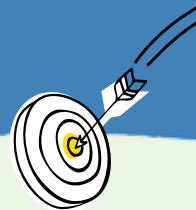


# Explore Area



How can you measure the area of a shape?



## Learning Target

- A plane figure which can be covered without gaps or overlaps by  $n$  unit squares is said to have an area of  $n$  square units.

**SMP** 1, 2, 3, 4, 5, 6

## MODEL IT

Complete the problems below.

- 1 There are different ways you can measure a rug in the shape of a rectangle.
  - a. Draw a rectangular rug to the right and label its length and width.
  - b. How could you measure the length and width of the rug?

- 2 **Area** is the amount of space a flat shape covers. The area of a rug is the amount of floor space it covers. How do you think you could measure the area of the rug to the right?



- 3 How are your ways of measuring in problem 1 and problem 2 different?



## DISCUSS IT

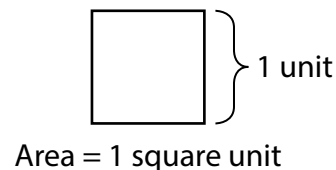
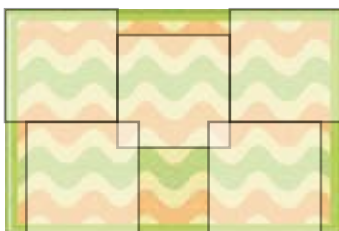
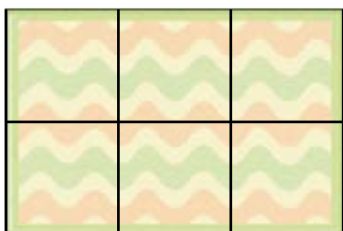
- Did you and your partner come up with the same way to measure in problem 2?
- I think measuring the length or width of a rectangle is different than measuring its area because ...

# MODEL IT

Complete the problems below.

4 You measure area in units that can cover space, called **square units**.

a. Circle the rug below that you think shows the correct way to use square units to measure its area.



b. Explain why your choice in Part a correctly measures area.

c. What is the area of the rug in square units?

..... square units

## 5 REFLECT

Explain how you use square units to find the area of a shape.

.....

.....

.....

.....

.....



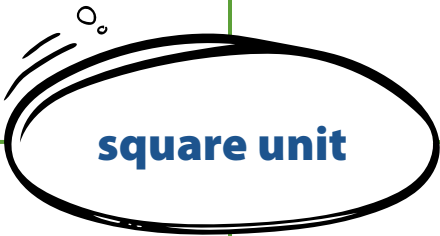
## DISCUSS IT

- Why was the other way to measure area in problem 4a wrong?
- I think square units need to be the same size when finding area because . . .

# Prepare for Finding Area

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

|                 |                  |
|-----------------|------------------|
| In My Own Words | My Illustrations |
| Examples        | Non-Examples     |



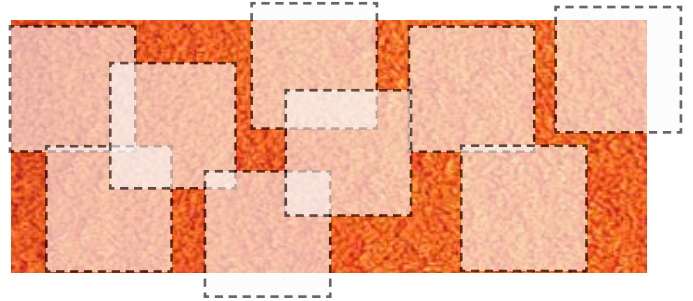
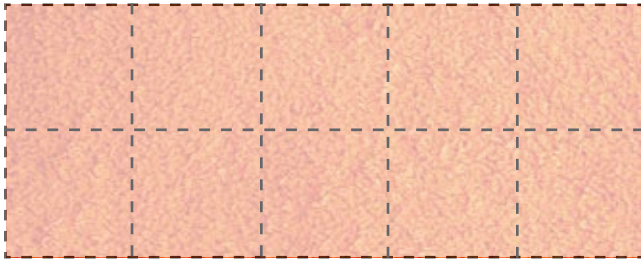
square unit

2 How do you think you could measure the area of the rug to the right in square units?



**Solve.**

- 3 Circle the rug below that you think shows the correct way to use square units to measure its area.



- 4 Explain why your choice in problem 3 correctly measures area.

- 5 What is the area of the rug in square units?

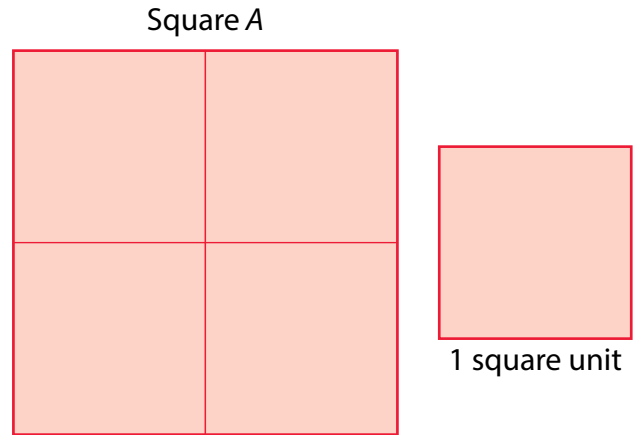
..... square units

# Develop Understanding of Area

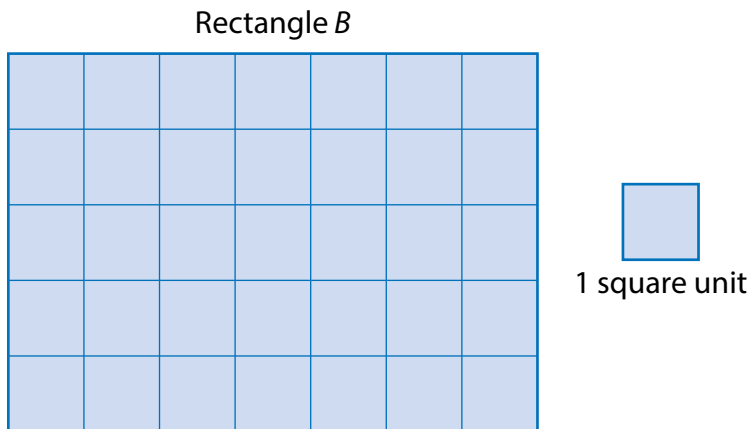
## MODEL IT: RECTANGULAR SHAPES

Try these two problems.

- 1 Look at Square *A* to the right.
  - a. Use an inch ruler to measure the length and width of the square unit next to Square *A*. What is the area of this square unit?  
 ..... square inch
  - b. What is the area of Square *A*?  
 ..... square inches



- 2 Look at Rectangle *B* below.



- a. Use a centimeter ruler to measure the length and width of the square unit next to Rectangle *B*. What is the area of this square unit?  
 ..... square centimeter
- b. What is the area of Rectangle *B*?  
 ..... square centimeters

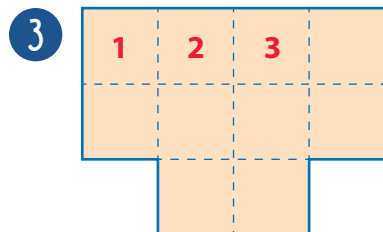


### DISCUSS IT

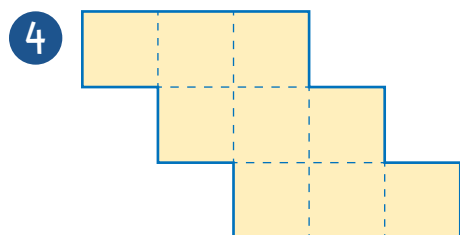
- How did you find the area of each shape?
- I think it would take more square centimeters than square inches to find the area of the same shape because ...

## MODEL IT: NON-RECTANGULAR SHAPES

Number and count the square units to find the area of each shape.



Area = ..... square units



Area = ..... square units



### DISCUSS IT

- Did you and your partner find the area of the shape in problem 4 in the same way?
- I think square units are different from square inches because ...

## CONNECT IT

Complete the problems below.

- 5 How is finding the area of a rectangular shape like finding the area of a non-rectangular shape?

- 6 Explain how to find the area of the rectangle. Then find the area.



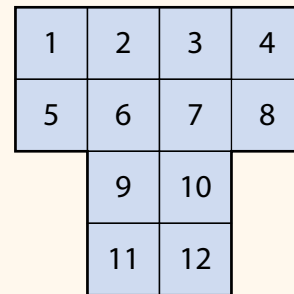
# Practice Finding Area

Study how the Example shows how to count square units to find area.  
Then solve problems 1–7.

## EXAMPLE

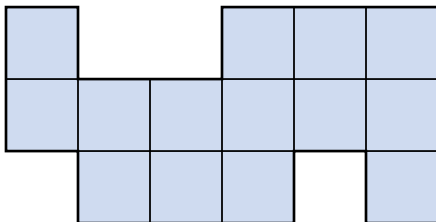
The shape is covered with squares of the same size.  
What is the area of this shape?

Count the square units. The area of the shape is 12 square units. You must use same-sized squares to find the area in square units.

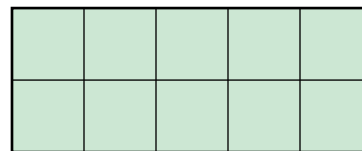


 = 1 square unit

1 Count to find each area.

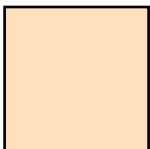


Area = ..... square units

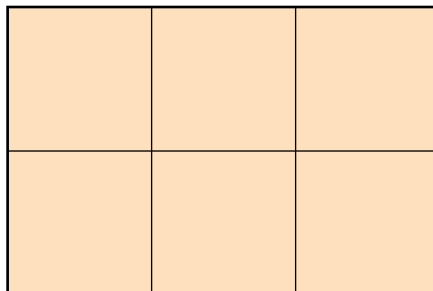


Area = ..... square units

2 What is the area?



1 square inch



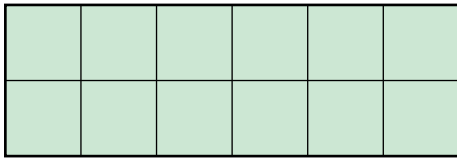
Area = ..... square inches

## Vocabulary

**area** the amount of space a flat shape covers.

**square unit** the area of a square with side lengths of 1 unit.

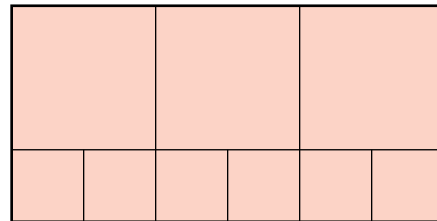
- 3 What is the area of this rectangle?



= 1 square centimeter

- 4 Ria says that the area of Rectangle A is 9 square units. Do you agree? Explain.

Rectangle A



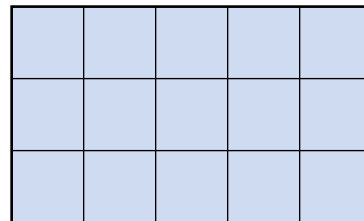
- 5 Fill in the blanks.

Rectangle B has ..... rows of squares.

There are ..... squares in each row.

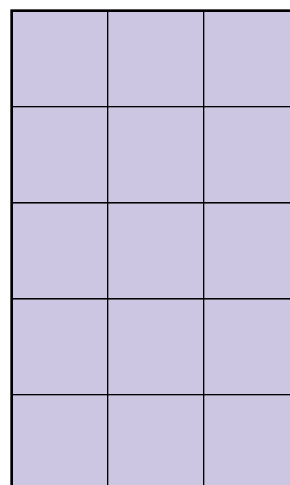
- 6 How can you skip-count to find the area of Rectangle B? Write the area.

Rectangle B



- 7 What is the area of Rectangle C? How does this compare to the area of Rectangle B? Are the rectangles the same size? Explain.

Rectangle C





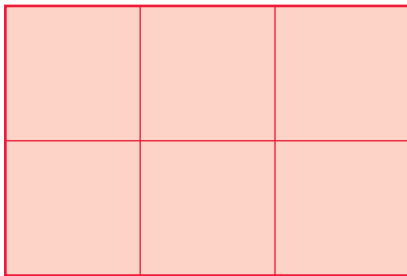
# Refine Ideas About Finding Area

## APPLY IT

Complete these problems on your own.

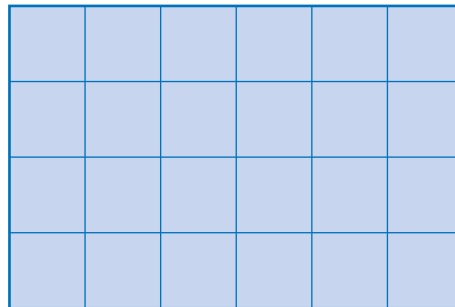
### 1 COMPARE

Find the area of each shape below.



Each  has an area of 1 square meter.

Area = .....



Each  has an area of 1 square foot.

Area = .....

### 2 EXAMINE

Anna says the area of this rectangle is 12 square units because each of the small rectangles is 1 unit long. Why is Anna wrong?

|    |    |    |
|----|----|----|
| 1  | 2  | 3  |
| 4  | 5  | 6  |
| 7  | 8  | 9  |
| 10 | 11 | 12 |

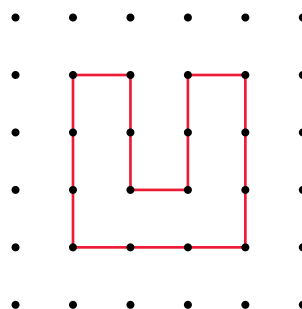
### 3 RELATE

Think about how you could find the area of this shape.

First, draw the square units.

Then number the square units to find the area of the shape.

Area = ..... square units

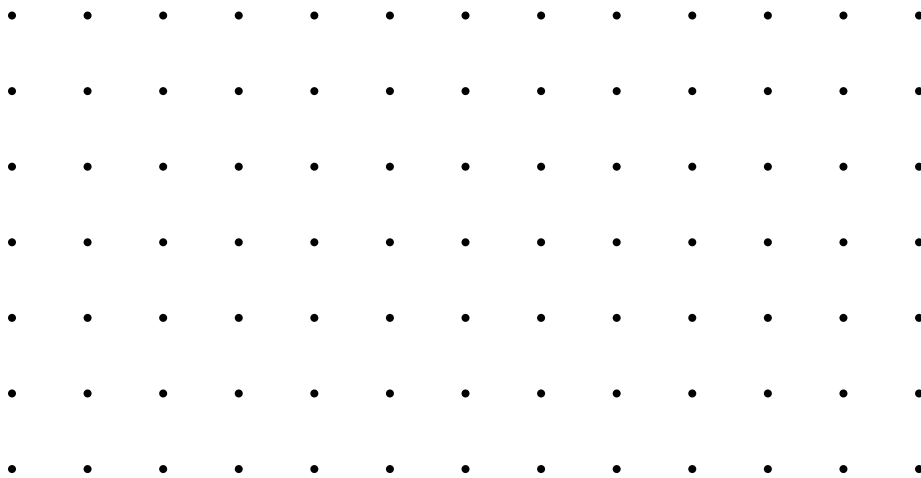


### PAIR/SHARE

Discuss your solutions to these three problems with a partner.

Use what you have learned to complete problem 4.

- 4 Use a ruler and the dot grid below to complete the problems.



**Part A** Draw a rectangle with an area of 8 square units on the grid. Label it with an *A*.

**Part B** Draw a rectangle with an area greater than 8 square units on the same grid. Label it with a *B*.

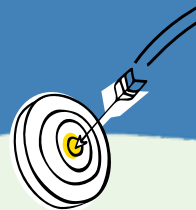
**Part C** How did you know how to draw your rectangle *B* with an area that is greater than 8 square units?

## 5 MATH JOURNAL

Explain how you can find the area of a rectangle drawn on a dot grid.

# Explore Multiplying to Find Area

You have already learned how to find the area of a rectangle by counting the number of square units that cover the rectangle. This lesson will help you find the area using multiplication. Use what you know to try to solve the problem below.

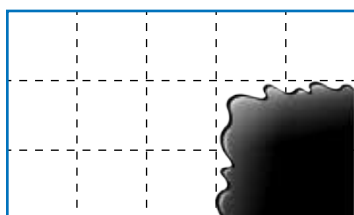


## Learning Target

- Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.

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

**Jenny wants to find the area of the rectangle shown. But some ink spilled on it. How can she find the area if she cannot count all of the square units?**



Area of  = 1 square unit.



## TRY IT



## Math Toolkit

- square tiles
- counters
- grid paper
- perimeter and area tool 
- multiplication models 



## DISCUSS IT

**Ask your partner:** How did you get started?

**Tell your partner:**  
I knew ... so I ...

## CONNECT IT

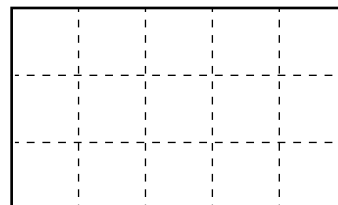
### 1 LOOK BACK

Explain how you found the area of Jenny's rectangle when you could not see all the squares. What is the area of Jenny's rectangle?

### 2 LOOK AHEAD

When you know the length and width of a rectangle, you do not have to count the square units to find the area. You can multiply instead.

- a. Jenny's rectangle without the ink spill is an array of squares that have been pushed together. What two multiplication equations can you write to describe this array?



3 squares wide

5 squares long

- b. Write an equation to multiply the **length** and the **width** of the rectangle. Explain how you can use length and width to find the area of a rectangle.

- c. Explain how  $5 \times 3$  gives you the same area as counting all the squares.

### 3 REFLECT

How is finding the area of a rectangle like finding the number of items in an array?

.....

.....

.....

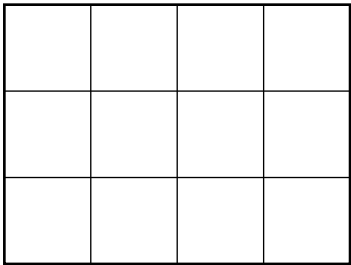
.....

# Prepare for Multiplying to Find Area

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

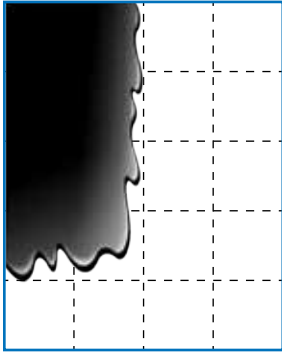
| Word   | In My Own Words | Example |
|--------|-----------------|---------|
| length |                 |         |
| width  |                 |         |
| area   |                 |         |

2 Manny skip-counts by fours 3 times to find the area of the rectangle shown. Lee multiplies the length of the rectangle by the width. They both say the area of the rectangle is 12 square units. Explain why the two methods give the same answer.



- 3 Solve the problem. Show your work.

**Marcos wants to find the area of the rectangle shown. But some ink spilled on it. How can he find the area if he cannot count all of the square units?**



Area of  = 1 square unit.

**Solution** .....

- 4 Check your answer. Show your work.

# Develop Multiplying to Find Area

Read and try to solve the problem below.

What is the area of the rectangle?



## TRY IT



### Math Toolkit

- square tiles
- grid paper
- dot paper
- perimeter and area tool 
- multiplication models 



## DISCUSS IT

**Ask your partner:** What strategy did you use?

**Tell your partner:** The strategy I used to find the answer was ...

Explore different ways to understand multiplying to find area.

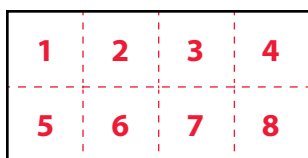
**What is the area of the rectangle?**



## PICTURE IT

**You can use square tiles to find area.**

The model below shows the rectangle covered by 1-centimeter squares.

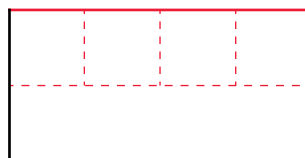


Area of  = 1 square centimeter.

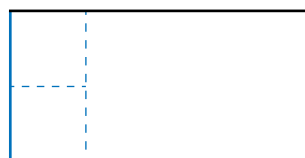
## MODEL IT

**You can also use a multiplication equation to find area.**

The length of the rectangle is **4 centimeters**.  
Using 1-centimeter squares,  
4 squares will fill a row.



The width of the rectangle is **2 centimeters**.  
Using 1-centimeter squares,  
2 squares will fill a column.



Multiply length and width to  
find the area of the rectangle.

$$\text{Area} = 4 \times 2$$



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to multiply to find area.

- 1 How many 1-centimeter squares fit along the length of the rectangle? .....

What is the length of the rectangle? ..... centimeters

- 2 How many 1-centimeter squares fit along the width of the rectangle? .....

What is the width of the rectangle? ..... centimeters

- 3 What does the problem ask you to find?

- 4 The unit of measurement for the length and width of the rectangle is centimeters.  
What is the unit of measurement for the area?

- 5 Complete the equation below to find the area of the rectangle.

|                   |   |                   |   |                          |
|-------------------|---|-------------------|---|--------------------------|
| <b>length</b>     | × | <b>width</b>      | = | <b>area</b>              |
| ..... centimeters | × | ..... centimeters | = | ..... square centimeters |

- 6 The area of the rectangle is ..... square centimeters.

- 7 Explain how you can use square tiles or multiplication to find the area of a rectangle.

## 8 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for multiplying to find the area of a rectangle? Explain.

.....

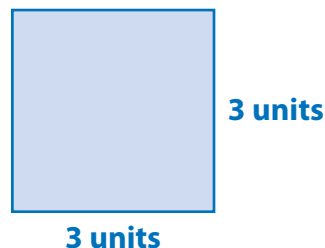
.....

.....

**APPLY IT**

Use what you just learned to solve these problems.

- 9 What is the area of the square? Show your work.



**Solution** .....

- 10 Sheigh has a rectangle that is 5 centimeters long. The area of the rectangle is 10 square centimeters. What is the width of the rectangle? Show your work.

**Solution** .....

- 11 A rectangle has a length of 8 inches and a width of 6 inches. What is the area of the rectangle? Show your work.

**Solution** .....



# Practice Multiplying to Find Area

Study the Example showing how to multiply to find area.  
Then solve problems 1–9.

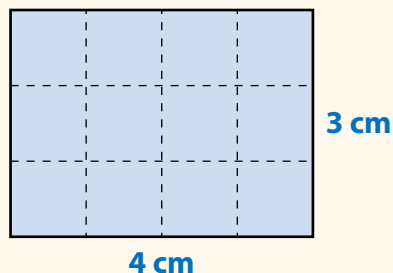
## EXAMPLE

A rectangle has a length of 4 centimeters and a width of 3 centimeters. What is the area?

Fill the rectangle with 1-centimeter squares. There are 4 squares in a row and 3 rows.

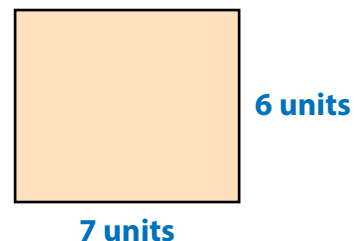
You can multiply to find the total number of squares:  $4 \times 3 = 12$ .

The area is 12 square centimeters.



- 1 What is the area of this rectangle? Write an equation.

|               |          |              |     |                    |
|---------------|----------|--------------|-----|--------------------|
| <b>length</b> | $\times$ | <b>width</b> | $=$ | <b>area</b>        |
| ..... units   | $\times$ | ..... units  | $=$ | ..... square units |



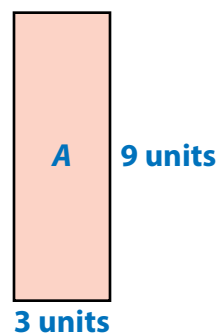
- 2 A rectangle has a length of 8 inches and a width of 7 inches. What is the area of the rectangle?

- 3 A square has sides that are 4 centimeters long. What is the area? Write an equation.

- 4 Write an equation to find the area of Rectangle A. Then write the area.

**Equation** .....

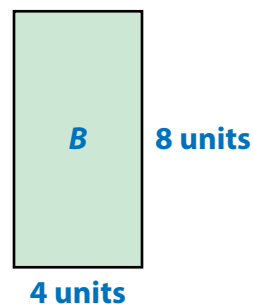
**Area** .....



- 5 A rectangle has a length of 6 centimeters and a width of 5 centimeters. What is the area of the rectangle? Show your work.

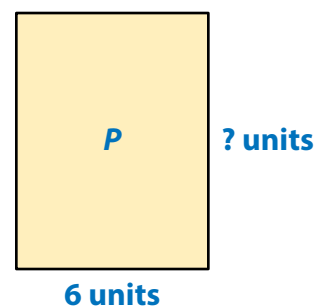
- 6 What is the area of a square with sides that are 8 centimeters long? Show your work.

- 7 What is the area of Rectangle B? Show your work.



- 8 Lena draws a square with an area that is greater than the area of Rectangle B. What are two possible side lengths of Lena's square? Explain.

- 9 Pablo draws Rectangle P. He says that the area is greater than 50 square units. What could the unknown side length be? Explain.



# Develop Solving Word Problems About Area

Read and try to solve the problem below.

**Tyler's rectangular bedroom floor is 9 feet wide and 9 feet long.  
Suki's rectangular bedroom floor is 8 feet wide and 10 feet long.  
Whose bedroom floor has a greater area?**

## TRY IT



### Math Toolkit

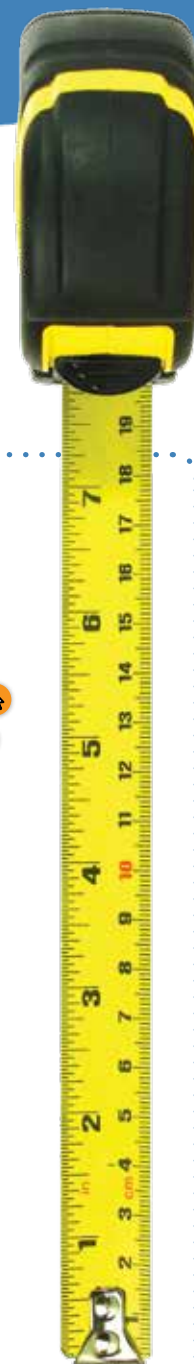
- square tiles
- grid paper
- dot paper
- perimeter and area tool
- multiplication models



## DISCUSS IT

**Ask your partner:** Can you explain that again?

**Tell your partner:** I agree with you about ... because ...



Explore different ways to understand solving word problems about area.

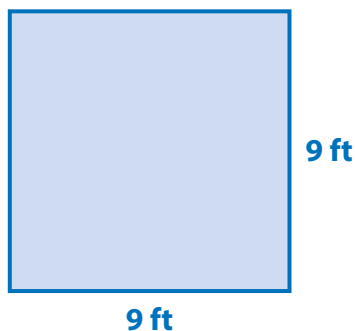
**Tyler's rectangular bedroom floor is 9 feet wide and 9 feet long.**  
**Suki's rectangular bedroom floor is 8 feet wide and 10 feet long.**  
**Whose bedroom floor has a greater area?**

## PICTURE IT

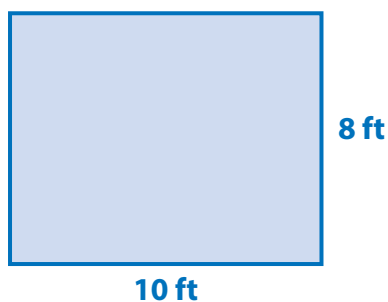
You can use models to help you multiply to find area.

The models below show the length and width of Tyler's and Suki's bedroom floors.

**Tyler's Bedroom Floor**



**Suki's Bedroom Floor**



## MODEL IT

You can also use multiplication equations to find area.

Use words to describe the measurements of each bedroom floor.

**Tyler's room:**

The **length** of the floor is **9** feet.

The **width** of the floor is **9** feet.

**Suki's room:**

The **length** of the floor is **10** feet.

The **width** of the floor is **8** feet.

Multiply **length** and **width** to find the area of each floor.

**Tyler's floor:** Area =  $9 \times 9$

**Suki's floor:** Area =  $10 \times 8$



## CONNECT IT

Now you will use the problem from the previous page to help you understand how to solve word problems about area.

- 1 What does the problem ask you to find?
- 2 What units are used to measure the length and width of the floors?
- 3 What unit should you use to record the area of each floor?
- 4 Complete the equation below to find the area of Tyler's bedroom floor.

**length**      ×      **width**      =      **area**

..... feet × ..... feet = ..... square feet

The area of Tyler's bedroom floor is ..... square feet.

- 5 Complete the equation below to find the area of Suki's bedroom floor.

**length**      ×      **width**      =      **area**

..... feet × ..... feet = ..... square feet

The area of Suki's bedroom floor is ..... square feet.

- 6 So, ..... has the bedroom floor with the greater area.
- 7 Explain how you know that the areas of the bedroom floors must have the label "square feet."

## 8 REFLECT

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for solving word problems about area? Explain.

.....

.....

## APPLY IT

Use what you just learned to solve these problems.

- 9 Fran found the area of a rectangle by multiplying 5 units and 4 units. Draw Fran's rectangle. Label the length and the width. What is the area of the rectangle? Show your work.

*Solution* .....

- 10 Kayla draws the rectangle shown. James draws a rectangle that has the same area as Kayla's rectangle, but it has different side lengths. What are possible side lengths for James's rectangle? Show your work.



*Solution* .....

- 11 Jan has a rectangular photo that is 7 inches long and 5 inches wide. How much space will this photo cover in Jan's photo album? Show your work.

*Solution* .....



# Practice Solving Word Problems About Area

Study the Example showing how to solve a word problem about area.  
Then solve problems 1–6.

## EXAMPLE

Ana's garden is 7 feet long and 7 feet wide. Noah's garden is 8 feet long and 6 feet wide. Which garden has a lesser area?

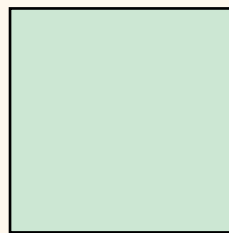
You can draw a model. Then multiply length and width to find the area of each garden.

Ana:  $7 \times 7 = 49$  square feet

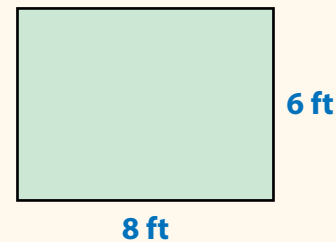
Noah:  $8 \times 6 = 48$  square feet

Noah's garden has a lesser area.

Ana's Garden



Noah's Garden



- 1 Roberto's desk is in the shape of a rectangle that is 4 feet long and 2 feet wide. What is the area of Roberto's desktop? Fill in the blanks.

**length**     $\times$     **width**    =    **area**

..... feet  $\times$  ..... feet = ..... square feet

- 2 Show how to find the area of this rug.

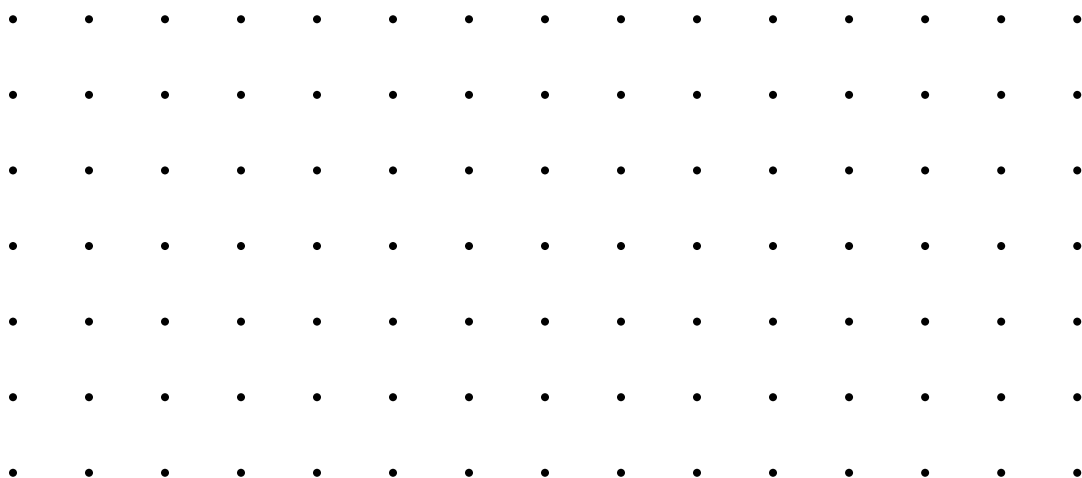
3 ft



5 ft

- 3 Vera buys a rug like the one in problem 2. Vera's rug is square. It has sides that are 4 feet long. Does Vera's rug cover more or less area than the rug in problem 2? Explain.

- 4 Aiden prints a rectangular photo that is 4 units wide and 6 units long. Bella prints a square photo. It is 5 units on each side. Draw the photos and label the side lengths. Write the area for each.



- 5 Draw and label a rectangle that has a lesser area than the area of a square that is 3 units on each side. Write the area of the rectangle.

- 6 Ron buys a rectangular rug for his room. The rug is 8 feet long and 5 feet wide. The floor in his room is shaped like a square that is 10 feet long and 10 feet wide. How much of the floor in Ron's room will NOT be covered by the rug? Show your work.

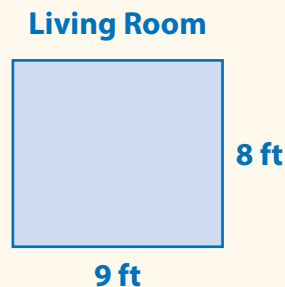
**Solution** .....

# Refine Multiplying to Find Area

Complete the Example below. Then solve problems 1–8.

## EXAMPLE

Ms. Cruz is putting carpet in the living room. The length and width of the room is shown below. How many square feet of carpet does Ms. Cruz need to cover the whole floor?



Look at how you could show your work using multiplication.

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

$$9 \text{ feet} \times 8 \text{ feet} = 72 \text{ square feet}$$

**Solution** .....

The student multiplies the length and the width to find the area.



## PAIR/SHARE

How else could you solve this problem?

## APPLY IT

- 1 Marcia finds the area of a square. The length of one side of the square is 5 centimeters. What is the area of the square? Show your work.

**Solution** .....

The sides of a square are all the same length.

## PAIR/SHARE

How did you and your partner solve this problem?

- 2 Ms. Clark is building a rectangular patio that is 4 yards long and 3 yards wide. She has enough bricks to cover an area of 14 square yards. Does Ms. Clark have enough bricks to build the patio? Explain. Show your work.

**Solution** .....

.....

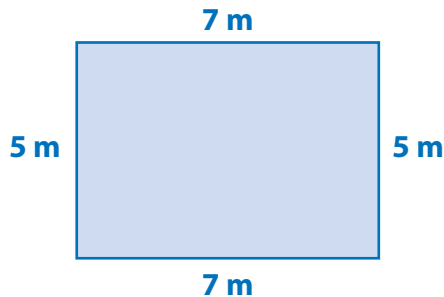
I think there are at least two different steps you need to do to solve this problem.



### PAIR/SHARE

How could you use a picture to solve this problem?

- 3 What is the area of the rectangle shown below?



- Ⓐ 35 square meters
- Ⓑ 24 square meters
- Ⓒ 12 square meters
- Ⓓ 7 square meters

Bobby chose Ⓑ as the correct answer. How did he get that answer?

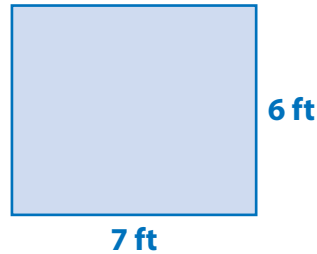
To find the area of the rectangle, do you add or multiply?

### PAIR/SHARE

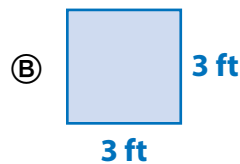
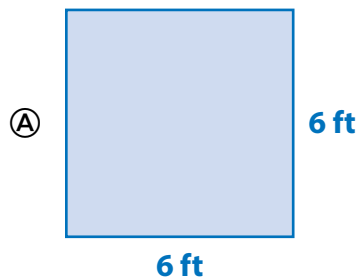
Do you need the measure of each side of the rectangle labeled to solve the problem? Why or why not?

- 4 Mr. Frank is putting tile on a bathroom wall above the tub. The model shows the length and width of the wall. How many square feet of tile does he need to cover the wall?

- Ⓐ 49 square feet
- Ⓑ 42 square feet
- Ⓒ 26 square feet
- Ⓓ 13 square feet



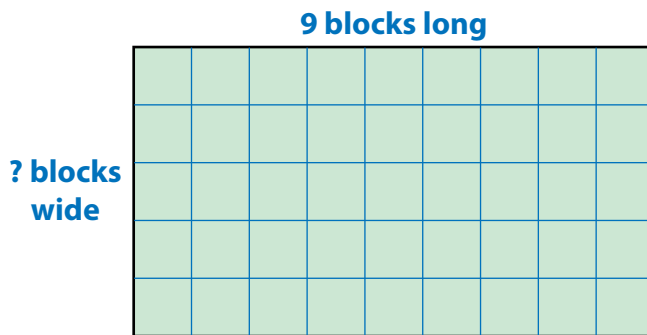
- 5 Which shape below has an area of 12 square feet?



- 6 The area of a rectangular patio is 24 square yards. Which measurements could be the length and width of the patio?

- Ⓐ length: 8 yards, width: 4 yards
- Ⓑ length: 5 yards, width: 5 yards
- Ⓒ length: 6 yards, width: 3 yards
- Ⓓ length: 6 yards, width: 4 yards
- Ⓔ length: 8 yards, width: 3 yards

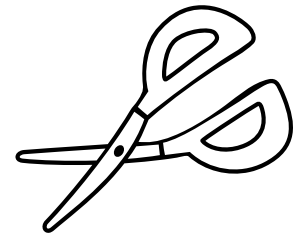
- 7 Rita is making a quilt. It is made with 45 square blocks of fabric and is 9 blocks long.



Complete the equation below to show how many blocks wide the quilt is. Use numbers from the ones listed below.

4      5      6      9      45

..... × ..... = .....



## 8 MATH JOURNAL

Draw a rectangle. Label its length and width. Then explain how to find the area of your rectangle. Use a multiplication equation in your explanation.



**SELF CHECK** Go back to the Unit 3 Opener and see what you can check off.