Student Guide

Lesson 5: The Distributive Property

Tom and Charlie collected trading cards. Tom had 4 sets of 10 cards and Charlie had 3 sets of 10 cards. They wanted to know how many trading cards they had altogether. So, Charlie wrote the expression $4 \times 10 + 3 \times 10$. But Tom knew the distributive property and said, "Hey, Charlie, it'd be easier to use the expression 7×10."

Is Tom right? Yes, he is, and in this lesson you'll learn how to put the distributive property to work simplifying expressions, just as Tom did.

Lesson Objectives

- Use the distributive property to simplify an expression.

Materials
Textbook, pages 13–15

Activity 1. Skills Update *(online)*

Activity 2. Distributive Property *(online)*

Activity 3. Offline Learning *(offline)*

A. Warm-Up
Simplify.

1) $(2 + 6) + 8$

2) $20 – (4 – 2)$

3) $4 \times (3 \times 5)$

4) $(7 \times 3) \times 2$

B. What Is the Distributive Property?
Concert tickets cost $17 each. CDs cost $13 each. What total amount would you pay for four concert tickets and four CDs?

What expression would you write to solve this problem? You could write $4 \times 17 + 4 \times 13$. Is this the simplest expression you could write? Knowledge of mathematical properties can help simplify expressions. In this case, knowledge of the distributive property can help.

Student Guide

C. In the Book *(pages 13–14)*

Big Idea
Properties can help you simplify expressions.

The Distributive Property: Read pages 13 and 14.

- Lesson Main Points
  - One of the distributive properties states that you can distribute a factor across addends.
  - Parentheses indicate which operations to do first.
  - The distributive properties of multiplication with respect to addition and subtraction are collectively called the distributive property.
- Example 1a
  - The distributive property lets you spread out or combine numbers to make them easier to work with.
- Example 1b
  - Multiplying by 10 is easier than multiplying by 6 and 4 and then adding the products.

D. Try It

Remember the problem?

> Concert tickets cost $17 each. CDs cost $13 each. What total amount would you pay for 4 concert tickets and 4 CDs?

How can you use the distributive property to solve the problem?

- You can solve the problem using the expression

$$(4 \times 17) + (4 \times 13)$$
$$68 + 52$$
$$120$$

- Using the distributive property, you can also solve the problem using the expression

$$4(17 + 13)$$
$$4(30)$$
$$120$$

The second way of solving it is simpler. Using the distributive property can help you simplify expressions.

Try the Class Exercises 1–7, odd, on page 14.

If you have difficulty solving the Class Exercises, review the example in the Another Look section.

Student Guide

E. Written Exercises *(page 14)*
1–28, all

Tip: When using the distributive property, use convenient numbers in your calculations. For example, look at Problem 21.

Simplify 28 × 15

This expression would more easily be computed as

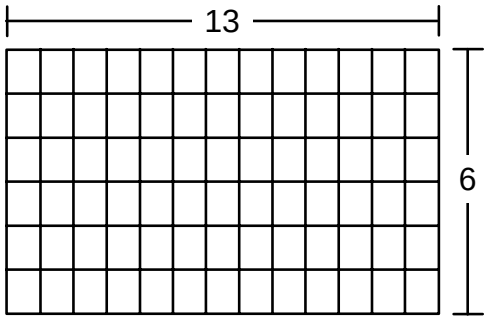
28 × (10 + 5)

than

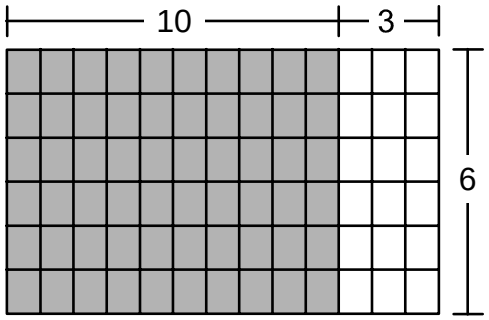
28 × (8 + 7)

F. Another Look *(optional)*
Using an area model can help you understand the distributive property.

The model below shows that 6 × 13 = 78



If you shade 10 columns of boxes, you can see that (6 × 10) + (6 × 3) = 78



Using the distributive property to “spread out” 13 made simplifying the expression easier, but it did not change the product.

You might want to try making some area models on your own to help you solve problems.

G. Extra Practice *(optional, pages 14–15)*
Complete Written Exercises 29–38, all.

Student Guide

H. Challenge *(optional)*
Have you ever wondered how some number tricks work? Let's take a look at one number trick.

Step 1: Choose two counting numbers less than 9
Step 2: Multiply one of the numbers by 5
Step 3: Add 4 to the product
Step 4: Double the sum
Step 5: Add the other number
Step 6: Subtract 8

What do you notice about your final answer? If you calculated correctly, you should be left with a two-digit number whose digits are the numbers you originally selected! To test the trick, try it again with two different counting numbers.

How do you think this trick works? To find out, let x and y be the two numbers you chose. You can write a variable expression for each step:

Step 1	x and y	Choose two counting numbers less than 9
Step 2	$5x$	Multiply one of the numbers by 5
Step 3	$5x + 4$	Add 4 to the product
Step 4	$2 (5x + 4)$	Double the sum
Step 5	$2 (5x + 4) + y$	Add the other number
Step 6	$2 (5x + 4) + y - 8$	Subtract 8

Once you simplify the last expression, you will see that the result simplifies to $10x + y$, a two-digit number whose tens' digit is x and whose ones' digit is y.

And there you have it! See if you can make up some number tricks of your own using combinations of the properties that you have learned.

Assessment *(offline)*
Complete Written Exercises 8, 10, 22, and 26, page 14, if you have not already done so. Then enter your results online.

Student Guide

Answers

Warm-Up
1) 16
2) 18
3) 60
4) 42