Lesson 7-1
Find Areas of Parallelograms and Rhombuses

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I can...
use what I know about areas of rectangles to find the areas of parallelograms and rhombuses.

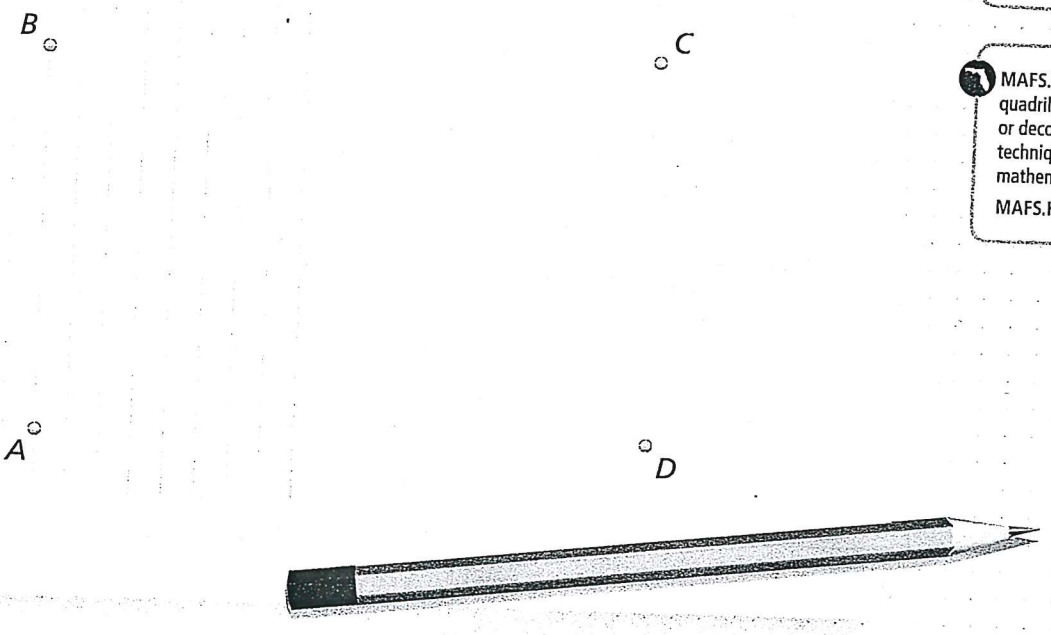
MAFS.6.G.1.1 Find the area of... special quadrilaterals... by composing into rectangles or decomposing into triangles... apply these techniques in the context of solving real-world and mathematical problems. Also 6.EE.1.2c

MAFS.K12.MP.2.1, MP.3.1, MP.6.1, MP.7.1, MP.8.1

Solve & Discuss It!

ACTIVITY

Sofía drew the grid below and plotted the points *A*, *B*, *C*, and *D*. Connect point *A* to *B*, *B* to *C*, *C* to *D*, and *D* to *A*. Then find the area of the shape and explain how you found it. Using the same grid, move points *B* and *C* four units to the right. Connect the points to make a new parallelogram *ABCD*. What is the area of this shape?



Look for Relationships What relationships do you see between rectangles and parallelograms?

Focus on math practices

Generalize How can you find the area of any parallelogram?

Essential Question How can you use the area formula of a rectangle to find the area formula of a parallelogram?

VISUAL LEARNING ASSESS

EXAMPLE 1 Find the Area Formula of a Parallelogram

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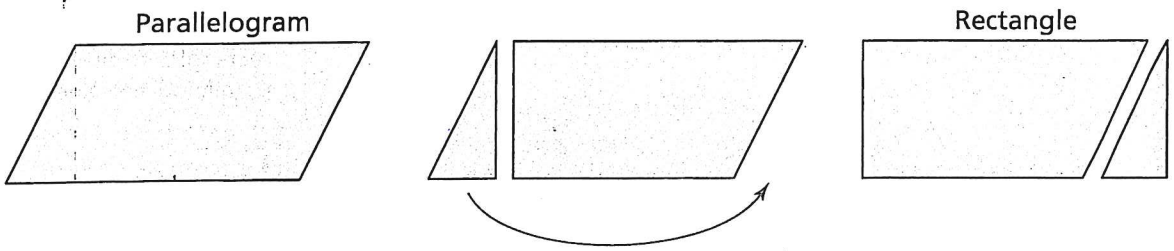
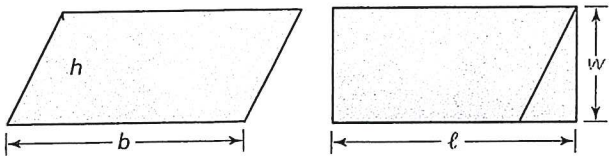
Look at the parallelogram below. If you move the triangle to the opposite side, you form a rectangle with the same area as the parallelogram. How can you find the area of a parallelogram?

Use Structure To compose a rectangle from a parallelogram, first decompose the parallelogram into a right triangle and a trapezoid.



Create a rectangle.

The height of the parallelogram, h, which is perpendicular to the base, equals the width of the rectangle, w.

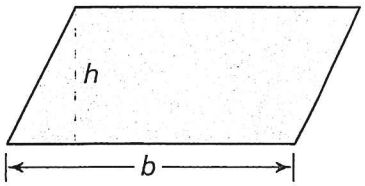


The base of the parallelogram, b, equals the length of the rectangle, ℓ.

The area of the parallelogram equals the area of the rectangle.

Area of a Rectangle $A = \ell \times w$

Area of a Parallelogram $A = b \times h$



The formula for the area of a parallelogram is $A = bh$.

Try It!

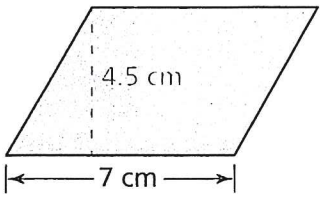
Find the area of the parallelogram.

$A =$ $\times h$

$A =$ $\times$

$A =$

The area of the parallelogram is $\quad$ cm^2.



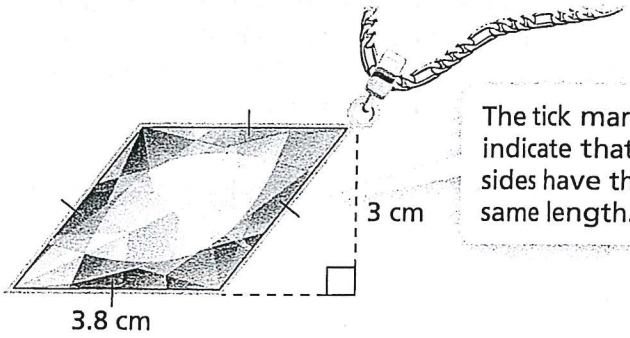
Convince Me! Compare the area of this parallelogram to the area of a rectangle with a length of 7 cm and a width of 4.5 cm. Explain.

EXAMPLE 2 Find the Area of a Rhombus

ACTIVITY ASSESS

The pendant at the right is in the shape of a rhombus. A rhombus is a parallelogram with sides of equal length. What is the area of the pendant?

Be Precise You can use the formula for the area of a parallelogram to find the area of a rhombus. Remember to record area in square units.



The tick marks indicate that the sides have the same length.

$A = b \times h$

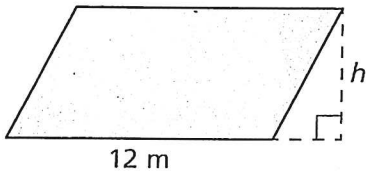
$A = 3.8 \times 3$

$A = 11.4$

The area of the pendant is 11.4 cm^2.

EXAMPLE 3 Find the Base or Height of a Parallelogram

A. The area of the parallelogram is 72 m^2. What is the height of the parallelogram?



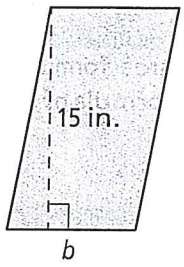
$A = b \times h$

$72 = 12 \times h$ Substitute 72 for A and 12 for b.

$6 = h$

The height of the parallelogram is 6 m.

B. The area of the parallelogram is 135 $in.^2$. What is the base of the parallelogram?



$A = b \times h$

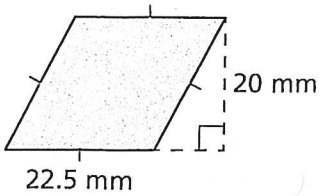
$135 = b \times 15$ Substitute 135 for A and 15 for h.

$9 = b$

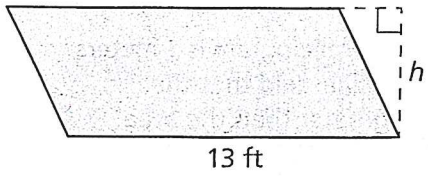
The base of the parallelogram is 9 in.

Try It!

a. Find the area of the rhombus.

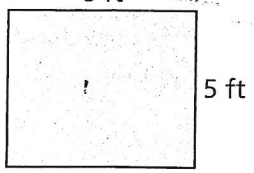


b. The area of the parallelogram is 65 ft^2. What is its height?



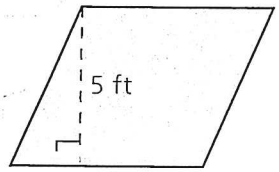
KEY CONCEPT

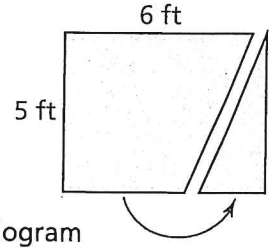
You can decompose a parallelogram and compose a rectangle to find the area of a parallelogram or a rhombus. The formula for the area of a rectangle, $A = \ell \times w$, can be written as the formula $A = b \times h$ to find the area of a parallelogram or the area of a rhombus.



The base equals the length.

The height equals the width.





Rectangle

$A = \ell \times w$

$A = 6 \times 5$

$= 30 \text{ ft}^2$

Parallelogram

$A = b \times h$

$A = 6 \times 5$

$= 30 \text{ ft}^2$

Do You Understand?

1. Essential Question How can you use the area formula of a rectangle to find the area formula of a parallelogram?

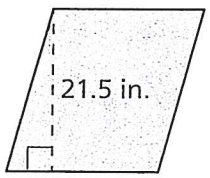
2. Ken combined a triangle and a trapezoid to make a parallelogram. If the area of the triangle is 12 in.^2 and the area of the trapezoid is 24 in.^2, what is the area of the parallelogram? Explain.

3. **Critique Reasoning** A parallelogram is 3 meters long and 7 meters high. Liam said that the parallelogram's area is greater than the area of a rectangle with the same dimensions. Is he correct? Explain.

Do You Know How?

In 4–6, use a formula to find the area.

4.



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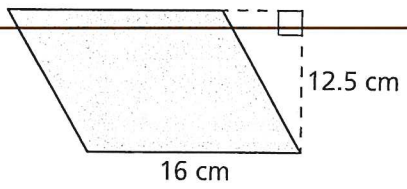

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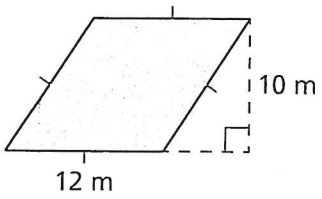

7. A rhombus has an area of 440 m^2 and a base of 22 m. What is its height?

Name:

PRACTICE TUTORIAL

Practice & Problem Solving

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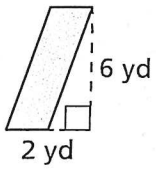
Leveled Practice In **8–11**, find the area of each parallelogram or rhombus.

8.

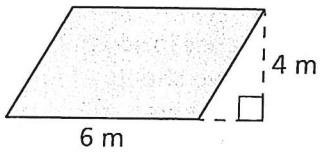


$A = b \cdot h$

$= \quad \cdot 6$

$= \quad \text{yd}^2$

9.

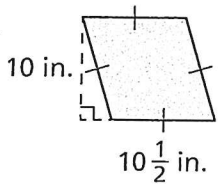


$A = b \cdot h$

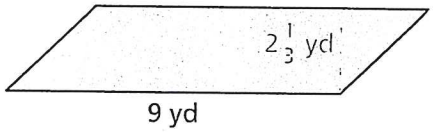
$= \quad \cdot$

$= \quad \text{m}^2$

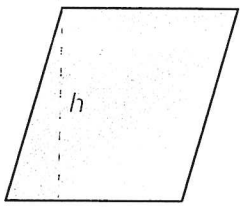
10.



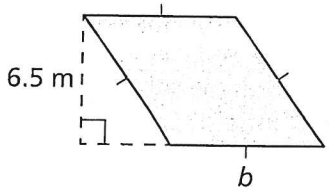
11.



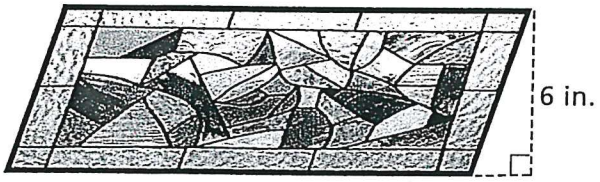
12. The area of the parallelogram is 132 in.^2. What is the height of the parallelogram?



13. The area of the rhombus is 52 m^2. What is the base of the rhombus?



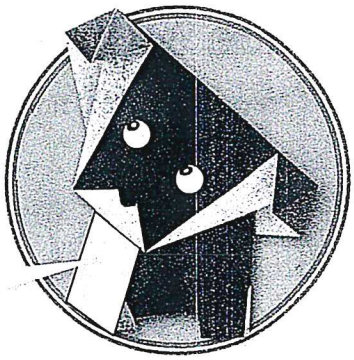
14. Micah and Jason made parallelogram-shaped stained glass windows with the same area. The height of Micah's window is 9 inches, and its base is 10 inches. The height of Jason's window is 6 inches. What is the base of Jason's window?



15. A rectangle has a length of 8 m and a width of 4.5 m. A parallelogram has a length of 6 m. The area of the parallelogram is twice the area of the rectangle. What is the height of the parallelogram?

In 16 and 17, use the picture at the right.

16. Hilary made an origami dog. What is the area of the parallelogram that is highlighted in the origami figure?



17. A type of origami paper comes in 15 cm by 15 cm square sheets. Hilary used two sheets to make the origami dog. What is the total area of the origami paper that Hilary used to make the dog?

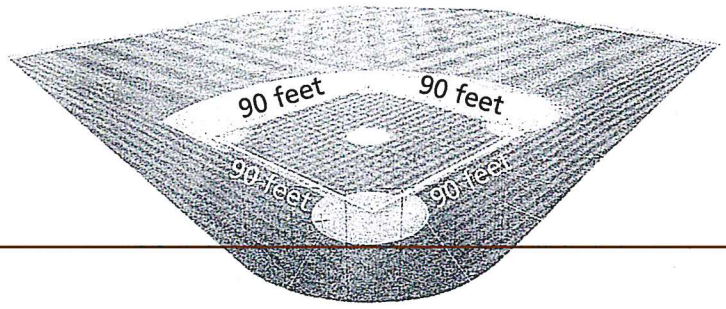
$b = 4$ cm

$h = 2.36$ cm

18. **Reasoning** A rectangle and a parallelogram have the same base and the same height. How are their areas related? Provide an example to justify your answer.

19. Soshi's rhombus has a base of 12 in. and a height of 10 in. Jack's rhombus has base and height measures that are double those of Soshi's rhombus. Compare the area of Jack's rhombus to the area of Soshi's rhombus. Explain.

20. **Higher Order Thinking** The infield of a baseball diamond is in the shape of a rhombus. An infield cover with dimensions of 85 feet by 100 feet is used to protect the field during rainy weather. Will the cover protect the entire infield? Explain.



Assessment Practice

21. The parking space shown at the right has an area of 209 ft^2. A custom truck has rectangular dimensions of 13.5 ft by 8.5 ft. Can the truck fit in the parking space? Justify your answer. 6.EE.1.2c