6.5 Area of Combined Rectangles

P Essential Question How can you break apart a figure to find the area?

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Go Lesson Opener

Making Connections

Invite students to tell you what they know about square units.

What is a square unit? (A square unit is a unit with 4 sides the same length.) What are examples of square units? (Possible answer: square inches or square feet)

Using the Digital Lesson

You may wish to show students that square feet is equal to feet \times feet, similar to a number being multiplied by itself such as 3×3 .

Learning Task

What is the problem the students are trying to solve? Connect the story to the problem.

- What problem are you trying to solve? (Find the total area of the seat and the backrest.)
- What is going to be painted? (The seat and backrest of the bench)
- What is the size of the seat? (side lengths of 3 feet and 6 feet)
- What is the size of the backrest? (side lengths of 2 feet and 6 feet)
- What does the diagram of the bench look like in the problem? (It has several squares. Each unit square is 1 square foot.)

Literacy and Mathematics

Choose one or more of the following activities.

- Have students construct a miniature bench using cardboard and tape. Have students brainstorm how they might find the total area of the seat and backrest of the bench they have created.
- Have students brainstorm real-world situations in which area might need to be found.

Texas Essential Knowledge and Skills

TEKS Geometry and Measurement—3.6.C Determine the area of rectangles with whole number side lengths in problems using multiplication related to the number of rows times the number of unit squares in each row **3.6.D.** Decompose composite figures formed by rectangles into non-overlapping rectangles to determine the area of the original figure using the additive property of area

MATHEMATICAL PROCESSES

3.1.C Select tools, technology, and techniques 3.1.E Create and use representations

Are You Ready?

Access Prior Knowledge

Use the Are You Ready? 16.5 in the Assessment Guide to assess students' understanding of the prerequisite skills for this lesson.

Vocabulary



Go Multimedia eGlossary at DIGITAL thinkcentral.com

Materials

Square tiles



For the student



environment!

For the teacher

Digital Management Center organizes program resources by TEKS!









Online Assessment System



Soar to Success Math Online Intervention

Unlock the Problem

Have students read the problem. Remind them that they have used the Distributive Property and the break apart method using an array to find products.

How can you use the Distributive Property to find the product 3 × 7? Show your work.
Answers will vary. Possible answer: I know 7 = 3 + 4.
So, I can find the sum of the products 3 × 3 and 3 × 4. 3 × 7 = 3 × (3 + 4) = (3 × 3) + (3 × 4) = 9 + 12 = 21.

Activity

Have students complete Steps 1 and 2.

- How did you decide where to place the vertical line to break apart the rectangle in Step 3? Answers will vary. Possible answer: I decided to place the vertical line breaking apart the rectangle into two smaller rectangles whose facts I know.
- Why do you add the areas of the two smaller rectangles in Step 5? Each of the smaller areas represents only part of the whole area. Together, they make up the whole area.

Point out to students that some numbers may be easier to work with than others. Illustrate the connection between where they place the vertical line and the numbers they will need to add to find the area. Have students share where they drew their lines and the sums they will use. Ask students if the products were easy to find or use.

 How could you break apart the side length 4 to find the area of Anna's rug? Possible answer: I can break 4 into 2 + 2. 2 × 9 + 2 × 9 = 18 + 18 = 36



Use Math Talk to help students recognize that the area of the original rectangle stays the same no matter how they choose to break it apart.

ELL English Language Learners			
Leveled Activities	ELPS		
Beginning: Activity 20	1.A.1, 3.G.2, 4.C.3		
Intermediate: Activity 3	2.D.2, 2.E.3, 3.F.2		
Advanced: Activity 58	2.C.2, 4.C.3, 4.F.9		
Advanced High: Activity 48	4.F.1, 4.F.2, 4.G.2		
Go to <i>thinkcentral.com</i> for the ELL Activity Guide containing these leveled activities.			



Differentiated Instruction

ELL Language Support

Interpersonal / Social Small Group

ELPS 2.I.4, 3.C.4, 3.H.3

Strategy: Creative Grouping

Materials: 1-Centimeter Grid Paper (see eTeacher Resources)

- Students can be grouped for language or mathematics needs to assist in language acquisition or practice.
- Pair fluent English speakers with English language learners to solve problems together.
- Have each pair of students draw a rectangle on grid paper and discuss how they can break it apart to find the area. Then have students draw a figure made up of combined rectangles and discuss how to find the area.
- Make sure the English language learners can describe how to break figures apart in order to find the total area.





Materials: 1-Centimeter Grid Paper (see eTeacher Resources)

- Ask students to find the areas of the figure at the right using only multiplication. Students can count unit squares to check their answers.
- Have students draw another figure on grid paper with the same area that is made up of at least 4 rectangles.
- Students should draw another figure that is made up of at least 4 rectangles, with any area. Ask students to exchange drawings and find the area of the figure.



Shape A: 21 square units

Connect

Discuss with students that they will break apart figures that are not rectangles by finding smaller rectangles within the figure. This is also called the additive property of area, which states that you can add the area of each non-overlapping rectangle to find the area of the combined figure. There may be more than one way to do this.

One Way

Have students break the figure apart using a horizontal line.

- How did you decide where to place the horizontal line? I looked to see how I could break the figure into two separate rectangles.
- If you had drawn the line in another place, how would you find the area? Possible answer: if I placed the horizontal line anywhere else, I would have to either count or draw a second line to find the area.

Another Way

Have students break the figure apart using a vertical line.

• How is using a vertical line to break the figure apart like using a horizontal line? In both cases, I try to break the figure into two separate rectangles.

Math Talk 🙀 Mathematical Processes

Use Math Talk to discuss how students can break apart combined rectangles in two different ways to check their work.

Share and Show

The first problem connects to the learning model. Have students use the MathBoard to explain their thinking.

Use the checked exercises for **Quick Check**. Students should show their answers for the Quick Check on the MathBoard.





ELABORATE

Problem Solving



Problem 5 requires students to find the area by combining the areas of two rectangles. Then, they must determine the the number of square feet that would be used for a rectangle 8 feet high using the same bricks, and find its area. The difference between the two areas gives them the number of bricks left over.

Problem 6 requires students to analyze the figure to determine how to break it apart. They will need to break the figure into three or more separate rectangles.

Go Deeper

Extend Problem 6 by asking students to find the answer by drawing a different line or lines. Have students explain their answers. Answers will vary. Possible answer: I used two horizontal lines to break the figure into four rectangles that have areas of 9, 9, 33, and 3. The total area is 9 + 9 + 33 + 3 = 54 square units.



COMMON ERRORS

Error Students forget to add the areas of the smaller figures together.

Example After drawing a line to make two rectangles, students may forget to add the areas of both rectangles when finding the area of the larger figure.

Springboard to Learning Tell students that they may want to write the areas of the smaller rectangles they find within the original figure to remind them to add to find the total.



Math on the Spot **Video Tutor**

Through the *Math on the Spot Video Tutor*, students will be guided through an interactive solving of this type of H.O.T. problem. Use this video to also help students solve the H.O.T. problem in the Interactive Student Edition. With these videos and the H.O.T. problems, students will build skills needed in the TEXAS assessment.



(c) Math on the Spot videos are in the DIGITAL Interactive Student Edition and at thinkcentral.com.

Math Talk Name _ Which problem can you Draw a line to break apart the figure into rectangles. solve using the Distributive Then find the area. Show your multiplication and Property? Explain. addition equations. Equations will vary. Possible lines are shown. Possible equations are given. **ৰ্থ** 2. **Ø** 3. Rectangle 1: $4 \times 5 = 20$ Rectangle 1: $4 \times 3 = 12$ Rectangle 2: $2 \times 6 = 12$ Rectangle 2: $4 \times 2 = 8$ $12 + \underline{12} = \underline{24}$ square units 20 + 8 = 28 square units Math Talk: I could use the Distributive Property to solve Problem 2 because it is a already a rectangle, Problem Solving 🎇 which is like an array. Possible lines are shown for 4–6. 4. Multi-Step Connect A model of Lee School's Media Center is shown at the right. Each unit square is 1 square yard. Draw a line to break apart the figure into rectangles. What is the total area of the media center? 70 square yards 5. Multi-Step Apply A builder uses glass bricks shaped like cubes for a playroom wall. Draw a line to break apart the figure into rectangles. Find the area of the wall. What if the height of the wall is 8 feet and the glass area must be a rectangle? How many bricks will be left over? 46 square feet; 6 bricks will be left over; $8 \times 5 = 40$ square feet; 46 - 40 = 6. 6. **HOT** Multi-Step Explain how to break apart the figure to find the area. 54 square units; Possible explanation: I drew two vertical lines, making three rectangles, and I found their areas. $6 \times 3 = 18$; $3 \times 5 = 15$; $7 \times 3 = 21$. Then, I added to find the total area: 18 + 15 + 21 = 54. Module 16 • Lesson 5 539

Differentiated Instruction

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Geometry and Measurement 155	Enrich E78 © Naugilian Millin Researt Patricing Company





Differentiated Centers Kit



Activities Classification Act Students complete orange Activity Card 18 by classifying two-dimensional figures based on their attributes.



Activities Hurray for Arrays! Students complete blue Activity Card 15 by using arrays to model multiplication facts.





TEXAS Test Prep Coach

Test Prep Coach helps teachers to identify common errors that students can make.

In the Test Prep exercise, if students selected:

- A They found the area of the patio.
- **B** They found the area of the patio and grass.
- D They found the area of only the top 3 rows.



How can you break apart a figure to find the area? I can break apart a figure into rectangles, find the area of both rectangles, and then add the areas to find the total area of the original figure.



Homework and Practice

Use the Homework and Practice pages to provide students with more practice on the concepts and skills of this lesson.



Formative Assessment

Use the Module Assessment to assess students' learning and progress. The formative assessment provides the opportunity to adjust teaching methods for individual or whole class instruction.

🗸 Data-Driven Decision Making 🐴 🥂 Rtl

Based on the results of the Module 16 Assessment, use the following resources to strengthen individual or whole class instruction.

ltem	Lesson	TEKS*	Common Error	Intervene With RtI* Tier 1 Lessons	Soar to Success Math
3	16.1	3.6.D	May not count unit squares correctly	79	48.31
4	16.2	3.6.C	May multiply an incorrect number of unit squares by the number of rows	76	48.28
5–6	16.5	3.6.C, 3.6.D	May forget to add the areas together	78	48.29

*TEKS—Texas Essential Knowledge and Skills; RtI—Response to Intervention

Depth of Knowledge			
DOK Level	Items		
1	3–4, 5–6, 7–8, 10		
2	9		

Fill in	he bubble for the correct answer choice.	TEXAS Test Pre
7. Pet equ	er drew this rectangle. Which nation can be used to find the area? KS 3.6.C	
A	$4 \times 4 = 16$ (C) $4 + 7 + 4 + 7 = 22$	
₿	$7 + 7 + 7 = 21$ $4 \times 7 = 28$	
8. Alfi to f Wh equ	redo used the Distributive Property ind the area of this rectangle. ich set of multiplication and addition lations could he have used? + TEKS 3.6.C, 3.6.D	
A	4 + 5 = 9; 4 + 5 = 9; 9 + 9 = 18	
₿	$4 + 5 = 9; 4 + 5 = 9; 9 \times 9 = 81$	
•	$4 \times 5 = 20; 4 \times 5 = 20; 20 + 20 = 40$	
D	$4 \times 10 = 40; 4 \times 10 = 40; 40 + 40 = 80$	
9. Wh rec	ich statement is true about the two tangles? 👆 TEKS 3.6.C	2 ft 4 ft
•	The area of Rectangle <i>B</i> is double the area of Rectangle <i>A</i> .	Rectangle A Rectangle B
₿	The area of Rectangle <i>A</i> is double the area of Rectangle <i>B</i> .	
C	The area of Rectangle <i>B</i> is half of the area of Rectangle <i>A</i> .	
D	The area of Rectangle <i>A</i> is the same as the area of Rectangle <i>B</i> .	
10. Sar Wh the	n divided the figure into parts with equal area. ich fraction names the area of each part of divided figure?	
A	$\frac{1}{2}$ © $\frac{1}{4}$	
-	$\frac{1}{2}$ \bigcirc $\frac{1}{2}$	

V Data-Driven Decision Making

Item	Lesson	TEKS*	Common Error	Intervene With RtI* Tier 1 Lessons	Soar to Success Math
7	16.2	3.6.C	May multiply an incorrect number of unit squares by the number of rows	76	48.28
8	16.5	3.6.C, 3.6.D	May use the Distributive Property incorrectly	78	48.29
9	16.3	3.6.C	May find an incorrect area for one of the two rectangles	77	48.28
10	16.4	3.6.E	May not understand how to divide a figure into parts with equal area	81	5.10

*TEKS—Texas Essential Knowledge and Skills; RtI—Response to Intervention