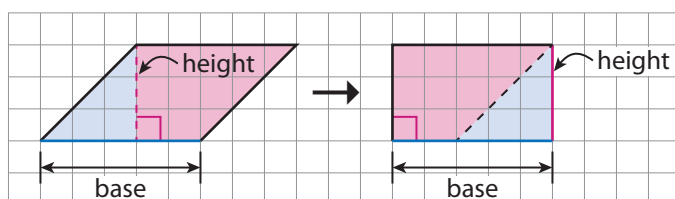


Dear Family,

In earlier grades, your student learned that a rectangle is a type of parallelogram. One way to find the area of a rectangle is to multiply the length (**base**) and width (**height**) of the rectangle.

To find the area of a parallelogram, you can decompose, or break apart, the parallelogram and compose the parts into a rectangle.

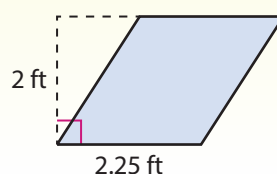


$$\begin{aligned} \text{Area} &= \text{length} \times \text{width} \\ \text{Area} &= \text{base} \times \text{height} \end{aligned}$$

The base and height of a parallelogram are always perpendicular, forming right angles. The height can be measured inside or outside the parallelogram.

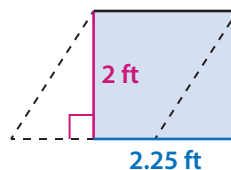
Your student will be learning how to solve problems like the one below.

What is the area of the parallelogram?



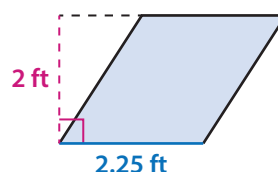
- **ONE WAY** to find the area is to rearrange the parallelogram into a rectangle.

$$\begin{aligned} A &= \ell \cdot w \\ &= 2.25 \cdot 2 \\ &= 4.5 \end{aligned}$$



- **ANOTHER WAY** is to use the formula for the area of a parallelogram.

$$\begin{aligned} A &= b \cdot h \\ &= 2.25 \cdot 2 \\ &= 4.5 \end{aligned}$$



Using either method, the area is 4.5 ft^2 .



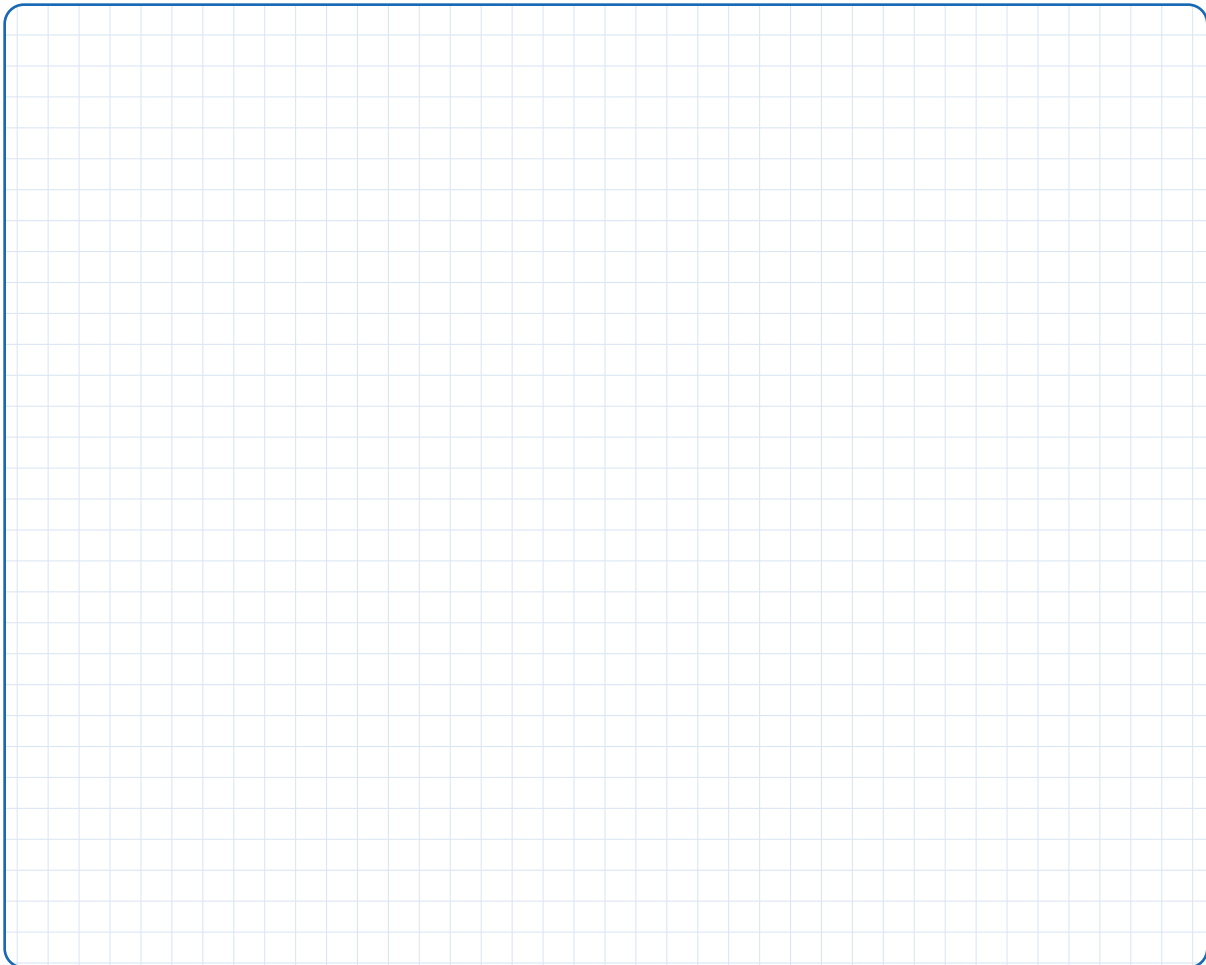
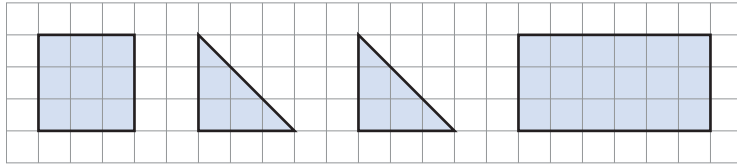
Use the next page to start a conversation about parallelograms.

Activity Decomposing Parallelograms

- **Do this activity together to investigate different ways of decomposing a parallelogram.**



Have you ever noticed you can decompose a parallelogram into smaller shapes? Decomposing a parallelogram allows you to rearrange the pieces into other familiar shapes. Use any combination of the following shapes to draw as many parallelograms as you can.



? What do you notice that is the same about all your shapes?

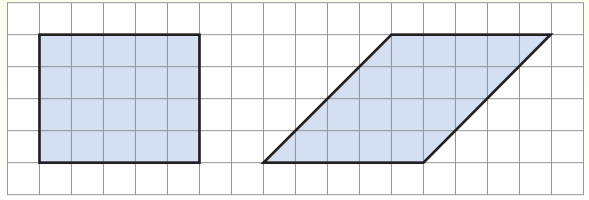
Explore The Area of a Parallelogram



Previously, you learned how to find the area of a rectangle. In this lesson, you will learn how to find the area of a parallelogram.

► Use what you know to try to solve the problem below.

Kenji and Alec are making paper kites for a kite fight. Kenji's kite is a rectangle and Alec's kite is a parallelogram that is not a rectangle. Each boy draws a model of his kite on grid paper. Does Alec's kite use more paper than Kenji's kite?



TRY IT



Math Toolkit geoboards, grid paper, tracing paper, unit tiles

DISCUSS IT

Ask: How would you explain what the problem is asking in your own words?

Share: The problem is asking . . .



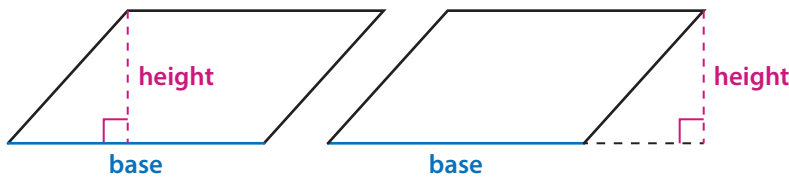
Learning Target SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6
Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

CONNECT IT

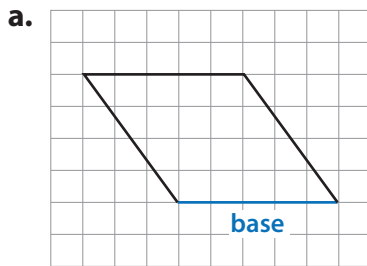
1 Look Back Does Alec’s kite use more paper than Kenji’s kite? Explain.

2 Look Ahead The words *length* and *width* are often used to describe the dimensions of a rectangle. When describing the dimensions of a parallelogram, you use **base** and **height**.

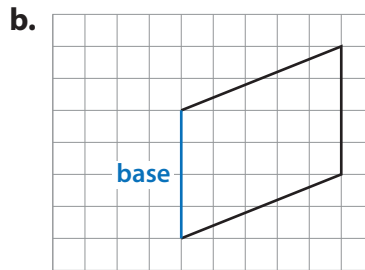
Any side of a parallelogram can be called the base. You can draw a corresponding height inside or outside the parallelogram. The base and height are perpendicular.



For each parallelogram, draw and label a height that corresponds to the side labeled as the base. Then write the length of the base and the height.



base = _____ units
height = _____ units

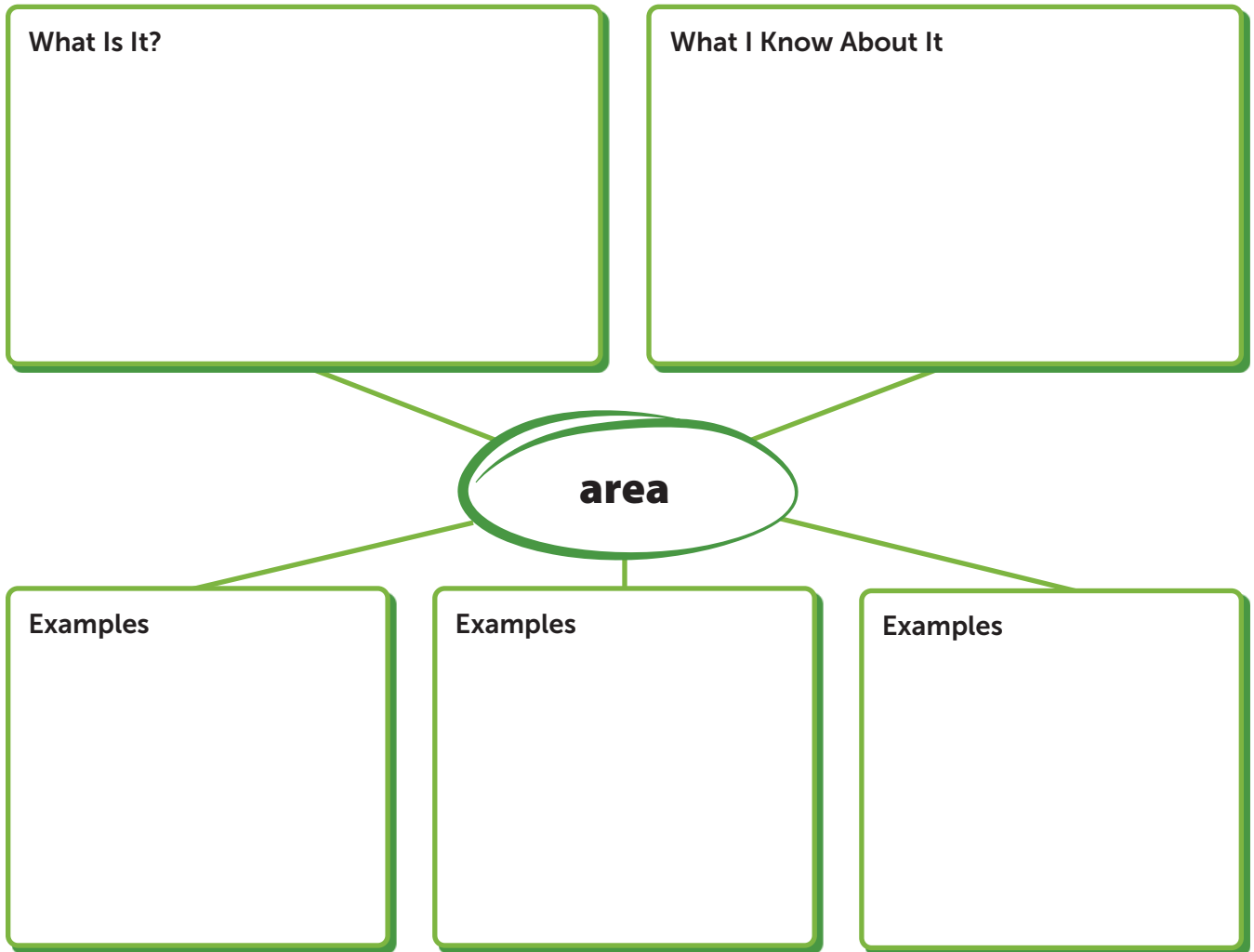


base = _____ units
height = _____ units

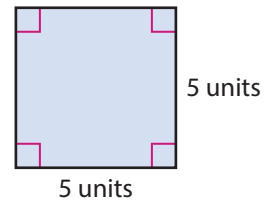
3 Reflect In problem 2a, would the length of the height change if you measured it from a different point on the same base? Explain.

Prepare for Finding the Area of a Parallelogram

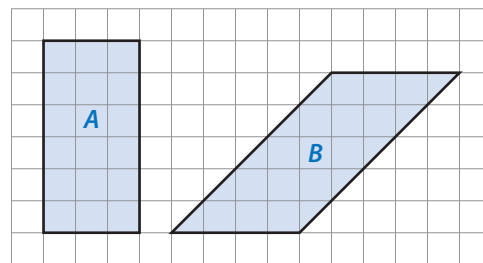
- 1 Think about what you know about area. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.



- 2 Doug says the area of the figure is 20 square units. What is the correct area of the figure? What mistake might Doug have made?



3 A parking lot has two types of parking spaces. Some parking spaces are rectangles and other spaces are parallelograms that are not rectangles. Plans for the parking spaces are drawn on grid paper.



- a. Which parking space covers the greater area, *space A* or *space B*? Show your work.

SOLUTION _____

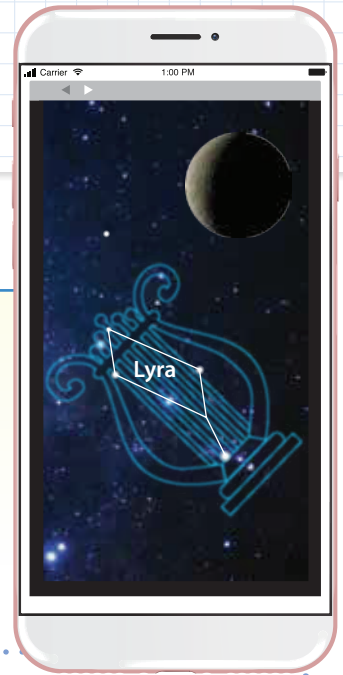
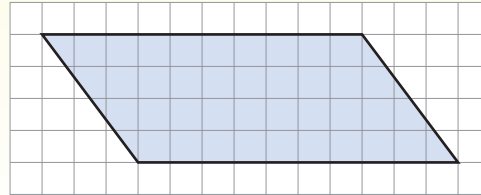
- b. Check your answer to problem 3a. Show your work.



Develop Finding the Area of a Parallelogram

► Read and try to solve the problem below.

On a star map, Neena sees that four stars in the constellation Lyra appear to form a parallelogram. Neena draws a model of the constellation on 1-centimeter grid paper. What is the area of Neena's parallelogram?



TRY IT



Math Toolkit geoboards, grid paper, tangrams, tracing paper

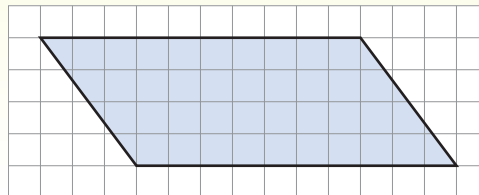
DISCUSS IT

Ask: How is your strategy for finding the area of the parallelogram similar to mine? How is it different?

Share: My strategy is similar to yours . . . It is different . . .

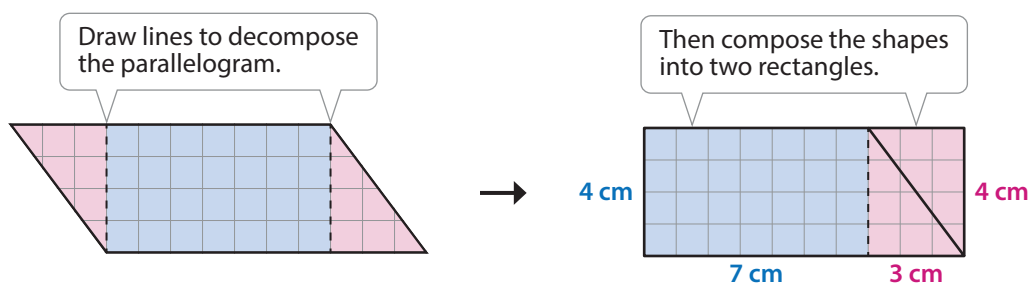
► Explore different ways to find the area of a parallelogram.

On a star map, Neena sees that four stars in the constellation Lyra appear to form a parallelogram. Neena draws a model of the constellation on 1-centimeter grid paper. What is the area of Neena's parallelogram?



Picture It

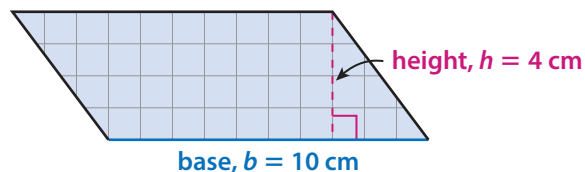
You can find the area of a parallelogram by breaking it into parts and rearranging the parts into rectangles.



$$\begin{aligned}
 \text{Area of parallelogram} &= \text{Area of left rectangle} + \text{Area of right rectangle} \\
 &= (\text{length} \times \text{width}) + (\text{length} \times \text{width}) \\
 &= 28 \text{ cm}^2 + 12 \text{ cm}^2
 \end{aligned}$$

Model It

You can use a formula to find the area of a parallelogram.



$$\begin{aligned}
 \text{Area of parallelogram} &= \text{base} \times \text{height} \\
 A &= b \times h \\
 &= 10 \times 4
 \end{aligned}$$

You can also write the formula $A = b \times h$ as $A = b \cdot h$ or $A = bh$.

CONNECT IT

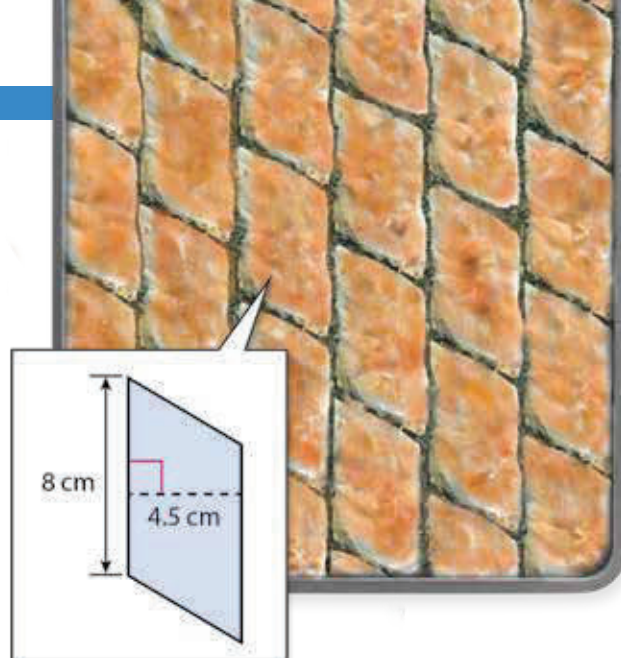
► Use the problem from the previous page to help you understand how to find the area of a parallelogram.

- 1 Look at **Picture It**. What is the combined area of the two rectangles? Why is this the same as the area of Neena's parallelogram?
- 2 In **Model It**, one side of the parallelogram is labeled as the base. How is the length of the base related to the lengths of the two rectangles in **Picture It**?
- 3 Neena's parallelogram can be rearranged into a rectangle. Use this to explain the formula for the area of a parallelogram.
- 4 Explain why you can also use the formula $A = b \cdot h$ to find the area of a rectangle.
- 5 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to find the area of a parallelogram.

Apply It

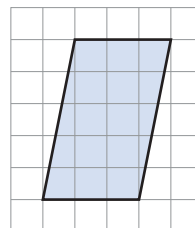
► Use what you learned to solve these problems.

- 6 Cyrus makes Greek spinach pie, called spanakopita, with his grandfather. They cut the pie into pieces shaped like parallelograms. The dimensions of one piece are shown. What is the area of the top of this piece of spinach pie? Show your work.



SOLUTION

- 7 A parallelogram has an area of 48 square units. Which dimensions could it have? Select all that apply.
- A base = 8 units, height = 6 units
 - B height = 24 units, base = 24 units
 - C base = 4 units, height = 12 units
 - D base = 12 units, height = 36 units
 - E height = 4 units, base = 12 units
- 8 What is the area of the parallelogram? Show your work.



SOLUTION

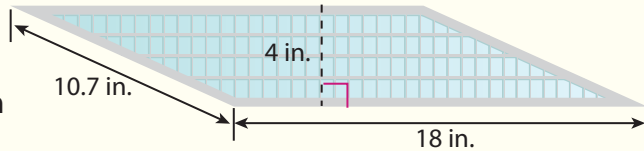
Practice Finding the Area of a Parallelogram

- Study the Example showing how to find the area of a parallelogram. Then solve problems 1–5.



Example

Grace is making a model of a building that is shaped like a parallelogram. The dimensions of the parallelogram in her model are shown. What is the area of the parallelogram in Grace’s model?



The segment labeled 4 in. is perpendicular to the side labeled 18 in. So, the **base** of the parallelogram is **18 in.** and the **height** is **4 in.**

You can use the formula for the area of a parallelogram.

$$A = b \cdot h$$

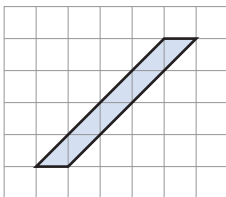
$$A = 18 \cdot 4$$

$$= 72$$

The area of the parallelogram in Grace’s model is 72 in.².

- 1 Look at the parallelogram in the Example. Describe a way to decompose the parallelogram and rearrange the parts to form a rectangle.

- 2 What is the area of the parallelogram? Show your work.



Vocabulary

decompose

to break into parts. You can break apart numbers and shapes.

parallelogram

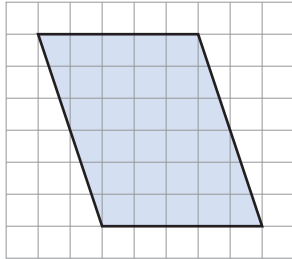
a quadrilateral with opposite sides parallel and equal in length.

perpendicular

meeting to form right angles.

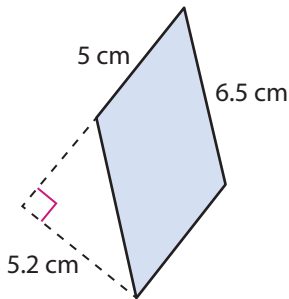
SOLUTION

- 3 The parallelogram shown on the grid represents a mirror. The mirror hangs on a wall that is covered with square tiles. Each grid square represents one tile. The side length of each square tile is 4 in. What is the area of the mirror? Show your work.

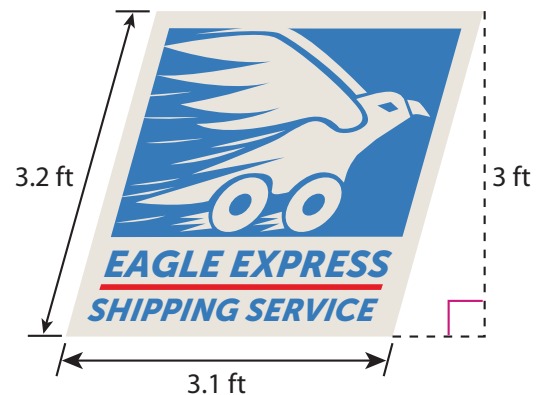


SOLUTION _____

- 4 Explain how you know which line segments are a base and height of the parallelogram.



- 5 The Eagle Express Shipping Service logo is in the shape of a parallelogram. The side lengths of the logo painted on a delivery truck are shown. The perpendicular distance from the bottom of the logo to the top of the logo is 3 ft. What is the area of the logo on the truck? Show your work.



SOLUTION _____

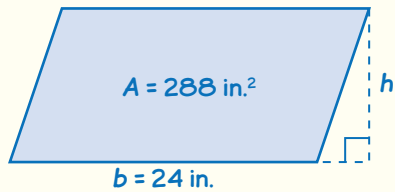
Refine Finding the Area of a Parallelogram

► Complete the Example below. Then solve problems 1–9.

Example

The area of a parallelogram is 288 in.^2 . The base of the parallelogram is 24 in. What is the height of the parallelogram?

Look at how you can use a diagram and equations to show your work.



$$A = b \cdot h$$

$$288 = 24 \cdot h$$

$$h = 288 \div 24$$

SOLUTION _____

CONSIDER THIS . . .

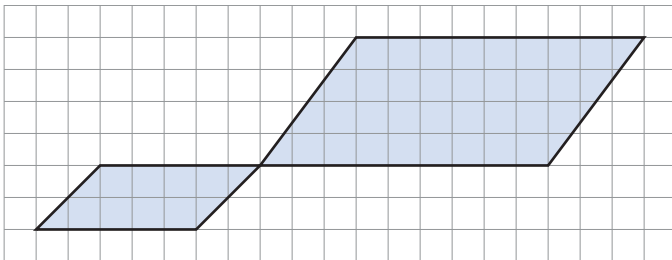
The dot between the b and the h in the area formula is a multiplication symbol.

PAIR/SHARE

Why can you use division to solve this problem?

Apply It

1 What is the area of the figure? Show your work.



SOLUTION _____

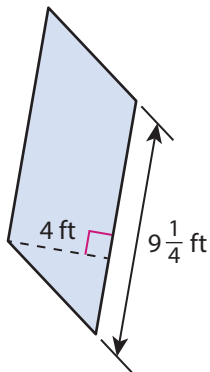
CONSIDER THIS . . .

The figure is made of two parallelograms.

PAIR/SHARE

How would your answer change if the height of each parallelogram were doubled?

- 2 Find the area of the parallelogram. Show your work.



SOLUTION _____

- 3 A small window in a barn is shaped like a parallelogram. The height of the window is half the length of the base of the window. The base of the window is 12 in. The length of the other side of the window is 10 in. What is the area of the window?

- A 22 in.²
 B 60 in.²
 C 72 in.²
 D 120 in.²

Juanita chose D as the correct answer. How might she have gotten that answer?

CONSIDER THIS ...

How can you rewrite the mixed number $9\frac{1}{4}$?

PAIR/SHARE

How could you solve this problem another way?

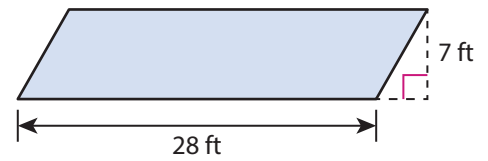
CONSIDER THIS ...

What are the two dimensions you need to find the area?

PAIR/SHARE

How could you draw a diagram to show one possible shape of the window?

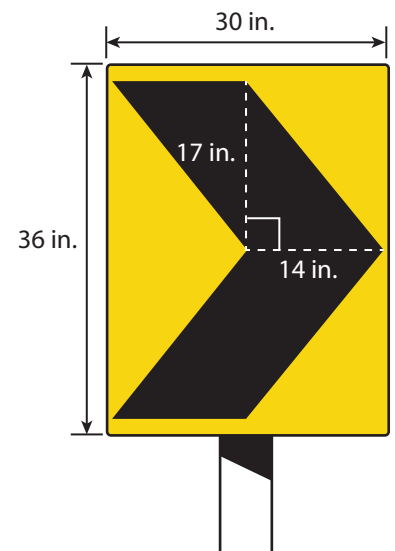
- 4 Kimani plans to paint the background of a mural on a wall in her school’s cafeteria. The mural will be in the shape of a parallelogram. One quart of paint covers 100 square feet. How many quarts of paint does Kimani need? Show your work.



SOLUTION _____

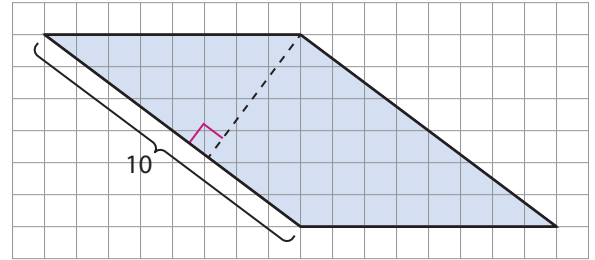
- 5 The area of a parallelogram is 18 square units. One side of the parallelogram is 24 units long. The other side is 6 units long. Which could be the parallelogram’s height? Select all that apply.
- A $\frac{3}{4}$ unit
 - B $\frac{4}{3}$ units
 - C 3 units
 - D 4 units
 - E 12 units

- 6 A road sign is a rectangle with the dimensions shown. The sign has two identical black parallelograms joined together. Each parallelogram has a base of 14 in. and a height of 17 in. Find the area of the sign that is not black. Show your work.

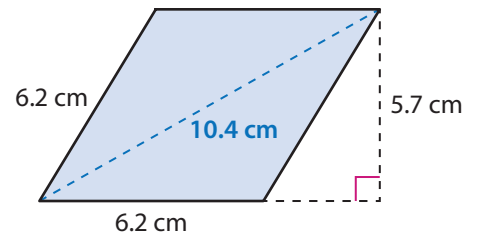
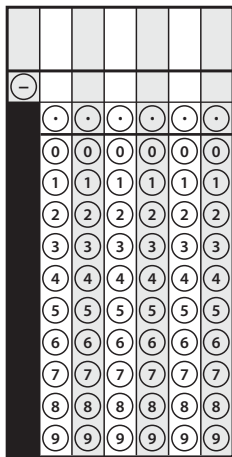


SOLUTION _____

- 7 Leon draws the height shown in the parallelogram. He estimates that the height is about 5 units long. Is Leon's estimate reasonable? Explain.



- 8 What is the area of the parallelogram in square centimeters?



- 9 **Math Journal** Draw two different parallelograms that each have an area of 12 square centimeters. Label the base and height of each parallelogram.

✓ End of Lesson Checklist

- INTERACTIVE GLOSSARY** Find the entries for *base* and *height* of a parallelogram. Write definitions for a younger student. Show an example and label the *base* and *height*.
- SELF CHECK** Go back to the Unit 1 Opener and see what you can check off.