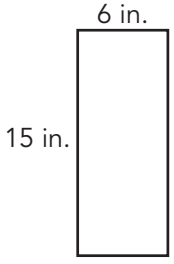
1 Taking Apart Numbers and Shapes

Writing Equivalent Expressions Using the Distributive Property

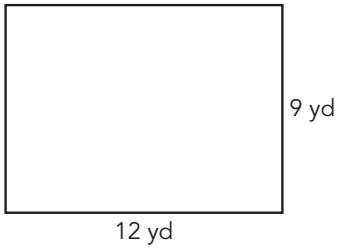
REVIEW

Calculate the area of each rectangle. Show your work.

1.



2.



LEARNING GOALS

- Write, read, and evaluate equivalent numeric expressions.
- Identify the adjacent side lengths of a rectangle as factors of the area value.
- Identify parts of an expression, such as the product and the factors.
- Write equivalent numeric expressions for the area of a rectangle by decomposing one side length into the sum of two or more numbers.
- Apply the Distributive Property to rewrite the product of two factors.

KEY TERMS

- numeric expression
- equation
- Distributive Property

You know how to add, subtract, multiply, and divide numbers using different strategies. Taking apart numbers before you perform a mathematical operation can highlight important information or make calculations easier. How can taking apart numbers help you to express number sentences in different ways?

Break It Down to Build It Up

Callie is building a rectangular walkway up to her house. The width of the walkway is 5 feet and the length is 27 feet. She needs to calculate the area of the walkway to determine the amount of materials needed to build it.

1. **Mark and label 2 different ways you could divide an area model to determine the area of the walkway.**

2. **Determine the areas of each of the subdivided parts of your models.**

3. **What is the total area of the walkway?**

ACTIVITY
1.1

Connecting Area Models and the Distributive Property

The numeric expression of 5×27 represents the area of the walkway from the Getting Started. A **numeric expression** is a mathematical phrase that contains numbers and operations.

The equation $5 \times 27 = 135$ shows that the expression 5×27 is equal to the expression 135.

An **equation** is a mathematical sentence that uses an equals sign to show that two or more quantities are the same as one another.

1. Reflect on the different ways you can rewrite the product of 5 and 27. Select one of your area models to complete the example.

How did you split the side length of 27?

$5 \times 27 = 5(\_\_\_\_\_ + \_\_\_\_\_)$

What are the factors of each smaller region?

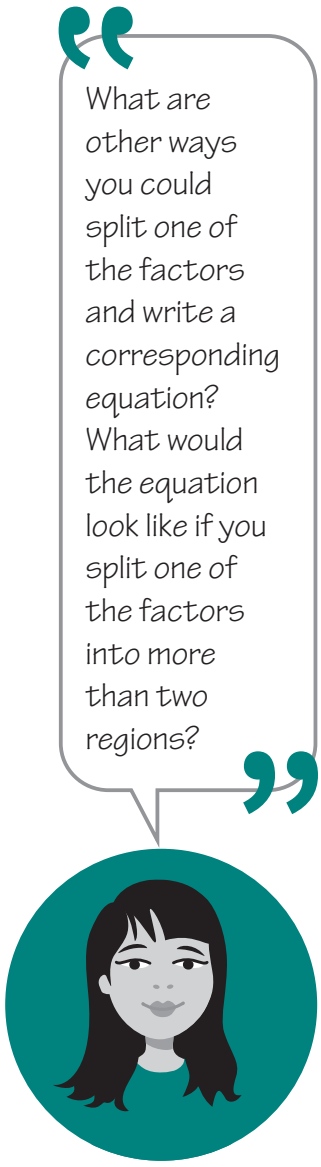
$= (5 \cdot \_\_\_\_\_) + (5 \cdot \_\_\_\_\_)$

What is the area of each smaller region?

$= \_\_\_\_\_ + \_\_\_\_\_$

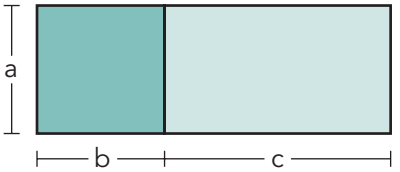
What is the total area?

$= \_\_\_\_\_$

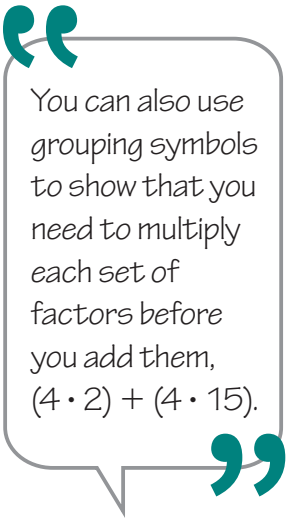


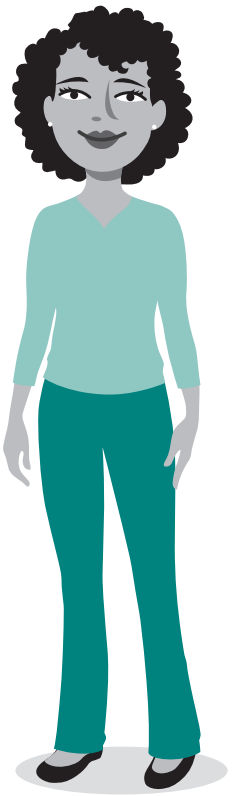
You just used the *Distributive Property!*

The **Distributive Property**, when applied for multiplication, states that for any numbers *a*, *b*, and *c*, the equation $a(b + c) = ab + ac$ is true.



2. Explain the Distributive Property using the area model shown.





WORKED EXAMPLE

Consider this example of the Distributive Property.

$4(2 + 15) = 4 \cdot 2 + 4 \cdot 15$

You can read and describe the expression 4(2 + 15) in different ways. For example, you can say:

- four times the quantity of two plus fifteen,
- four times the sum of two and fifteen, or
- the product of four and the sum of two and fifteen.

You can describe the expression 4(2 + 15) as a product of two factors. The quantity (2 + 15) is both a single factor and a sum of two terms.

3. Fill in the missing addend in each box that makes the equation true.

a. 7 (_____ + 10) = 21 + 70

b. 3 (_____ + 15) = 36 + 45

c. 8 (2 + _____) = 16 + 56

d. 5 (6 + _____) = 30 + 45

4. Rewrite a factor as the sum of two terms in each expression and use the Distributive Property to verify each product.

   a. $4 \times 17 = 68$

   b. $9 \times 34 = 306$

   c. $3 \times 29 = 87$

5. Identify each statement as true or false. If the statement is false, show how you could rewrite it to make it a true statement.

   a. True False $3(2 + 4) = 3 \cdot 2 + 4$

   b. True False $6(10 + 5) = 6 \cdot 10 + 6 \cdot 5$

   c. True False $7(20 + 8) = 7 + 20 \cdot 8$

   d. True False $4(5 + 10) = 20 + 10$

   e. True False $2(6 + 11) = 12 + 22$

NOTES

TALK the TALK

The Floor Is Yours

You can apply the Distributive Property to solve real-world problems.

Consider the situation.

Tyler is setting up the gym floor for an after-school program. He wants to include a rectangular area for playing volleyball and another for dodgeball. He also wants to have an area for kids who like to play board games or just sit and read. The gym floor is already 50 feet by 84 feet, or 4200 square feet.

1. **Create a diagram to show how you would split up the gym floor. Represent your diagram using the Distributive Property and write an explanation for the areas assigned to each activity.**