problems to find out.

a.



b.



Show your work.

a. _____

b. _____

Find Missing Dimensions

Use the formula for the area of a triangle to find missing dimensions.

Example



3. Find the missing dimension of the triangle.

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

Area of a triangle

$$24 = \frac{b \cdot 6}{2}$$

Replace A with 24 and h with 6.

$$24(2) = \frac{b \cdot 6}{2}(2)$$

Multiply each side by 2.

$$48 = b \cdot 6$$

Simplify.

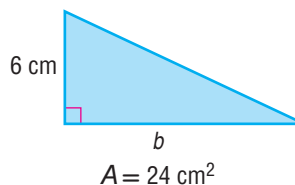
$$\frac{48}{6} = \frac{b \cdot 6}{6}$$

Divide each side by 6.

$$8 = b$$

Simplify.

So, the base is 8 centimeters.

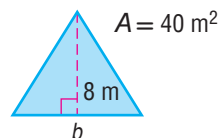


Check for Reasonableness

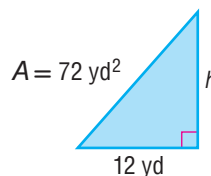
To check your work, replace b and h with the measurements and solve to find the area.

Got It? Do these problems to find out.

c.



d.



c. _____

d. _____



Example



4. The front of a camping tent has the dimensions shown. How much material was used to make the front of the tent?



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

Area of a triangle

$$A = \frac{1}{2}(5)(3)$$

Replace b with 5 and h with 3.

$$A = \frac{1}{2}(15) \text{ or } 7.5$$

Multiply.

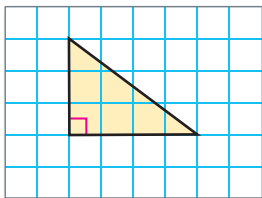
The front of the tent has an area of 7.5 square feet.

Guided Practice

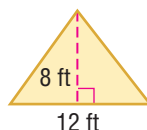


Find the area of each triangle. (Examples 1 and 2)

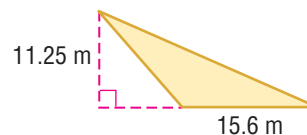
1. _____



2. _____

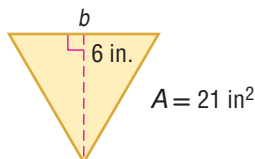


3. _____

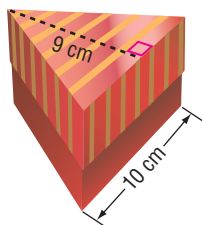



Show your work.

4. Tayshan designs uniquely shaped ceramic floor tiles. What is the base of the tile shown? (Example 3)



5. Consuela made a triangular paper box as shown. What is the area of the top of the box? (Example 4)



6.  **Building on the Essential Question** How is the formula for the area of a triangle related to the formula for the area of a parallelogram?

Rate Yourself!

☐

I understand how to find the area of a triangle.



Great! You're ready to move on!

☐

I still have some questions about the area of a triangle.



No Problem! Go online to access a Personal Tutor.



FOLDABLES

Time to update your Foldable!

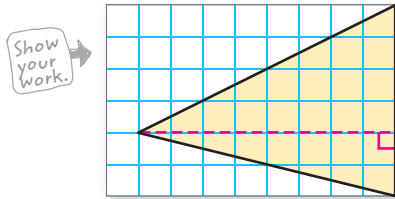
Independent Practice

Go online for Step-by-Step Solutions

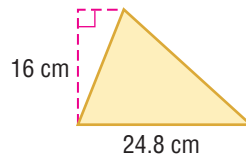


Find the area of each triangle. (Examples 1 and 2)

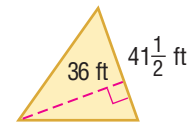
1. _____



2. _____



3. _____

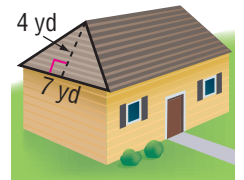


Find the missing dimension of each triangle described. (Example 3)

4. height: 14 in.
area: 245 in^2

5. base: 27 cm
area: 256.5 cm^2

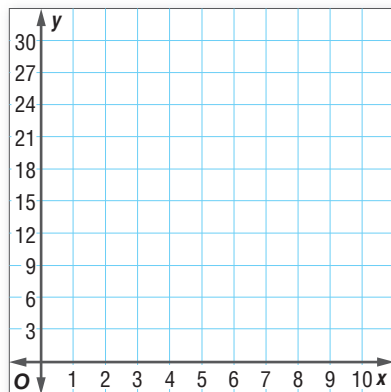
6. Ansley is going to help his father shingle the roof of their house. What is the area of the triangular portion of one end of the roof? (Example 4)



7 CCSS Multiple Representations The table shows the areas of a triangle where the base of the triangle stays the same but the height changes.

a. **Algebra** Write an algebraic expression that can be used to find the area of a triangle that has a base of 5 units and a height of n units. _____

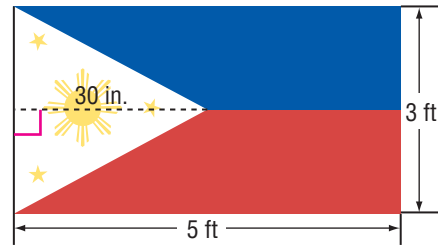
b. **Graph** Graph the ordered pairs (height, area).



c. **Words** Describe the graph.

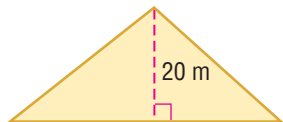
| Area of Triangles | | |
|-------------------|----------------|----------------------------|
| Base (units) | Height (units) | Area (units ²) |
| 5 | 2 | 5 |
| 5 | 4 | 10 |
| 5 | 6 | 15 |
| 5 | 8 | 20 |
| 5 | n | ? |

8. What is the area of the triangle on the flag of the Philippines in inches? _____
- _____
- _____



H.O.T. Problems Higher Order Thinking

9. **Find the Error** Dwayne is finding the base of the triangle shown. Its area is 100 square meters. Find his mistake and correct it.



$$\begin{aligned} 100 &= (b)20 \\ 100 &= 20b \\ 5 &= b \end{aligned}$$



10. **Persevere with Problems** How can you use triangles to find the area of the hexagon shown? Draw a diagram to support your answer.
- _____
- _____



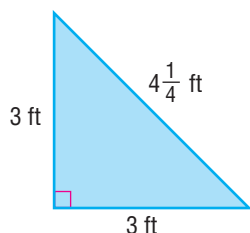
11. **Identify Repeated Reasoning** Draw a triangle and label its base and height. Draw another triangle that has the same base, but a height twice that of the first triangle. Find the area of each triangle. Then write a ratio that expresses the area of the first triangle to the area of the second triangle.
- _____
- _____



Georgia Test Practice

12. A piece of metal is cut in the shape of the triangle below. What is the area of the piece of metal?

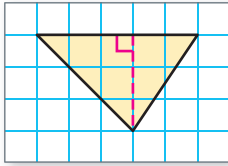
- (A) $3\frac{1}{4} \text{ ft}^2$
- (B) $4\frac{1}{2} \text{ ft}^2$
- (C) $6\frac{3}{8} \text{ ft}^2$
- (D) 9 ft^2



Extra Practice

Find the area of each triangle.

13. $7\frac{1}{2} \text{ units}^2$



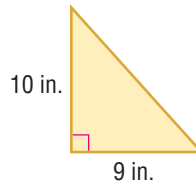
Homework Help

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

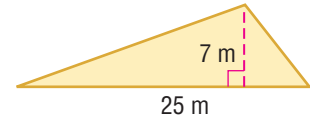
$$A = \frac{5 \cdot 3}{2}$$

$$A = \frac{15}{2} \text{ or } 7\frac{1}{2}$$

14. _____



15. _____



Find the missing dimension of each triangle described.

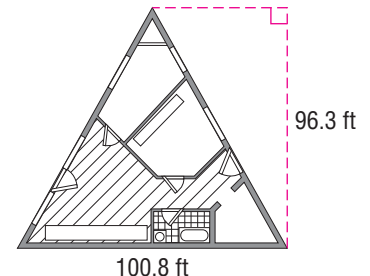
16. height: 7 in., area: 21 in^2

17. base: 11 m, area: 115.5 m^2

18. base: 14.2 yd, area: 63.9 yd^2

19. height: 11 cm, area: 260.15 cm^2

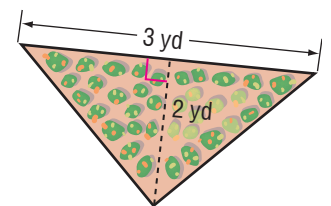
20. **STEM** An architect is designing a building on a triangular plot of land. If the base of the triangle is 100.8 feet and the height is 96.3 feet, find the available floor area of the building.



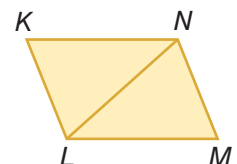
21. A flower bed in a parking lot is shaped like a triangle as shown.

a. Find the area of the flower bed in square feet.

b. If one bag of topsoil covers 10 square feet, how many bags are needed to cover this flower bed?



22. **CCPS Identify Repeated Reasoning** Refer to parallelogram $KLMN$ at the right. If the area of parallelogram $KLMN$ is 35 square inches, what is the area of triangle KLN ?





Georgia Test Practice

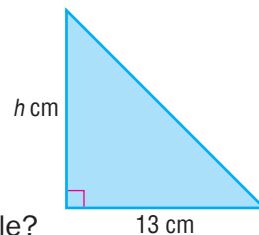
23. The table shows the areas of a triangle where the height of the triangle stays the same but the base changes.

| Areas of Triangles | | |
|--------------------|--------------|---------------------|
| Height (units) | Base (units) | Area (square units) |
| 7 | 2 | 7 |
| 7 | 3 | $10\frac{1}{2}$ |
| 7 | 4 | 14 |
| 7 | 5 | $17\frac{1}{2}$ |
| 7 | x | ? |

Which expression can be used to find the area of a triangle that has a height of 7 units and a base of x units?

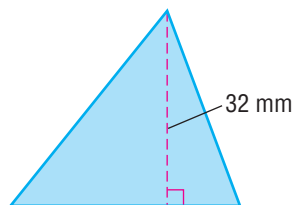
- Ⓐ $7x$ Ⓒ $\frac{7}{2}$
 Ⓑ $\frac{7x}{2}$ Ⓓ $\frac{x}{2}$

24. Norma cut a triangle out of construction paper for an art project. The area of the triangle is 84.5 square centimeters. What is the height of the triangle?



- Ⓕ 6.5 cm Ⓗ 26 cm
 Ⓖ 13 cm Ⓘ 169 cm

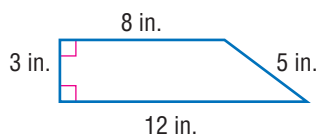
25. **Short Response** The triangle has an area of 640 square millimeters. What is the base of the triangle? _____



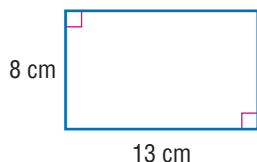
Common Core Review

Identify each figure below as a **rectangle**, **rhombus**, or **trapezoid**. **MCC5.G.4**

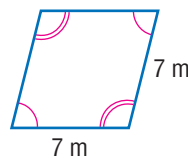
26. _____



27. _____



28. _____

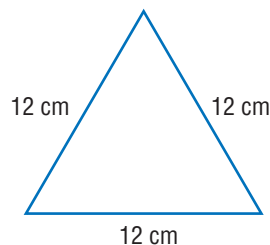


29. Jackson's floor rug has four 90° angles. All four sides are 18 inches long. The rug has two sets of parallel sides. What shape is Jackson's floor rug?

MCC5.G.4 _____

30. How many lines of symmetry can be drawn for the figure shown?

Draw them on the figure. **MCC4.G.3** _____





HOW can you use the area of a parallelogram to find the area of a corresponding trapezoid?



Content Standards
MCC6.G.1

Mathematical Practices
1, 3, 5, 7

Garden Lizette is building a garden in the shape of a trapezoid. The garden is 6 feet wide in the back, 10 feet wide in the front, and 5 feet from back to front. She wants to find the area of the garden.

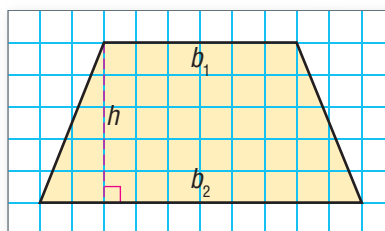
Investigation 1

Find the area of a trapezoid by drawing the related parallelogram.

Step 1

Trace the trapezoid below on grid paper. Label the height h and label the bases b_1 and b_2 .

A trapezoid has two bases, b_1 and b_2 . The height h of a trapezoid is the perpendicular distance between the bases.



The shorter base b_1 represents the garden width of _____.

The longer base b_2 represents the garden width of _____.

The height h represents the garden dimension of _____.

Step 2

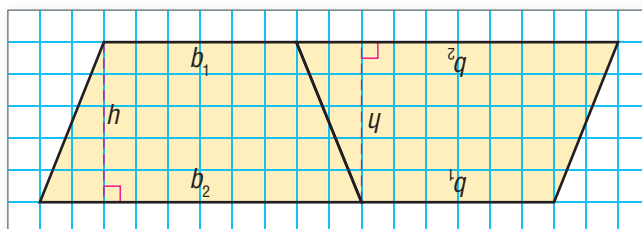
Cut out another trapezoid that is identical to the one in Step 1.

Step 3

Tape the trapezoids together as shown.

Step 4

Find the area of the parallelogram. Then divide by 2 to find the area of each trapezoid.



$$\boxed{} \times \boxed{} = \boxed{} \quad \boxed{} \div 2 = \boxed{}$$

So, the area of the garden is $\boxed{}$ square feet.

Investigation 2

Watch



Discover the formula for the area of a trapezoid.

Step 1 What figure is formed by the two trapezoids in Investigation 1? _____

Write an addition expression to represent the length of the base of the entire figure. _____

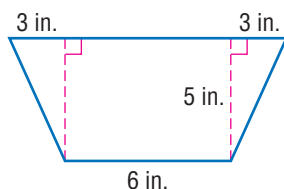
Step 2 Write a formula for the area A of the parallelogram using b_1 , b_2 , and h . _____

Step 3 How does the area of each trapezoid compare to the area of the parallelogram? _____

Step 4 Write a formula for the area A of each trapezoid using b_1 , b_2 , and h . _____

Investigation 3

Another way to find the area of a trapezoid is to deconstruct it to determine which figures form the trapezoid. Find the area of the trapezoid shown below.



Step 1 The trapezoid is made up of one rectangle and two congruent triangles. Find the area of the shapes that make up the trapezoid.

The area of the rectangle is $\square \times \square = \square$ square inches.

The area of each triangle is $\frac{\square \times \square}{\square} = \square$ square inches.

Step 2 Add the areas.

$\square + \square + \square = \square$ square inches



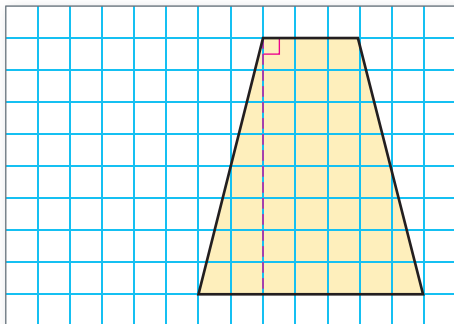
Collaborate



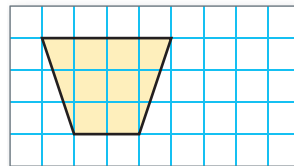
Use Math Tools Work with a partner. Find the area of each trapezoid by drawing the related parallelogram.

1. $A = \underline{\hspace{2cm}}$ square units

Show your work.



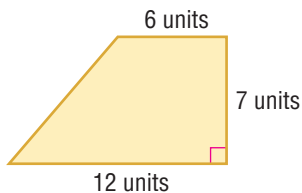
2. $A = \underline{\hspace{2cm}}$ square units



Work with a partner. Find the area of each trapezoid by using the formula.

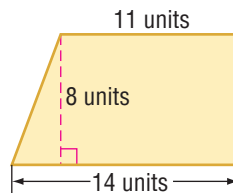
3. $A = \frac{(\square + \square)\square}{\square}$

$A = \underline{\hspace{2cm}}$ square units



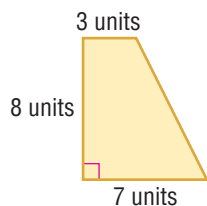
4. $A = \frac{(\square + \square)\square}{\square}$

$A = \underline{\hspace{2cm}}$ square units

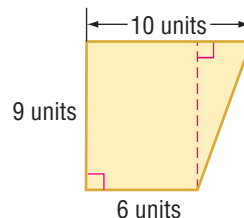


Work with a partner. Decompose each trapezoid to find the area.

5. $A = \underline{\hspace{2cm}}$ square units



6. $A = \underline{\hspace{2cm}}$ square units





Analyze

The table shows the dimensions of several parallelograms and corresponding trapezoids. Work with a partner to complete the table. The first one is done for you.

| | Dimensions of Parallelogram | Area of Parallelogram | Length of Trapezoid b_1 | Length of Trapezoid b_2 | Trapezoid Height | Area of Trapezoid |
|----|-----------------------------|-----------------------|---------------------------|---------------------------|------------------|-------------------|
| | | 28 | 2 | 5 | 4 | 14 |
| 7. | | | 5 | 6 | 6 | |
| 8. | | | 8 | 4 | 5 | |
| 9. | $b = 11$ $h = 3$ | | 7 | 4 | 3 | |

10. **CCGPS Reason Inductively** Compare the dimensions of the parallelogram to the dimensions of the corresponding trapezoid. What pattern do you see in the table? _____

11. **CCGPS Reason Inductively** Compare the area of the parallelogram to the area of the corresponding trapezoid. What pattern do you see in the table? _____



Reflect

12. **CCGPS Identify Structure** Write the formula for the area A of a trapezoid with bases b_1 and b_2 and height h . _____

13. **inquiry** HOW can you use the area of a parallelogram to find the area of a corresponding trapezoid? _____

Area of Trapezoids

What You'll Learn

Scan the lesson. Predict two things you will learn about finding the area of trapezoids.

- _____
- _____



Essential Question

HOW does measurement help you solve problems in everyday life?



Common Core GPS

Content Standards
MCC6.G.1

Mathematical Practices
1, 2, 3, 4, 7, 8



Real-World Link

Window Seat Kiana has a bay window in her room. The window seat is in the shape of a trapezoid. She needs to measure the seat in order to sew a cushion for the seat. The blue trapezoid in the diagram below represents the dimensions of the window seat.

Use the diagram below to describe the relationship between trapezoids and rectangles.

1. Find the dimensions of each figure.

Trapezoid

base 1: units

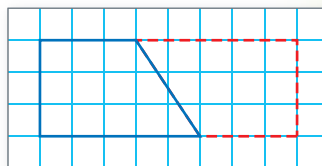
base 2: units

height: units

Rectangle

length: units

height: units



2. What is the relationship between the measures of the rectangle and the measures of the trapezoid?

3. **Make a Conjecture** How is the area of a trapezoid related to the area of a rectangle? _____



Key Concept

Area of a Trapezoid

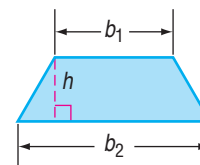


Work Zone

Words

The area A of a trapezoid is one half the product of the height h and the sum of the bases b_1 and b_2 .

Model

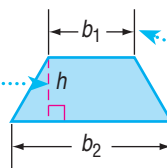


Symbols

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

A trapezoid has two bases, b_1 and b_2 . The height of a trapezoid is the distance between the bases.

The height is the perpendicular distance between the bases.



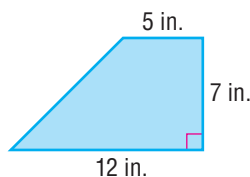
The two bases are parallel. They will always be the same distance apart.

When finding the area of a trapezoid, it is important to follow the order of operations. In the formula, the bases are to be added before multiplying by $\frac{1}{2}$ of the height h .

Examples



1. Find the area of the trapezoid.



The bases are 5 inches and 12 inches.
The height is 7 inches.

$$A = \frac{1}{2}h(b_1 + b_2) \quad \text{Area of a trapezoid}$$

$$A = \frac{1}{2}(7)(5 + 12) \quad \text{Replace } h \text{ with } 7, b_1 \text{ with } 5, \text{ and } b_2 \text{ with } 12.$$

$$A = \frac{1}{2}(7)(17) \quad \text{Add 5 and 12.}$$

$$A = 59.5 \quad \text{Multiply.}$$

The area of the trapezoid is 59.5 square inches.

2. Find the area of the trapezoid.

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

Area of a trapezoid

$$A = \frac{1}{2}(9.8)(7 + 12)$$

Replace h with 9.8,
 b_1 with 7, and b_2 with 12.

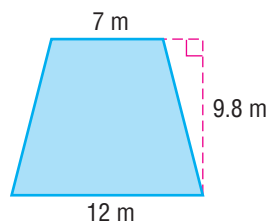
$$A = \frac{1}{2}(9.8)(19)$$

Add 7 and 12.

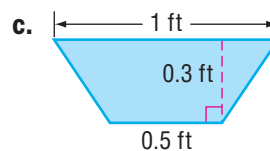
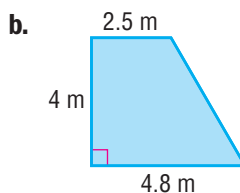
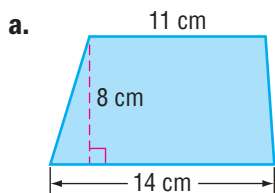
$$A = 93.1$$

Multiply.

So, the area of the trapezoid is 93.1 square meters.



Got It? Do these problems to find out.



Find the Missing Height

Use the related formula, $h = \frac{2A}{b_1 + b_2}$, to find the height of a trapezoid.

Example



3. The trapezoid has an area of 108 square feet. Find the height.

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

Height of a trapezoid

$$h = \frac{2(108)}{12 + 15}$$

Replace A with 108, b_1 with 12,
and b_2 with 15.

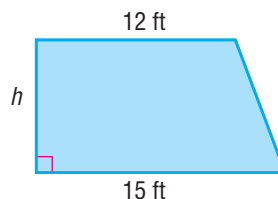
$$h = \frac{216}{27}$$

Multiply 2 and 108. Add 12 and 15.

$$h = 8$$

Divide.

So, the height of the trapezoid is 8 feet.



Be Precise

Check your answer by using the formula for the area of a trapezoid.

Got It? Do these problems to find out.

d. $A = 24 \text{ cm}^2$
 $b_1 = 4 \text{ cm}$
 $b_2 = 12 \text{ cm}$
 $h = ?$

e. $A = 21 \text{ yd}^2$
 $b_1 = 2 \text{ yd}$
 $b_2 = 5 \text{ yd}$
 $h = ?$



Example



Mental Math

To multiply $\frac{1}{2}(51)(64)$, it is easier to use the Commutative Property to reorder the factors as $\frac{1}{2}(64)(51)$ and take half of 64 instead of half of 51.

4. The shape of Osceola County, Florida, resembles a trapezoid. Find the approximate area of this county.

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

Area of a trapezoid

$$A = \frac{1}{2}(51)(48 + 16)$$

Replace h with 51, b_1 with 48, and b_2 with 16.

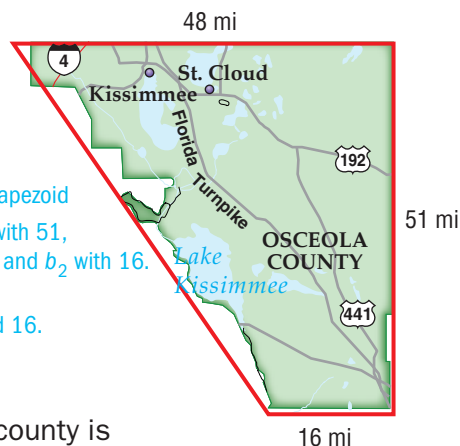
$$A = \frac{1}{2}(51)(64)$$

Add 48 and 16.

$$A = 1,632$$

Multiply.

So, the approximate area of the county is 1,632 square miles.

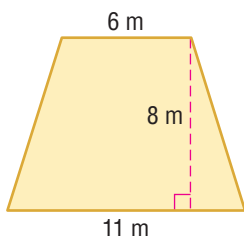


Guided Practice

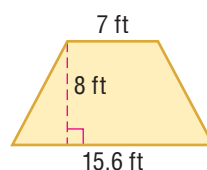


Find the area of each trapezoid. Round to the nearest tenth if necessary. (Examples 1 and 2)

1. _____



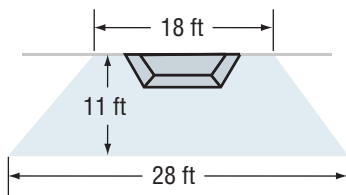
2. _____



Show your work.

3. A trapezoid has an area of 15 square feet. If the bases are 4 feet and 6 feet, what is the height of the trapezoid? (Example 3) _____

4. In the National Hockey League, goaltenders can play the puck behind the goal line only in a trapezoid-shaped area, as shown at the right. Find the

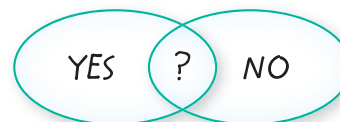


area of the trapezoid. (Example 4) _____

5. **Building on the Essential Question** How is the formula for the area of a trapezoid related to the formula for the area of a parallelogram? _____

Rate Yourself!

Are you ready to move on?
Shade the section that applies.



For more help, go online to access a Personal Tutor.



FOLDABLES Time to update your Foldable!

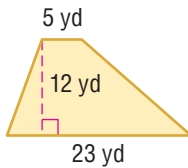
Independent Practice

Go online for Step-by-Step Solutions



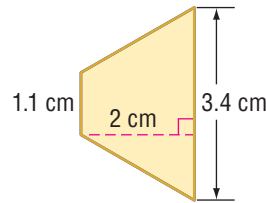
Find the area of each trapezoid. Round to the nearest tenth if necessary. (Examples 1 and 2)

1

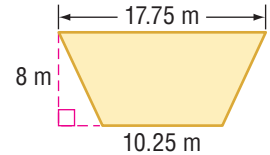


Show your work.

2.



3.

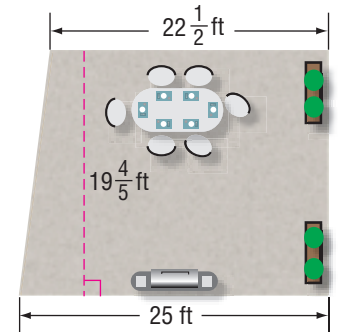


4. A trapezoid has an area of 150 square meters. If the bases are 14 meters and 16 meters, what is the height of the trapezoid?

(Example 3)

5. A trapezoid has an area of 400 square millimeters. The bases are 14 millimeters and 36 millimeters. What is the height of the trapezoid? (Example 3)

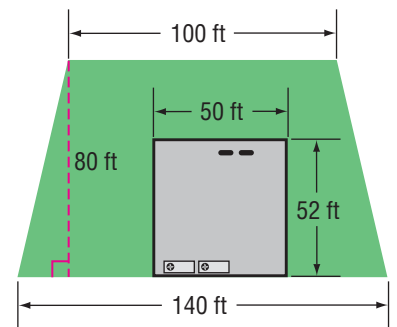
6. Find the area of the patio shown. (Example 4)



- 7 Use the diagram that shows the lawn that surrounds an office building.

a. What is the area of the lawn? _____

b. If one bag of grass seed covers 2,000 square feet, how many bags are needed to seed the lawn?



8. **Reason Abstractly** Tiles are being placed in front of a fireplace to create a trapezoidal hearth. The hearth will have a height of 24 inches and bases that are 48 inches and 60 inches. If the tiles cover 16 square inches, how many tiles will be needed?

Draw and label each figure. Then find the area.

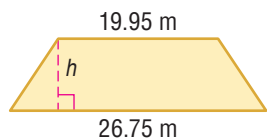
9. a trapezoid with no right angles and an area less than 12 square centimeters

10. a trapezoid with a right angle and an area greater than 40 square inches



H.O.T. Problems Higher Order Thinking

11. **CC.6-8.MS.8** **Persevere with Problems** Apply what you know about rounding to explain how to estimate the height h of the trapezoid shown if the area is 235.5 m^2 .



12. **CC.6-8.MS.8** **Identify Repeated Reasoning** Find two possible lengths of the bases of a trapezoid with a height of 1 foot and an area of 9 square feet. Explain how you found your answer.



Georgia Test Practice

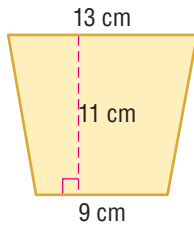
13. Barrington cuts a piece of wood in the shape of a trapezoid. The height is 4 feet. The top is 3 feet across and the bottom is 10 feet across. Which equation could be used to find the area of the piece of wood?

- (A) $10 = \frac{1}{2} \times h(4 + 3)$
(B) $A = \frac{1}{2} \times 10(4 + 3)$
(C) $A = \frac{1}{2} \times 3(4 + 10)$
(D) $A = \frac{1}{2} \times 4(3 + 10)$

Extra Practice

Find the area of each figure. Round to the nearest tenth if necessary.

14. 121 cm^2



Homework Help

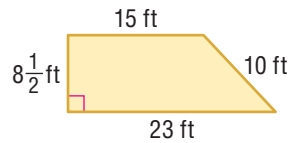
$$A = \frac{1}{2}h(b_1 + b_2)$$

$$A = \frac{1}{2}(11)(13 + 9)$$

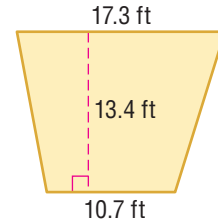
$$A = \frac{1}{2}(11)(22)$$

$$A = 121$$

15. _____



16. _____

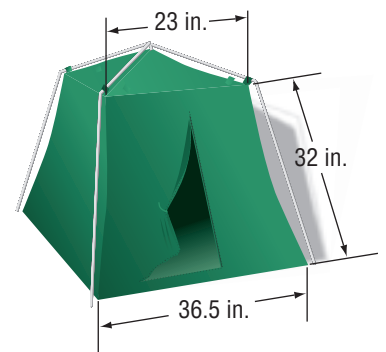


17. A trapezoid has an area of 50 square inches. The bases are 3 inches and 7 inches. What is the height of the trapezoid?

18. A trapezoid has an area of 18 square miles. The bases are 5 miles and 7 miles. What is the height of the trapezoid?

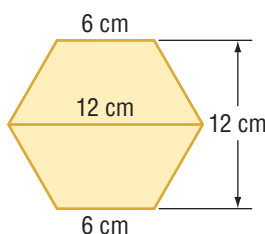
19. A county is shaped like a trapezoid. Its northern border is about 9.6 miles across, and the southern border is approximately 25 miles across. The distance from the southern border to the northern border is about 90 miles. Find the approximate area of the county.

20. A play tent is shown. How much fabric was used to make the front and back of the play tent?

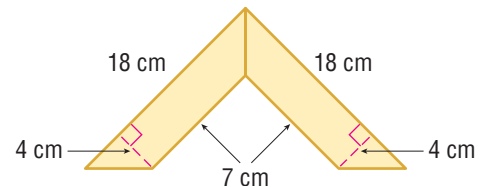


CCGPS Identify Structure Each figure below is made up of congruent trapezoids. Find the area of each figure.

21. _____



22. _____





Georgia Test Practice

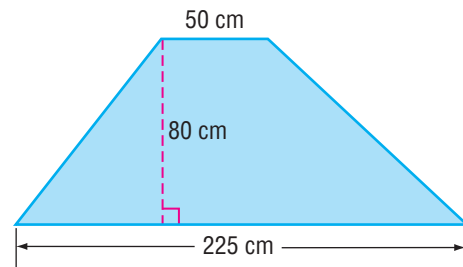
23. Find the area of a trapezoid with a height of 4 yards and bases of $5\frac{1}{2}$ yards and $6\frac{1}{2}$ yards.

(A) 16 square yards
(B) 24 square yards
(C) $28\frac{1}{2}$ square yards
(D) 143 square yards

24. **Short Response** Serina designed the bag shown. How much fabric will be needed to make the front of the bag?



25. **Short Response** A piece of sod is shaped like a trapezoid as shown. What is the area of the piece of sod?



Common Core Review

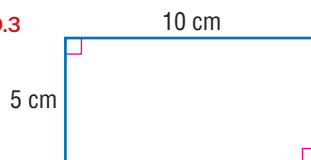
Add or multiply. **MCC5.NBT.7**

26. $5 + 6.2 + 8.8 =$ _____

27. $8 \times 8 \times 4 =$ _____

28. $725 + 315 + 4 =$ _____

29. Find the perimeter of the rectangle. **MCC4.MD.3**



30. Delanie is building a rectangular frame for her favorite photograph. The frame is 7 inches wide and 5 inches long. What is the perimeter of the frame? **MCC4.MD.3** _____

Problem-Solving Investigation

Draw a Diagram



Content Standards
MCC6.G.1

Mathematical Practices
1, 4, 7

Case #1 Amazing Array

A designer wants to arrange 12 mosaic tiles into a rectangular shape with the least perimeter possible.

What are the dimensions of the rectangle?



1

Understand **What are the facts?**

Twelve tiles will be arranged with the least perimeter possible.

2

Plan **What is your strategy to solve this problem?**

Use graph paper. Make diagrams of 12 squares to represent 12 tiles.

3

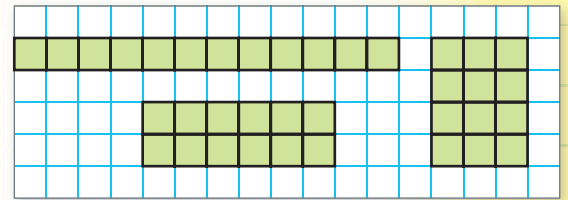
Solve **How can you apply the strategy?**

A rectangle with dimensions of 12 and 1 has a perimeter of _____.

A rectangle with dimensions of 3 and 4 has a perimeter of _____.

A rectangle with dimensions of 2 and 6 has a perimeter of _____.

So, the least perimeter has dimensions of _____.



4

Check **Does the answer make sense?**

Use addition to check your answer.

$$3 + 4 + 3 + 4 = 14 \quad 2 + 6 + 2 + 6 = 16 \quad 12 + 1 + 12 + 1 = 26$$

Analyze the Strategy

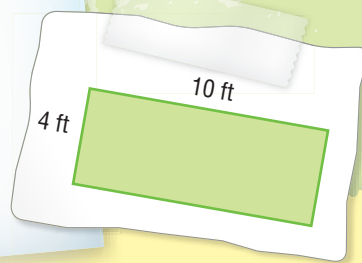


Identify Structure Describe a design with a perimeter and an area of 16.

Case #2 Dynamic Dimensions

For a school assignment, Santiago has to give three different possibilities for the dimensions of a rectangle that has a perimeter of 28 feet and an area greater than 30 square feet. One of the diagrams he drew is shown at the right.

What are two other possibilities for the dimensions of the rectangle?



1

Understand

Read the problem. What are you being asked to find?

I need to find _____.

Underline key words and values in the problem. What information do you know?

The perimeter of the rectangle is feet, and the area is greater than _____.

2

Plan

Choose a problem-solving strategy.

I will use the _____ strategy.

3

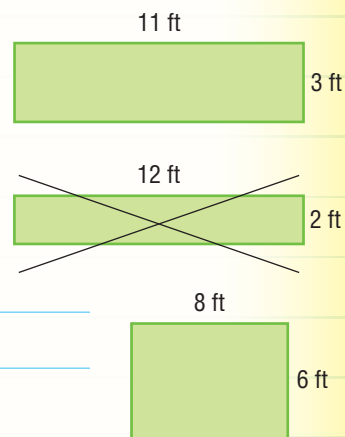
Solve

Use your problem-solving strategy to solve the problem.

Draw rectangles with perimeters of feet. Then, multiply length times width to find the area.

The product must be greater than .

So, the dimensions of two possible rectangles are _____.



4

Check

Use information from the problem to check your answer.

Reread the problem. Check that both conditions have been met.

Perimeter: = 28 Area: > 30 and > 30



Collaborate Work with a small group to solve the following cases. Show your work on a separate piece of paper.

Case #3 Decorations

A rectangular table that is placed lengthwise against a wall is 8 feet long and 3 feet wide. Balloons will be attached 1 foot apart along the three exposed sides, with one balloon at each of the four corners.

How many balloons are needed?



Case #4 Geography

The mall is 10 miles from your home. Your school is one half of the way from your home to the mall. The library is two fifths of the way from your school to the mall.

How many miles is it from your home to the library?

Case #5 Painting

Van is going to paint a mural in his home. The mural is in the shape of a parallelogram with a base of 8 feet and a height of 15 feet.

- What is the area of the mural?

- If one quart of paint will cover 70 square feet, how many quarts of paint does Van need to buy?

Circle a strategy below to solve the problem.

- Look for a pattern.
- Work backward.
- Guess, check, and revise.
- Make a table.

Case #6 Geometry

The base and height of each successive triangle are each half the length of the previous triangle.



What will be the area of the fourth triangle?

Mid-Chapter Check

Vocabulary Check



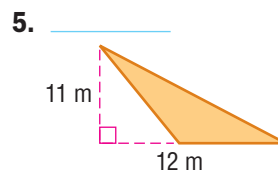
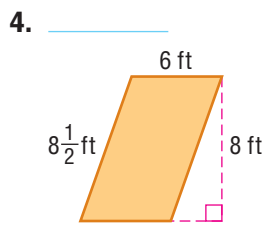
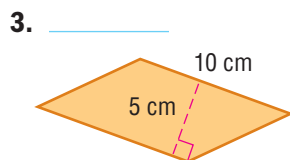
1. **CCPS Be Precise** Define *polygon*. Give an example of a figure that is a polygon and an example of a figure that is not a polygon. (Lesson 1)

2. Fill in the blank in the sentence below with the correct term(s). (Lesson 2)

Congruent figures have the _____ size and the _____ shape.

Skills Check and Problem Solving

Find the area of each figure. (Lessons 1 and 2)

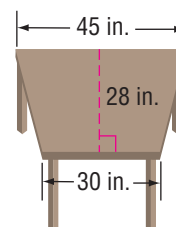


Find the missing dimension of each figure. (Lessons 1 and 3)

6. parallelogram: $h = 5\frac{1}{4}$ ft; $A = 12$ ft²

7. trapezoid: $b_1 = 3$ m; $b_2 = 4$ m; $A = 7$ m²

8. **CCPS Model with Mathematics** A corner table is in the shape of a trapezoid. Find the area of the tabletop. (Lesson 3) _____



9. **Georgia Test Practice** What is the height of a triangle with a base of 14 centimeters and an area of 56 square centimeters? (Lesson 2)

- Ⓐ 112 centimeters Ⓒ 8 centimeters
Ⓑ 56 centimeters Ⓓ 7 centimeters

Changes in Dimension

What You'll Learn

Scan the lesson. Predict two things you will learn about changes in dimension.

- _____
- _____



Essential Question

HOW does measurement help you solve problems in everyday life?



Common Core GPS

Content Standards
MCC6.G.1

Mathematical Practices
1, 2, 3, 4, 7

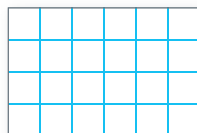


Real-World Link

Construction Mr. Blackwell is building a rectangular dog house. The floor of the dog house is 4 feet long and 2 feet wide.

1. Draw the floor of the dog house on the graph paper below.

Show your work.



2. Add the lengths of the sides to find the perimeter.

3. Multiply the length and width to find the area.

4. Mr. Blackwell doubles the width of the dog house. Draw the new floor below.



5. How did the perimeter and area of the floors change from the first to the second dog house? _____



Key Concept

Changing Dimensions: Effect on Perimeter

Work Zone

Words

If the dimensions of a polygon are multiplied by x , then the perimeter of the polygon changes by a factor of x .

Model

Figure A

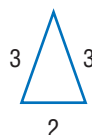
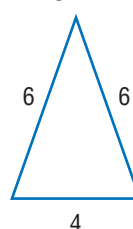


Figure B



Example

The dimensions of Figure A are multiplied by 2 to produce Figure B.

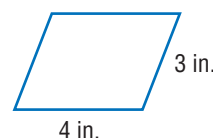
$$\underbrace{\text{perimeter of Figure A}}_8 \cdot 2 = \underbrace{\text{perimeter of Figure B}}_{16}$$

Notice that all the dimensions of the figure must change using the same factor, x .

Example



1. Suppose the side lengths of the parallelogram at the right are tripled. What effect would this have on the perimeter? Justify your answer.



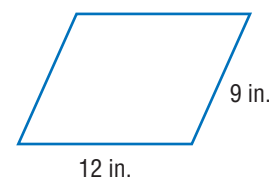
The dimensions are 3 times greater.

original perimeter: $2(4) + 2(3) = 14$ in.

new perimeter: $2(12) + 2(9) = 42$ in.

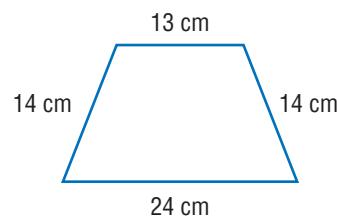
compare perimeters: $42 \text{ in.} \div 14 \text{ in.} = 3$

So, the perimeter is 3 times the perimeter of the original figure.



Got It? Do this problem to find out.

- a. Suppose the side lengths of the trapezoid at the right are multiplied by $\frac{1}{2}$. What effect would this have on the perimeter? Justify your answer.



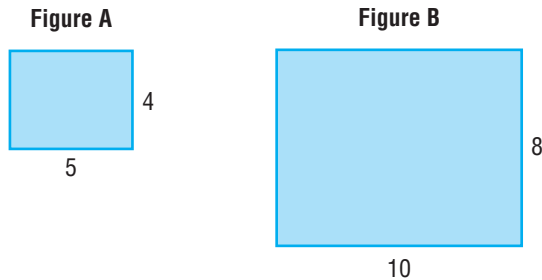
a. _____

Changing Dimensions: Effect on Area

Key Concept

Words If the dimensions of a polygon are multiplied by x , then the area of the polygon changes by $x \cdot x$ or x^2 .

Model



Example The dimensions of Figure A are multiplied by 2 to produce Figure B.

$$\underbrace{\text{area of Figure A}}_{20} \cdot \underbrace{2^2}_{4} = \underbrace{\text{area of Figure B}}_{80}$$

Notice that all the dimensions of the figure must change using the same factor, x .

Example



- 2. The side lengths of the triangle at the right are multiplied by 5. What effect would this have on the area? Justify your answer.**



The dimensions are 5 times greater.

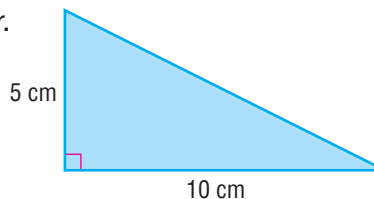
original area: $\frac{1}{2} \cdot 2 \cdot 1 = 1 \text{ cm}^2$

new area: $\frac{1}{2} \cdot 10 \cdot 5 = 25 \text{ cm}^2$

compare areas:

$25 \text{ cm}^2 \div 1 \text{ cm}^2 = 25$ or 5^2 .

So, the area is 5^2 or 25 times the area of the original figure.



Show your work.

Got It? Do this problem to find out.

- b. A rectangle measures 2 feet by 4 feet. Suppose the side lengths are multiplied by 2.5. What effect would this have on the area? Justify your answer.

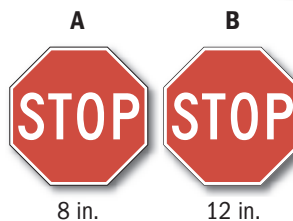
b. _____



Example



3. A stop sign is in the shape of a regular octagon. Sign A shown at the right has an area of 309 square inches. What is the area of sign B?



Since $8 \times 1.5 = 12$, the area of sign B is 1.5^2 times the area of sign A.

$$309 \cdot 1.5^2 = 309 \cdot 2.25 \text{ or } 695.25$$

So, the area of sign B is 695.25 square inches.

Guided Practice



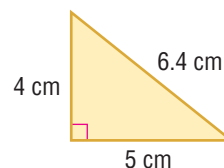
Refer to the figure at the right for Exercises 1 and 2. Justify your answers. (Examples 1–2)

1. Each side length is doubled. Describe the change in the perimeter.

2. Each side length is tripled. Describe the change in the area.

3. Different sizes of regular hexagons are used in a quilt. Each small hexagon has side lengths of 4 inches and an area of 41.6 square inches. Each large hexagon has side lengths of 8 inches. What is the area of each large hexagon? (Example 3) _____

4. **Building on the Essential Question** How can exponents help you find the area of a rectangle if each side length is multiplied by x ? _____



Rate Yourself!

How confident are you about changes in dimension? Check the box that applies.



For more help, go online to access a Personal Tutor.

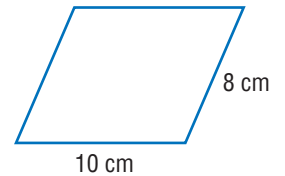


Independent Practice

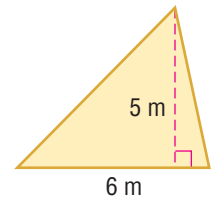
Go online for Step-by-Step Solutions



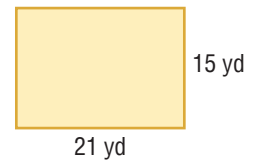
- 1 Each side length of the parallelogram at the right is multiplied by 4. Describe the change in the perimeter. Justify your answer. (Example 1)



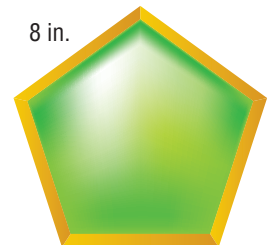
- 2 The base and height of the triangle at the right are multiplied by 4. Describe the change in the area. Justify your answer. (Example 2)



- 3 Each side length of the rectangle is multiplied by $\frac{1}{3}$. Describe the change in the area. Justify your answer. (Example 2)

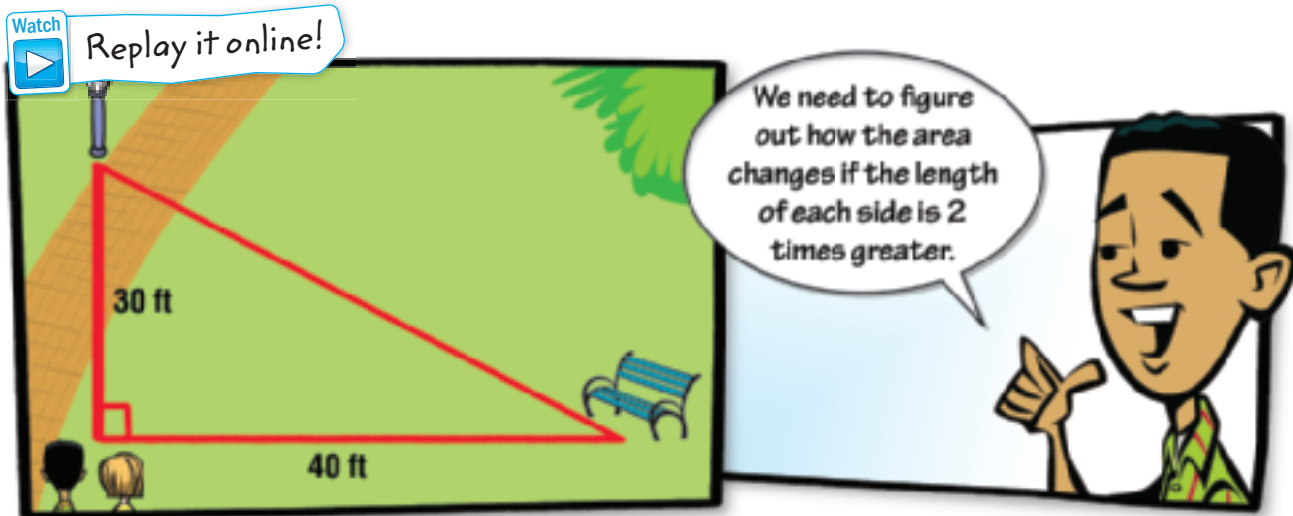


- 4 Different sizes of regular pentagons are used in a stained glass window. Each small pentagon has side lengths of 4 inches and an area of 27.5 square inches. Each large pentagon has side lengths of 8 inches. What is the area of each large pentagon? (Example 3)



- 5 **CCAFS** **Justify Conclusions** A dollhouse has a bed with dimensions $\frac{1}{12}$ the size of a queen-size bed. A queen-size bed has an area of 4,800 square inches, and a length of 80 inches. What are the side lengths of the dollhouse bed? Justify your answer.

6. **CCGPS Reason Abstractly** Refer to the graphic novel frame below for Exercises a–b.



- a. What is the original area of the triangle? _____
- b. What is the new area if the sides are all two times longer?
- _____

H.O.T. Problems Higher Order Thinking

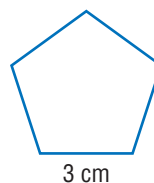
7. **CCGPS Identify Structure** Sketch a triangle with the side lengths labeled. Sketch and label another triangle that has a perimeter two times greater than the perimeter of the first triangle.

Show your work.

8. **CCGPS Persevere with Problems** The corresponding side lengths of two figures have a ratio of $\frac{a}{b}$. What is the ratio of the perimeters? the ratio of the areas?
- _____

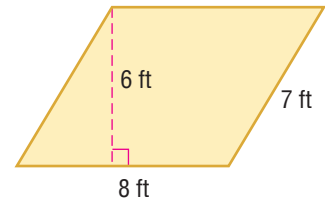
Georgia Test Practice

9. The regular pentagon shown at the right is enlarged so that its sides are four times longer. What effect does this have on the perimeter?
- (A) The perimeter is 4 times greater.
- (B) The perimeter is 12 times greater.
- (C) The perimeter is 16 times greater.
- (D) The perimeter is 20 times greater.



Extra Practice

Refer to the parallelogram at the right for Exercises 10–12. Justify your answers.



10. Suppose the base and height are each multiplied by $\frac{1}{2}$. What effect would this have on the area?



original area: $8 \cdot 6$ or 48 square feet

new dimensions: base = $8 \cdot \frac{1}{2}$ or 4 ft, height = $6 \cdot \frac{1}{2}$ or 3 ft

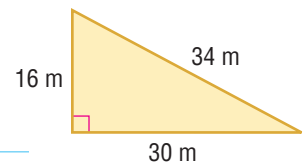
new area: $4 \cdot 3$ or 12 square feet; $12 \text{ ft}^2 \div 48 \text{ ft}^2 = \frac{1}{4}$;


So, the area is $\frac{1}{2} \cdot \frac{1}{2}$ or $\frac{1}{4}$ times the area of the original figure.

11. Suppose the side lengths are multiplied by 6. Describe the change in the perimeter. _____

12. Suppose the base and height are each multiplied by 3.5. Describe the change in the area. _____

13. Refer to the triangle at the right. Suppose the side lengths and height of the triangle were divided by 4. What effect would this have on the perimeter? the area? Justify your answer.

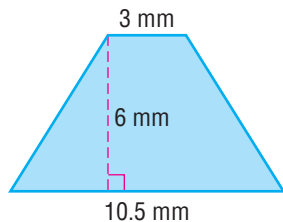


14.  **Justify Conclusions** A model car has a windshield with dimensions $\frac{1}{18}$ the size of a real car windshield. The rectangular windshield of the real car has an area of about 2,318 square inches, with a width of 61 inches. What are the side lengths of the model car's windshield? Round to the nearest hundredth. Justify your answer.



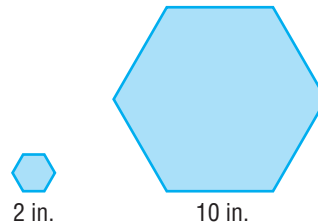
Georgia Test Practice

15. The lengths of the bases and height of the trapezoid below are doubled. How does the area of the trapezoid change?



- (A) The area doubles.
 (B) The area triples.
 (C) The area is 4 times greater.
 (D) The area is 6 times greater.
16. **Short Response** Two regular pentagons have side lengths of 1 centimeter and 7 centimeters, respectively. How many times greater is the perimeter of the larger pentagon?

17. Two regular hexagons are shown below. How many times greater is the area of the larger hexagon than the smaller hexagon?



- (F) 2 times
 (G) 5 times
 (H) 10 times
 (I) 25 times
18. Two equilateral triangles have perimeters of 9 meters and 27 meters, respectively. How many times greater is the area of the larger triangle?
- (A) 2 times
 (B) 3 times
 (C) 9 times
 (D) 27 times



Common Core Review

Describe the sides of each figure using the terms *parallel*, *perpendicular*, and *congruent*. **MCC5.G.4**

19. parallelogram _____



20. trapezoid _____



21. Mr. Macy's garden is surrounded by a fence. The fence makes four right angles at each corner. All four sides of the fence are 14 meters long. What shape best describes Mr. Macy's garden? **MCC5.G.4**

22. Gary drew the logo to the right. The blue figure has two pairs of parallel sides, two pairs of congruent sides, and four right angles. What is the shape of the blue figure? **MCC5.G.4**



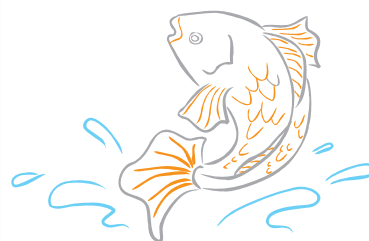
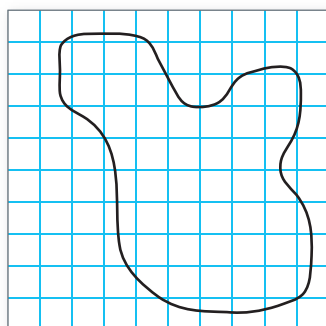


HOW can you estimate the area of an irregular figure?



Content Standards
MCC6.G.1
Mathematical Practices
1, 3, 4, 5

Ponds The Ramirez family is putting a koi pond in their backyard. They need to estimate the area of the pond to know how many fish they can put in the pond. A scale drawing of the pond is shown below. In the drawing, each square represents one square foot.



What do you know? _____

What do you need to know? _____

Investigation 1

Step 1 Shade and count the number of whole squares the pond covers.

Step 2 Estimate the number of whole squares covered by the partial squares altogether.

Step 3 Add your answers from Steps 1 and 2.

 + =

So, the area of the pond is about square feet.

Investigation 2

Another way to estimate the area of an irregular figure is to separate the figure into simpler shapes. Then find the sum of these areas.

Step 1 First, separate the figure into a triangle and a rectangle.

Step 2 Find the area of each figure.

Area of a triangle

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

$$= \frac{1}{2} \cdot 200 \cdot 311 \quad b = 300 - 100 \text{ or } 200$$

$$h = 481 - 170 \text{ or } 311$$

$$= 31,100$$

Simplify.

Area of rectangle

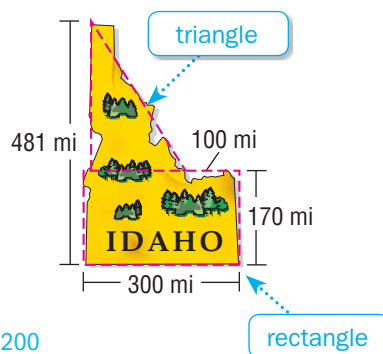
$$A = \ell w$$

$$= 300 \cdot 170 \text{ or } 51,000 \quad \ell = 300 \text{ and } w = 170$$

Step 3 Add to find the total area.

$$\boxed{} + \boxed{} = \boxed{}$$

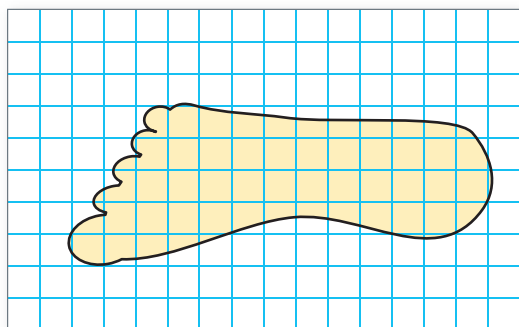
The area of Idaho is about $\boxed{}$ square miles.



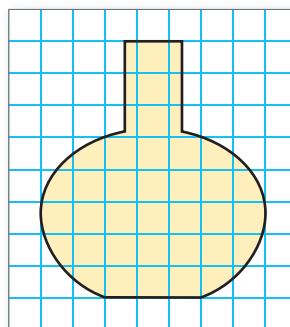
Collaborate

Use Math Tools Work with a partner to estimate the area of each irregular figure.

1. $A \approx$ _____



2. $A \approx$ _____

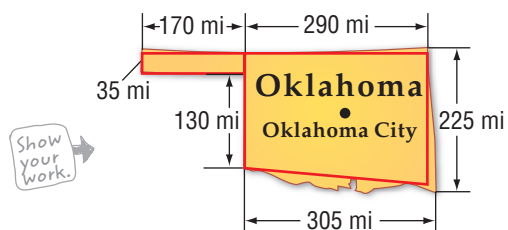




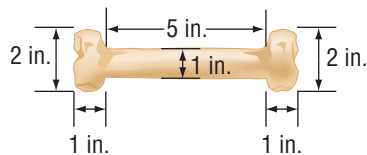
Collaborate

Work with a partner to estimate the area of each irregular figure.

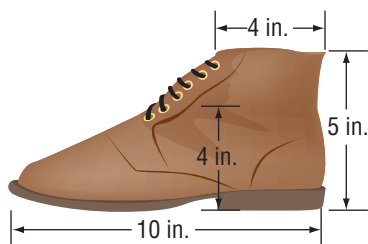
3. $A \approx$ _____



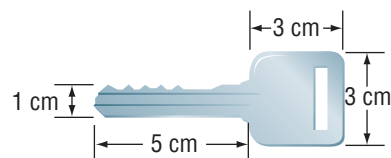
4. $A \approx$ _____



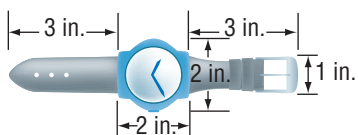
5. $A \approx$ _____



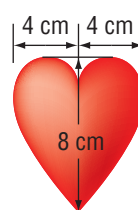
6. $A \approx$ _____



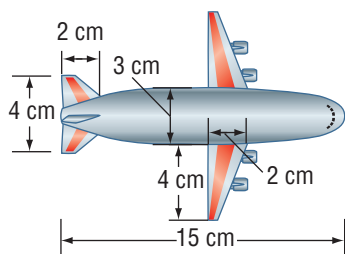
7. $A \approx$ _____



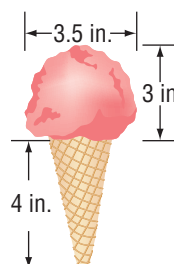
8. $A \approx$ _____



9. $A \approx$ _____



10. $A \approx$ _____





Analyze

Work with a partner to complete the table. The first one is done for you.

| | Irregular Figure | Draw the simpler shapes you can make. | Area of Each Simpler Shape | Estimated Area of Irregular Figure |
|-----|------------------|---------------------------------------|---|------------------------------------|
| | | | $8 \times 3 = 24$ $12 \times 4 = 48$ | 72 square centimeters |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |



14. **Reason Inductively** Heather solves Exercise 11 by subtracting the area of two triangles from the area of a large rectangle and finds the answer 105 square inches. How does Heather's answer compare to your answer for Exercise 11?



Reflect

15. **Model with Mathematics** Describe a real-world example of when it would be useful to estimate the area of a figure.

16. **Inquiry** HOW can you estimate the area of an irregular figure?

Area of Composite Figures

What You'll Learn

Scan the lesson. List two things real-world scenarios in which you would use the area of composite figures.

- _____
- _____



Essential Question

HOW does measurement help you solve problems in everyday life?



Vocabulary

composite figure



Common Core GPS

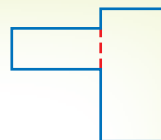
Content Standards
MCC6.G.1

Mathematical Practices
1, 2, 3, 4, 6, 7

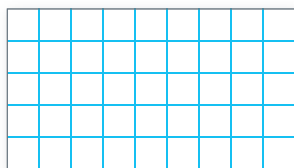
Vocabulary Start-Up



A **composite figure** is a figure made of two or more two-dimensional figures. The composite figure shown to the right is made of two rectangles.

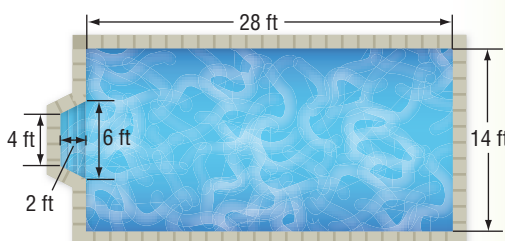


Draw a composite figure made of a rectangle and a right triangle on the graph paper below.



Real-World Link

Pools The dimensions of the city pool are shown.



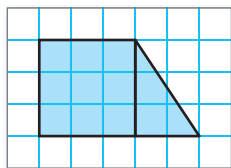
- What two-dimensional figures are used to make the shape of the pool?

- How could you determine the area of the pool floor?



Find the Area of a Composite Figure

You can decompose some trapezoids into a square and a triangle to find the area.



Area of Square

$$A = \ell \cdot w$$

$$A = 3 \cdot 3, \text{ or } 9$$

Area of Triangle

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

$$A = \frac{1}{2}(2)(3), \text{ or } 3$$

Then add the area of the square and the area of the triangle to find the area of the trapezoid. The area of the trapezoid is $9 + 3$ or 12 square units.

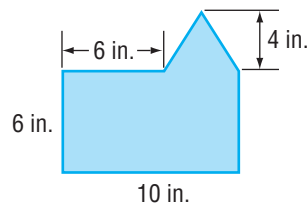
You can find the area of a composite figure using the same strategy. To find the area of a composite figure, separate it into figures with areas you know how to find. Then add those areas.

Example

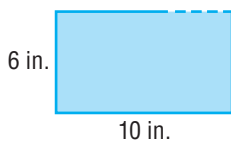


1. Find the area of the figure at the right.

The figure can be separated into a rectangle and a triangle. Find the area of each.



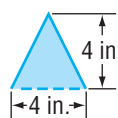
Area of Rectangle



$$A = \ell w$$

$$A = 10 \cdot 6 \text{ or } 60$$

Area of Triangle



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

$$A = \frac{1}{2}(4)(4) \text{ or } 8$$

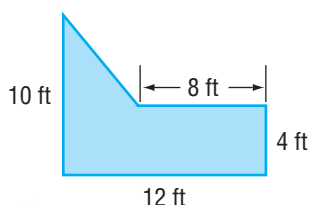
The base of the triangle is $10 - 6$ or 4 inches.

The area is $60 + 8$ or 68 square inches.

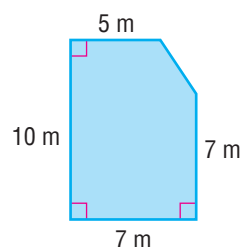
Got It? Do these problems to find out.

Find the area of each figure.

a.



b.



a. _____

b. _____





Example



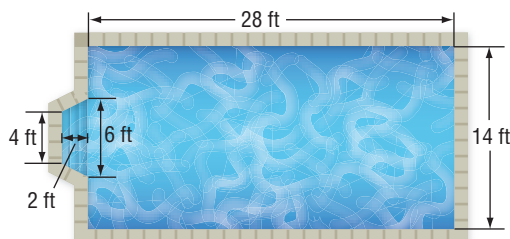
2. Find the area of the pool's floor.

Separate the figure into a rectangle and a trapezoid.

Rectangle: 28×14 or 392

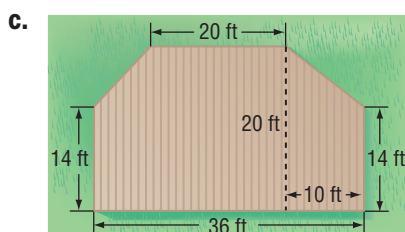
Trapezoid: $\frac{1}{2}(2)(4 + 6)$ or 10

So, the area of the pool's floor is $392 + 10$ or 402 square feet.



Got It? Do this problem to find out.

Show your work.



Find the Area of Overlapping Figures

To find the area of overlapping figures, decompose the figures.

Example



3. Find the area of the figure at the right.

Square: 12×12 or 144

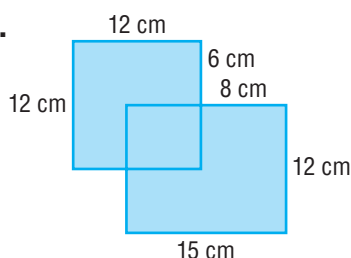
Rectangle: 15×12 or 180

The sum of the areas: $144 + 180$ or 324

Overlapping area: 6×7 or 42

Subtract the overlapping area. $324 - 42 = 282$

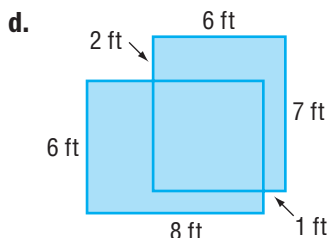
So, the area of the figure is 282 square centimeters.



Be Precise

It is important not to count the area of the overlapping portion twice when finding the area of overlapping figures.

Got It? Do this problem to find out.





Example



- 4. Charlie and his brother Matthew are neighbors in an apartment complex where they share a patio. What is the area of both apartments and the patio?**

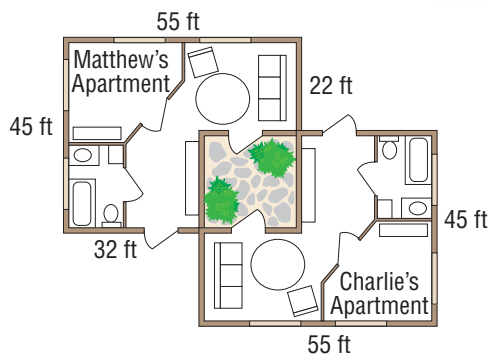
Each apartment:
 55×45 or 2,475

The sum of the areas:
 $2,475 + 2,475$ or 4,950

Patio: 23×23 or 529

Subtract the overlapping area. $4,950 - 529 = 4,421$

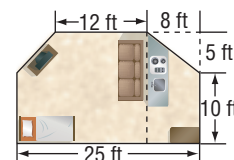
So, the total area is 4,421 square feet.



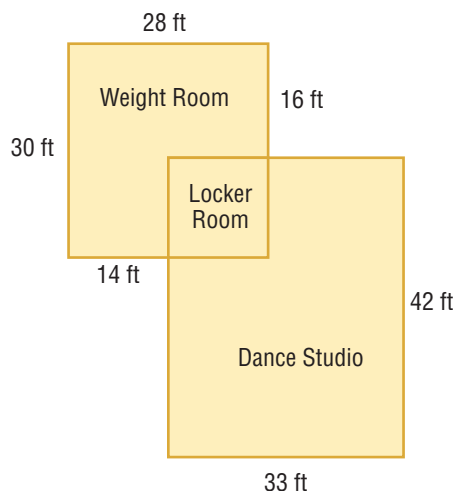
Guided Practice



- 1.** The manager of an apartment complex will install new carpeting in a studio apartment. The floor plan is shown at the right. What is the total area that needs to be carpeted? (Example 1 and 2)



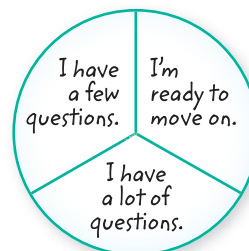
- 2.** Finn Fitness has an entrance to the locker room from both the dance studio and the weight room. What is the total area of Finn Fitness? (Examples 3 and 4)



- 3. Building on the Essential Question** How can you decompose figures to find area?

Rate Yourself!

Are you ready to move on?
 Shade the section that applies.



For more help, go online to access a Personal Tutor.



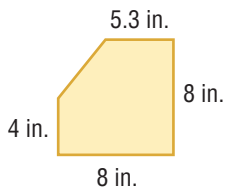
Independent Practice

Go online for Step-by-Step Solutions



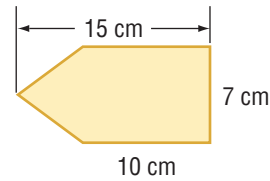
Find the area of each figure. Round to the nearest tenth if necessary. (Example 1)

1

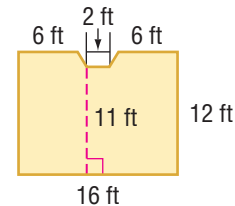


Show your work.

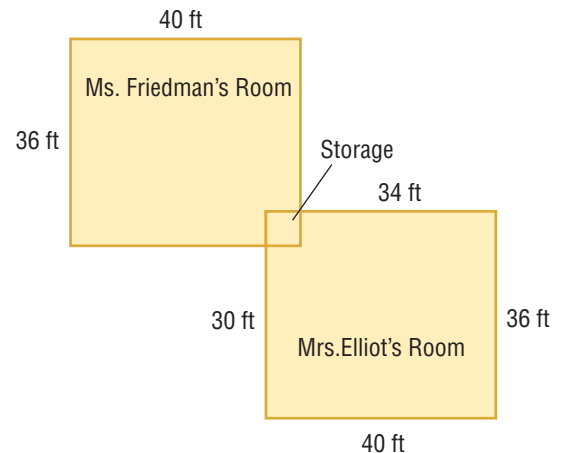
2.



3. The floor plan of a kitchen is shown at the right. If the entire kitchen floor is to be tiled, how many square feet of tile are needed? (Example 2)



4. Ms. Friedman and Mrs. Elliot both teach sixth grade math. They share a storage closet. What is the total area of both rooms and the storage closet? (Examples 3 and 4)



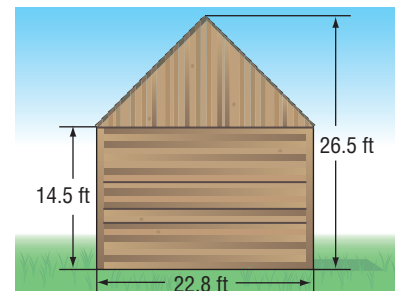
5

The diagram shows one side of a storage barn.

- a. This side needs to be painted. Find the total area to be painted. _____

Show your work.

- b. Each gallon of paint costs \$20 and covers 350 square feet. Find the total cost to paint this side once. Justify your answer.



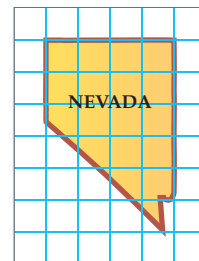
6. **Reason Abstractly** Refer to the graphic novel frame below for Exercises a–b.



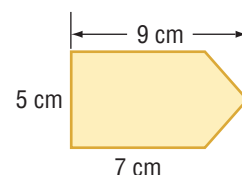
- a. The first clue was hidden in a triangular section of the park with an area of 600 square feet. The second clue was hidden in a rectangular section with a height of 30 feet and a width of 24 feet. What was the area of the rectangular section? _____
- b. What is the total search area? _____

H.O.T. Problems Higher Order Thinking

7. **Persevere with Problems** Describe how to separate the figure into simpler figures. Then estimate the area. One square unit equals 2,400 square miles. Justify your answer.



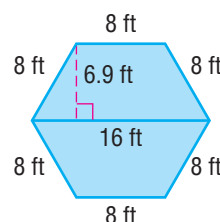
8. **Identify Structure** Describe how you would find the area of the figure shown at the right. _____



Georgia Test Practice

9. The diagram gives the dimensions of the geodome climber on the playground. What is the total area of the geodome?

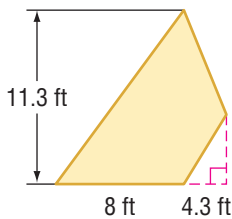
- (A) 82.8 ft^2 (C) 331.2 ft^2
(B) 165.6 ft^2 (D) 883.2 ft^2



Extra Practice

Find the area of each figure. Round to the nearest tenth if necessary.

10. 69.5 ft²

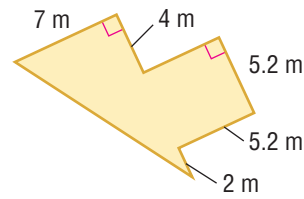


$$A = \frac{1}{2}(8)(11.3) = 45.2$$

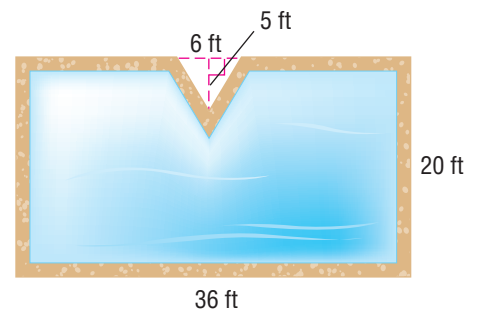
$$A = \frac{1}{2}(4.3)(11.3) \approx 24.3$$

$$45.2 + 24.3 = 69.5$$

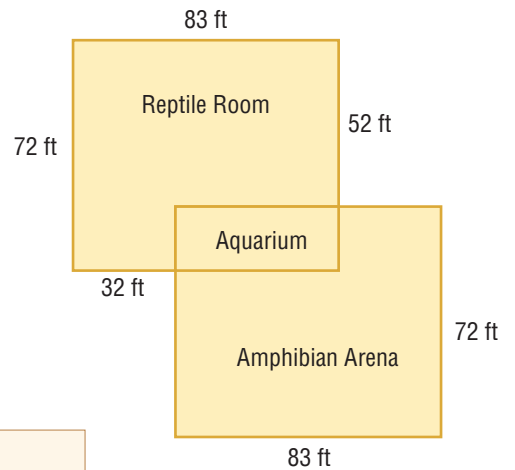
11. _____



12. The diagram gives the dimensions of a swimming pool. If a cover is needed for the pool, what will be the approximate area of the cover? _____



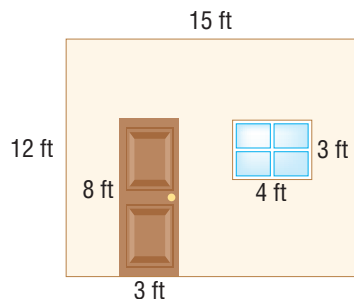
13. At the local zoo, the aquarium can be seen from the Reptile Room and the Amphibian Arena. What is the total area of both rooms and the aquarium? _____



14. **CCPS Persevere with Problems**

The diagram shows one wall of Sadie's living room.

- a. This wall needs to be painted. Find the total area to be painted. _____

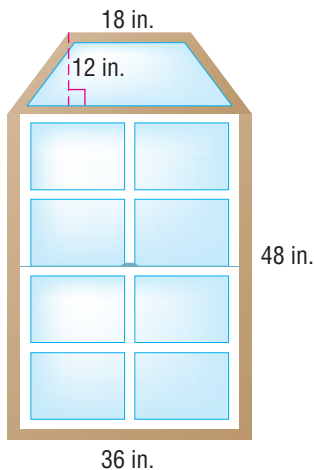


- b. Each quart of paint costs \$8 and covers 90 square feet. Find the total cost to paint this wall once. Justify your answer.



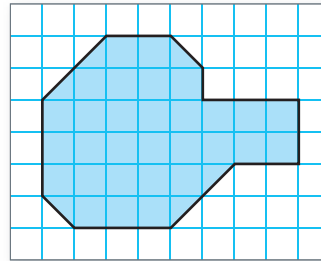
Georgia Test Practice

15. What is the area of the window shown?



- (A) $2,052 \text{ in}^2$ (C) 508.68 in^2
(B) $1,728 \text{ in}^2$ (D) 324 in^2

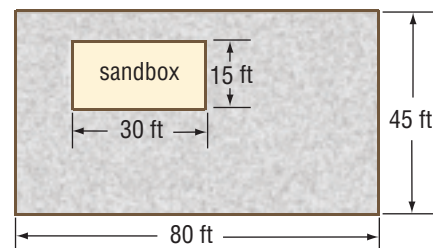
16. The shaded part of the grid represents the plans for a fish pond.



If each square on the grid represents 5 square feet, what is the approximate area of the fish pond?

- (F) 175 square feet
(G) 165 square feet
(H) 150 square feet
(I) 33 square feet

17. **Short Response** To promote recycling, the ground of the neighborhood playground shown is being covered by shredded tires. The sandbox will *not* be covered. What is the area, in square feet, of the shredded tire portion of the playground? _____



Common Core Review

Multiply. MCC5.NBT.5

18. $36 \times 12 =$ _____

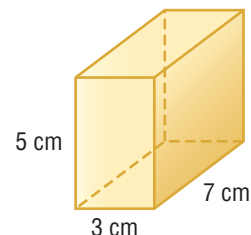
19. $15 \times 71 =$ _____

20. $72 \times 200 =$ _____

21. Find the volume of the rectangular prism. MCC5.MD.5b

22. Hiking burns about 144 Calories each half hour. About how many Calories can be burned if someone hikes 3 days a week for an hour?

MCC4.OA.3 _____



21ST CENTURY CAREER

in Community Planning

Parks and Recreation Planner

Do you enjoy thinking about how your community might look 10 years in the future? If so, a career in parks and recreation planning might be a perfect fit for you. Most planners are employed by local governments. They assess the best use for the land and create short and long term plans for various parks and recreation areas. They make recommendations based on the location of roads, schools, and residential areas. A parks and recreation planner uses mathematics, science, and computer software to complete their work.



Explore college and careers at ccr.mcgraw-hill.com

Is This the Career for You?

Are you interested in a career as a parks and recreation planner? Take some of the following courses in high school.

- ◆ Economics
- ◆ Environmental Design
- ◆ Geometry

Turn the page to find out how math relates to a career in Community Planning.

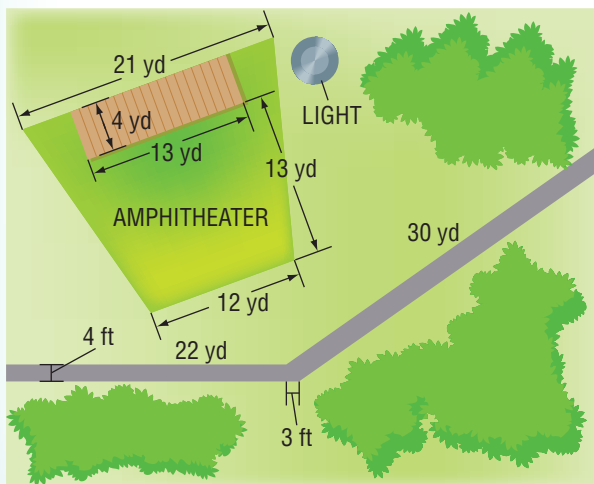


You be the Parks and Recreation Planner!

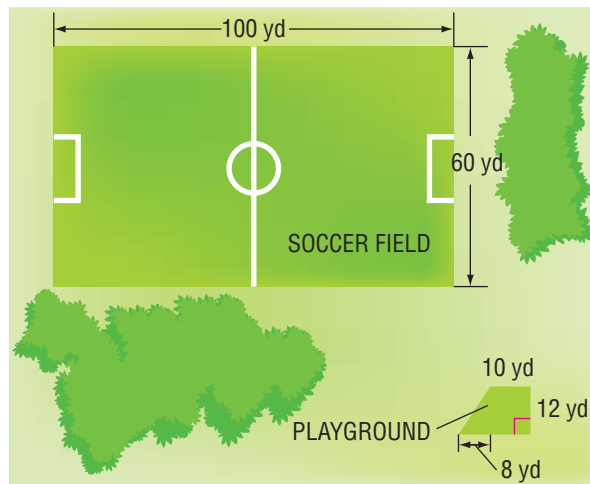
For each problem, use the information in the designs.

- What is the area of the playground in Design 2? _____
- In Design 2, how much larger is the area of the soccer field than the area of the playground? _____
- In Design 1, the amphitheater has a stage. What is the area of the amphitheater without the stage? _____
- The cost of building the amphitheater including the stage is \$225 a square yard. The budget provided to build the amphitheater is \$65,000. Are they within budget? Explain.

Design 1



Design 2



Career Project

It's time to update your career portfolio! The New York City Department of Parks and Recreation has a free "Park Planner Game" online. Go to the Website to create your own park with trees, sports fields, and paths, while trying to stay under budget.

What is something you really want to do in the next ten years?

- _____
- _____
- _____
- _____
- _____



Vocabulary Check

Unscramble each of the clue words.

SEBA

HGEHTI

LYNPOOG

LAEGARLAPLORM

MHOBRUS

NETRUGNOC

POMECSTI ERFUGI

AROMLUF

Complete each sentence using one of the unscrambled words above.

1. A _____ is a simple closed figure formed by three or more straight line segments.
2. The shortest distance from the base of a parallelogram to its opposite side is the _____.
3. A _____ is a quadrilateral with opposite sides parallel and opposite sides congruent.
4. Any side of a parallelogram is a _____.
5. A parallelogram with four congruent sides is a _____.
6. If two shapes have the same measure they are _____.
7. A figure made of triangles, quadrilaterals, and other two dimensional figures is a _____.
8. A _____ is an equation that shows a relationship among certain quantities.

Key Concept Check

Use Your FOLDABLES®

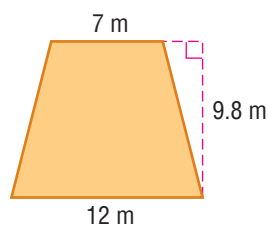
Use your Foldable to help review the chapter.

Tape here

| Area | | |
|---------------------|---------------------|---------------------|
| Real-World Examples | Real-World Examples | Real-World Examples |
| | | |
| | | |
| | | |
| | | |

Got it?

Match each expression with correct steps used to find the area of the trapezoid.



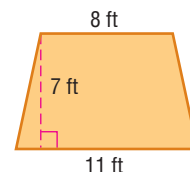
- Write the correct area formula.
 - Replace h with 9.8.
 - Replace b_1 with 7 and replace b_2 with 12.
 - Add.
 - Multiply.
- $A = \frac{1}{2}(9.8)(b_1 + b_2)$
 - $A = \frac{1}{2}bh$
 - $A = \frac{1}{2}(9.8)(19)$
 - $A = \frac{1}{2}h(b_1 + b_2)$
 - $A = 93.1$
 - $A = \frac{1}{2}(9.8)(7 + 12)$

Problem Solving

1. Find the height of a deck if it is a parallelogram with base $8\frac{1}{4}$ feet and an area of $49\frac{1}{2}$ square feet. (Lesson 1) _____

2. How much material is needed to make a triangular flag with base $2\frac{1}{4}$ feet and height $8\frac{1}{2}$ feet? (Lesson 2) _____

3. One room in Franco's room is in the shape of a trapezoid with the dimensions shown. Find the area of the wall to be painted. (Lesson 3)

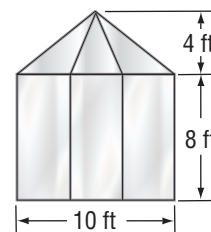


4. **CCPS Reason Abstractly** A window is shaped like a trapezoid. The bases are 30 inches and 40 inches. The height of the window is 24 inches. Find the area of the window. (Lesson 3)

5. A bricklayer wants to arrange 16 bricks into a rectangular shape with the greatest perimeter possible. How many bricks will be in each row? (PSI)

6. **CCPS Identify Structure** Each side of a rectangle with a length of 10 centimeters, and a width of 8 centimeters is multiplied by 0.5. Describe the change in the perimeter. (Lesson 4) _____

7. The side of a four season room is being constructed with the dimensions shown. Find the area of the side being built of glass windows. (Lesson 5)



Reflect



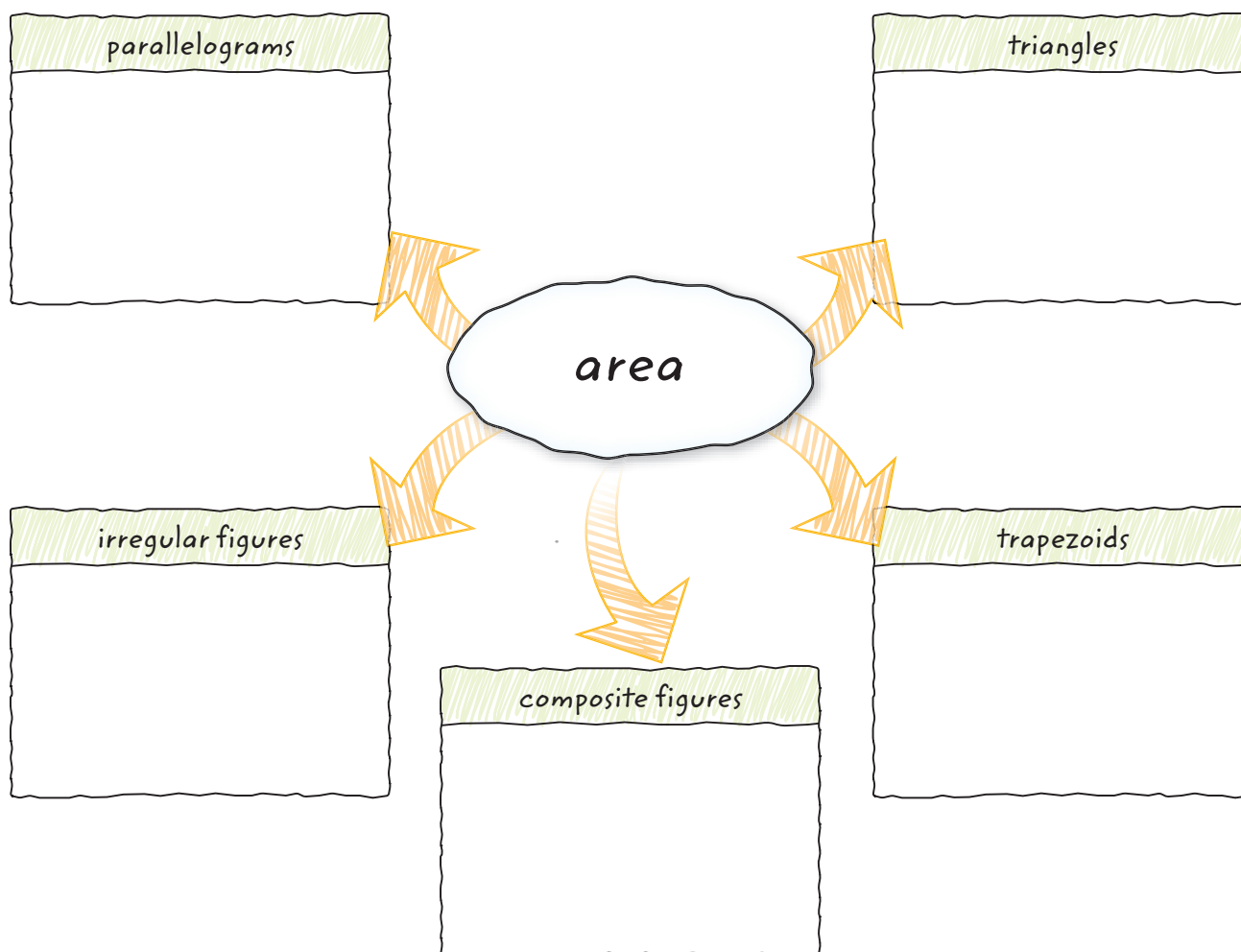
Answering the Essential Question

Use what you learned about area to complete the graphic organizer. List several real-world examples for each figure.



Essential Question

HOW does measurement help you solve problems in everyday life?



Answer the Essential Question. HOW does measurement help you solve problems in everyday life?
