

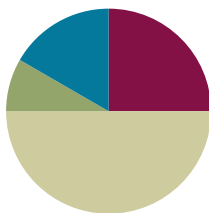
## Lesson 12

**Objective:** Solve word problems involving area.

**Related Topics:** [More Lesson Plans for the Common Core Math](#)

### Suggested Lesson Structure

■ Fluency Practice	(15 minutes)
■ Application Problem	(5 minutes)
■ Concept Development	(30 minutes)
■ Student Debrief	(10 minutes)
<b>Total Time</b>	<b>(60 minutes)</b>



### Fluency Practice (15 minutes)

- Group Counting **3.OA.1** (3 minutes)
- Multiply by 7 **3.OA.7** (7 minutes)
- Find the Side Length **3.MD.7** (5 minutes)

### Group Counting (3 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition.

Direct students to count forward and backward, occasionally changing the direction of the count.

- Fours to 40
- Sixes to 60
- Eights to 80
- Nines to 90

### Multiply by 7 (7 minutes)

Materials: (S) Multiply by 7 Pattern Sheet (6–10)

Note: This activity builds fluency with multiplication facts using units of 7. It works toward students knowing from memory all products of two one-digit numbers. See G3–M4–Lesson 2 for the directions for administration of a *Multiply By* pattern sheet.

T: (Write  $7 \times 7 = \underline{\quad}$ .) Let's skip-count up by sevens. (Count with fingers to 7 as students count.)

S: 7, 14, 21, 28, 35, 42, 49.

T: Let's see how we can skip-count down to find the answer, too. (Show 10 fingers.) Start at 70. (Count down with your fingers as students say numbers.)

S: 70, 63, 56, 49.

Continue with the following possible sequence:  $9 \times 7$ ,  $6 \times 7$ , and  $8 \times 7$ .

T: (Distribute Multiply by 7 Pattern Sheet.) Let's practice multiplying by 7. Be sure to work left to right across the page.

### Find the Side Length (5 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews the relationship between side lengths and area.

T: (Project a rectangle with a width of 2 units and an unknown length. Inside the rectangle, write *Area = 10 square units.*) Say the area of the rectangle.

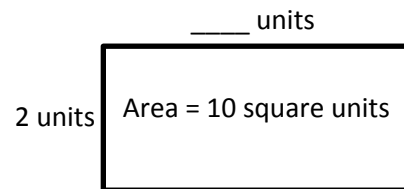
S: 10 square units.

T: What's the width of the rectangle?

S: 2 units.

T: (Write  $2 \text{ units} \times \underline{\hspace{1cm}} \text{ units} = 10 \text{ square units.}$ ) On your boards, complete the equation, filling in the unknown length.

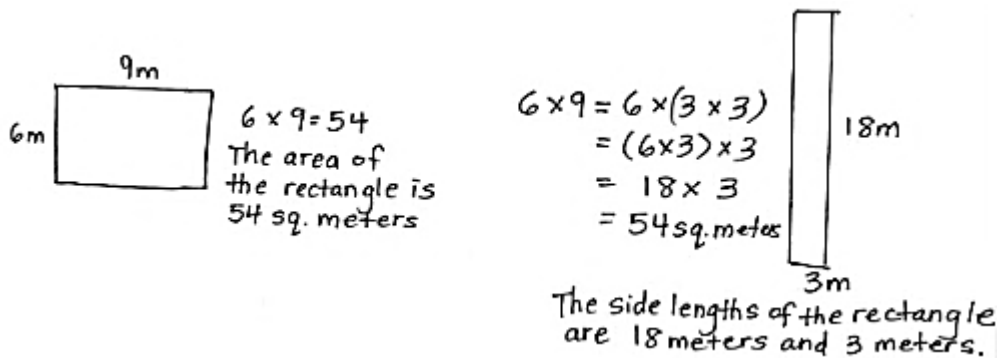
S: (Write  $2 \text{ units} \times 5 \text{ units} = 10 \text{ square units.}$ )



Continue with the following possible sequence:  $1 \text{ unit} \times \underline{\hspace{1cm}} \text{ units} = 8 \text{ square units}$ ,  $5 \text{ units} \times \underline{\hspace{1cm}} = 15 \text{ square units}$ ,  $3 \text{ units} \times \underline{\hspace{1cm}} \text{ units} = 18 \text{ square units}$ , and  $6 \text{ units} \times \underline{\hspace{1cm}} \text{ units} = 24 \text{ square units}$ .

### Application Problem (5 minutes)

- Find the area of a 6 m by 9 m rectangle.
- Use the side lengths, 6 m  $\times$  9 m, to find different side lengths for a rectangle that has the same area. Show your equations using parentheses. Then estimate to draw the rectangle and label the side lengths.



Note: This problem reviews using the associative property to generate whole number side lengths of rectangles with a given area.

**Concept Development (30 minutes)**

Materials: (S) Personal white boards

**Problem 1: Solve area word problems with 1 side length unknown.**

Write or project the following problem: The area of Theo’s banner is 42 square feet. If the length of his banner measures 4 feet, how wide is his banner?

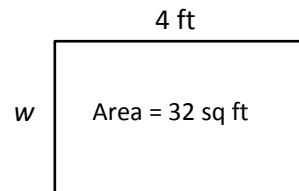
T: What information is known?

S: The area and length of Theo’s banner.

T: What information is unknown?

S: The width.

T: I’ll draw an area model and use a letter for the unknown.  
(Draw an incorrectly scaled model like the one shown at right.)



T: If the length is 4 feet and the area is 32 square feet, can the width be less than 4 feet?

S: No, the width needs to be more than 4 feet. → The width should be more than 4 feet because 4 times 4 only equals 16, but the area is 32 square feet.

**MP.6**

T: Talk to your partner: Is the area model I drew an accurate representation of the rectangle in the problem? How do you know?

S: No, because the width should be much longer than the length.

T: Work with your partner to correctly redraw my area model on your board.

S: (Draw as shown at right.)

T: How can we find the value of  $w$ ?

S: Divide 32 by 4!

T: Write a division equation to find the value of  $w$ .

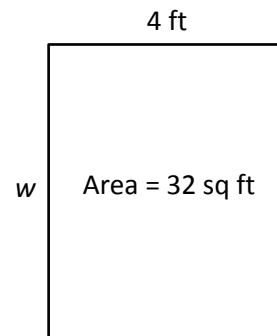
S: (Write  $32 \div 4 = w$ .)

T: What is the value of  $w$ ?

S: 8!

T: So the width of Theo’s banner is just 8? 8 what?

S: 8 feet!



Repeat the process with the following suggestions:

- The area of a piece of paper is 72 square inches. Margo measures the length of the paper and says it is 8 inches. What is the width of the piece of paper?
- Jillian needs to draw a rectangle with an area of 56 square centimeters and a width of 7 inches. What is the length of the rectangle that Jillian needs to draw?

**Problem 2: Choose a strategy to find the area of a larger rectangle.**

Write or project the following problem: Amir is getting carpet in his bedroom, which measures 7 feet by 15 feet. How many square feet of carpet will Amir need?

T: Draw an area model to represent Amir’s bedroom. Write an expression that shows how to find the area.

S: (Draw as shown at right.)

T: Talk to your partner: How can we find the area of Amir’s bedroom since the measurements are so large?

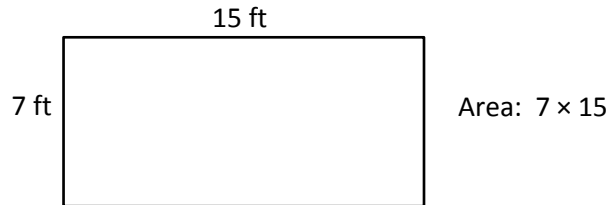
S: We can break the room up into two smaller rectangles and add their areas together. → We can also break apart one of the factors in  $7 \times 15$  to come up with a multiplication sentence that is easier to solve.

T: Decide with your partner which strategy you’ll use to find the area. Then solve.

S: (Decide on a strategy and solve.)

T: What is the area of Amir’s bedroom?

S: 105 square feet!



Invite students to share which strategy they chose and why, and to articulate how they used the strategy to solve the problem. For the break apart and distribute strategy, students may have broken the rectangle apart several different ways.

Continue with the following suggested examples, encouraging students to try different strategies:

- Maya helps her family tile the bathroom wall. It measures 12 feet by 11 feet. How many square-foot tiles does Maya need to cover the wall?
- Francis washes all of the windows outside his parents’ bookstore. There are 5 windows, each one is 6 feet wide and 8 feet high. What is the total area of the windows that Francis washes?

**Problem Set (10 minutes)**

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

**NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:**

Offer planning and strategy development support to learners if needed. Some learners may use a method simply because they are not fluent in an alternative method. Model a think-aloud in which you consider two or more strategies, reason about your selection, and solve. This may take more time than allotted here. You may want to pre-teach to preserve the pace of the lesson and to maximize every student’s participation.

**NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**

During the Problem Set, extend Problem 4 for students working above grade level. Have students model all possible rectangles with an area of 64. Or, have students model up to eight ways of breaking their rectangle (Part b) into two smaller rectangles. Make it an exciting, perhaps timed, competition. Always offer challenges and extensions to learners as alternatives, rather than additional “busy” work.

### Student Debrief (10 minutes)

**Lesson Objective:** Solve word problems involving area.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- What shape is the sticky note in Problem 1? How do you know?
- Share student explanations to Problem 2(b).
- What is another way the artist’s mural in Problem 3 could have been broken apart?
- How did you identify Alana’s pattern in Problem 4?
- Discuss how you found the area of two pieces of Jermaine’s paper in Problem 5. Why was it necessary to find the missing side length first? Are there any other ways to find the area of the two pieces of paper? ( $81 - 27 = 54$  sq cm.)
- How were all of today’s word problems related? Does the unknown in a problem change the way you solve it? Why or why not?

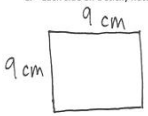
### Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students’ understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 12 Problem Set 3•4

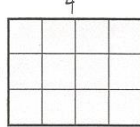
Name Gina Date \_\_\_\_\_

1. Each side on a sticky note measures 9 centimeters. What is the area of the sticky note?

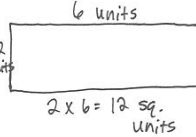


$9 \times 9 = 81$  sq. cm  
The area of the sticky note is 81 sq. cm.

2. Stacy tiles the rectangle below using her square pattern blocks. Find the area of Stacy’s rectangle in square units. Then draw and label a different rectangle with whole number side lengths and having the same area.



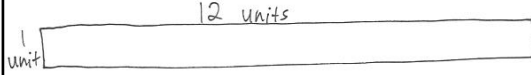
The area of Stacy’s rectangle is 12 sq. units.



$2 \times 6 = 12$  sq. units

b. Can you draw another rectangle with different whole number side lengths and having the same area? Explain how you know.

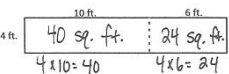
Yes, I can draw a 12 units by 1 unit rectangle because I know  $12 \times 1 = 12$ .



COMMON CORE Lesson 12: Solve word problems involving area. Date: 9/5/13 engage<sup>ny</sup> 4.D.7

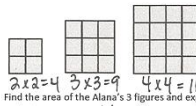
NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 12 Problem Set 3•4

3. An artist paints a 4 x 16 foot mural on a wall. What is the total area of the mural? Use the break apart and distribute strategy.



$40 + 24 = 64$   
The total area of the mural is 64 square feet.

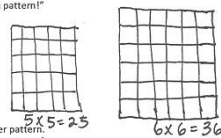
4. Alana tiles the 3 figures below. She says, “I’m making a pattern!”



$2 \times 2 = 4$     $3 \times 3 = 9$     $4 \times 4 = 16$

a. Find the area of the Alana’s 3 figures and explain her pattern.

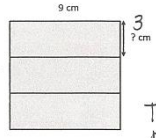
Alana adds 1 row and 1 column to each figure.



$5 \times 5 = 25$     $6 \times 6 = 36$

b. Draw the next 2 figures in Alana’s pattern and find their areas.

5. Jermaine glues 3 identical pieces of paper as shown below and makes a square. Find the missing side length of 1 piece of paper. Then find the total area of 2 pieces of paper.



$9 : 3 = 3$  cm   The missing side length is 3 cm.  
 $3 \times 9 = 27$  sq. cm  
 $27 + 27 = 54$  sq. cm  
The total area of 2 pieces of paper is 54 sq. cm.

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Multiply.

$7 \times 1 = \underline{\quad\quad}$      $7 \times 2 = \underline{\quad\quad}$      $7 \times 3 = \underline{\quad\quad}$      $7 \times 4 = \underline{\quad\quad}$

$7 \times 5 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$

$7 \times 9 = \underline{\quad\quad}$      $7 \times 10 = \underline{\quad\quad}$      $7 \times 5 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$

$7 \times 5 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 5 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$

$7 \times 5 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 5 = \underline{\quad\quad}$      $7 \times 10 = \underline{\quad\quad}$

$7 \times 6 = \underline{\quad\quad}$      $7 \times 5 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$

$7 \times 6 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$

$7 \times 6 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$

$7 \times 8 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$

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$7 \times 8 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$

$7 \times 9 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$

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$7 \times 7 = \underline{\quad\quad}$      $7 \times 9 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$

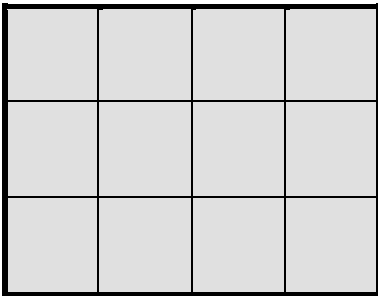
$7 \times 9 = \underline{\quad\quad}$      $7 \times 7 = \underline{\quad\quad}$      $7 \times 6 = \underline{\quad\quad}$      $7 \times 8 = \underline{\quad\quad}$

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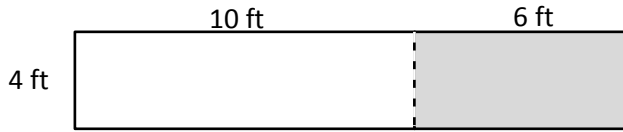
Date \_\_\_\_\_

1. Each side on a sticky note measures 9 centimeters. What is the area of the sticky note?
  
  
  
  
  
  
  
  
  
  
2. Stacy tiles the rectangle below using her square pattern blocks. Find the area of Stacy's rectangle in square units. Then draw and label a different rectangle with whole number side lengths and having the same area.

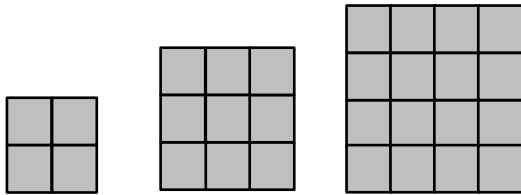


- b. Can you draw another rectangle with different whole number side lengths and having the same area?  
Explain how you know.

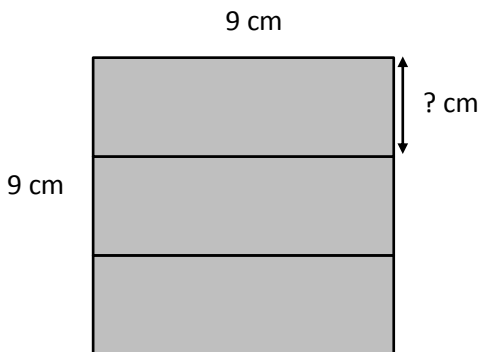
3. An artist paints a  $4 \times 16$  foot mural on a wall. What is the total area of the mural? Use the break apart and distribute strategy.



4. Alana tiles the 3 figures below. She says, “I’m making a pattern!”



- a. Find the area of the Alana’s 3 figures and explain her pattern.
- b. Draw the next 2 figures in Alana’s pattern and find their areas.
5. Jermaine glues 3 identical pieces of paper as shown below and makes a square. Find the missing side length of 1 piece of paper. Then find the total area of 2 pieces of paper.

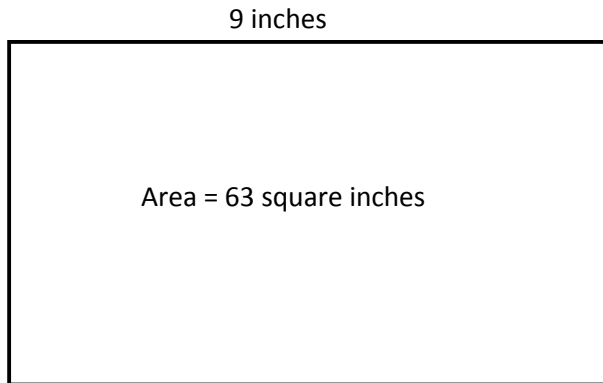




Name \_\_\_\_\_

Date \_\_\_\_\_

1. A painting has an area of 63 square inches. One side length is 9 inches. What is the other side length?




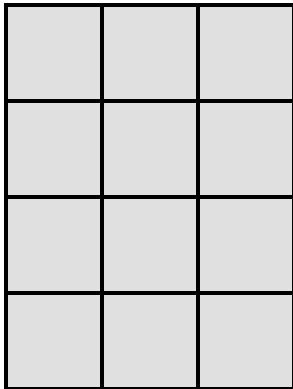
2. Judy's mini dollhouse measures 4 inches by 16 inches. What is the total area of the dollhouse?

Name \_\_\_\_\_

Date \_\_\_\_\_

1. A square calendar has sides that are 9 inches long. What is the calendar's area?

2. Each  is 1 square unit. Sienna uses the same square units to draw a  $6 \times 2$  rectangle and says that it has the same area as the rectangle below. Is she correct? Explain why or why not.



3. The surface of an office desk has an area of 15 square feet. Its length is 5 feet. How wide is the office desk?

4. A rectangular garden has a total area of 48 square yards. Draw and label two possible rectangular gardens with different side lengths having the same area.

5. Lila makes the pattern below. Find and explain her pattern. Then draw the **fifth** figure in her pattern.

