LESSON OVERVIEW

Lesson 3 Split Numbers to Multiply

Lesson Objectives

Content Objectives

- Break apart a factor as a strategy for multiplying (distributive property of multiplication).
- Apply the distributive property of multiplication as a strategy to learn multiplication facts and to solve multiplication problems.

Language Objectives

- Draw arrays to demonstrate the distributive property.
- Write multiplication expressions to represent word problems and visual models.
- Justify conclusions and communicate the conclusions to others.

Standards for Mathematical Practice (SMP)

1 Make sense of problems and persevere in solving them.

2 Reason abstractly and quantitatively.

4 Model with mathematics.

7 Look for and make use of structure.

8 Look for and express regularity in repeated reasoning.

Prerequisite Skills

- Understand multiplication of whole numbers.
- Use a multiplication equation to represent and solve a word problem involving equal groups, arrays, and equal measurement quantities.

Lesson Vocabulary

There is no new vocabulary. Review the following key terms.

- **array** a set of objects arranged in equal rows and equal columns
- **multiply** to repeatedly add the same number a certain number of times; used to find the total number of items in equal-sized groups
- **factor** a number that is multiplied
- **product** the result of multiplication

Learning Progression

In the previous lesson students learned about the commutative and associative properties of multiplication and used the properties as strategies to find easier ways to multiply.

In this lesson students use another property, the distributive property of multiplication, to break apart factors in order to make a multiplication problem easier to solve.

Students use models, such as pictures of equal groups and arrays, to break apart a factor into lesser numbers. For example, to solve 8×7, students can create an array that shows 8×7 and break it apart into two arrays that show 8×5 and 8×2. Students then add the products of the two arrays [40 and 16] to find the product of 8×7 [56]. Students write equations to represent each array in the multiplication problem. The strategy of breaking apart a factor allows students to use multiplication facts they know in order to solve more difficult multiplication problems.

Later in Grade 3 students will use a similar strategy when they multiply one-digit numbers by multiples of 10.

In Grade 4 students will use place-value concepts to break apart factors when they learn to use area models and partial products to multiply greater numbers.

Lesson Pacing Guide

Whole Class Instruction

Day 1 *45–60 minutes*	**Toolbox: Interactive Tutorial*** *Distributive Property* **Introduction** • Use What You Know *15 min* • Find Out More *15 min* • Reflect *5 min*	**Practice and Problem Solving** Assign pages 23–24.
Day 2 *45–60 minutes*	**Modeled and Guided Instruction** **Learn About Breaking Apart Numbers to Multiply** • Picture It/Model It/Solve It *20 min* • Connect It *15 min* • Try It *10 min*	**Practice and Problem Solving** Assign pages 25–26.
Day 3 *45–60 minutes*	**Modeled and Guided Instruction** **Learn About Breaking Apart Numbers to Multiply** • Model It/Solve It *20 min* • Connect It *15 min* • Try It *10 min*	**Practice and Problem Solving** Assign pages 27–28.
Day 4 *45–60 minutes*	**Guided Practice** **Practice Breaking Apart Numbers to Multiply** • Example *5 min* • Problems 16 –18 *15 min* • Pair/Share *15 min* • Solutions *10 min*	**Practice and Problem Solving** Assign pages 29–30.
Day 5 *45–60 minutes*	**Independent Practice** **Practice Breaking Apart Numbers to Multiply** • Problems 1–5 *20 min* • Quick Check and Remediation *10 min* • Hands-On or Challenge Activity *15 min* **Toolbox: Lesson Quiz** Lesson 3 Quiz	

*We continually update the Interactive Tutorials. Check the Teacher Toolbox for the most up-to-date offerings for this lesson.

Small Group Differentiation

Teacher-Toolbox.com

Reteach

Ready Prerequisite Lessons *45–90 min*

Grade 2
- Lesson 4 *Understand* Even and Odd Numbers
- Lesson 5 Add Using Arrays

Student-led Activities

Math Center Activities *30–40 min*

Grade 2 *(Lessons 4 and 5)*
- 2.7 Even or Odd?
- 2.8 Facts for Even and Odd Numbers
- 2.13 Skip Count by 5s
- 2.9 Use Array Vocabulary
- 2.10 Use Arrays to Add

Grade 3 *(Lesson 3)*
- 3.1 Break Apart a Factor
- 3.13 Toss and Multiply

Personalized Learning

i-Ready.com

Independent

i-Ready Lessons* *10–20 min*

Grade 2 *(Lessons 4 and 5)*
- Odd and Even Numbers
- Add Using Arrays

At A Glance

Students find the product of equal groups and then explore breaking apart one factor into lesser numbers and finding the product. Then students explore how breaking apart a factor into lesser numbers can help them with facts they don't know.

Step By Step

- Work through **Use What You Know** as a class.
- Tell students that this page models a way to make multiplying easier. Have students read the problem at the top of the page. Ask: *What multiplication equation can we write to show it?* [6 × 3 = ______]
- Work through the first two questions as a class. Have students in pairs or groups work on the last question. Have them share their answers.
- Together, summarize what they did: they broke apart one of the factors into two lesser numbers, multiplied each lesser number by the other factor, then added those products to get the total. 5 groups of 3 and 1 group of 3 equals 18.

▶ **Mathematical Discourse 1 and 2**

▶ **Visual Model**

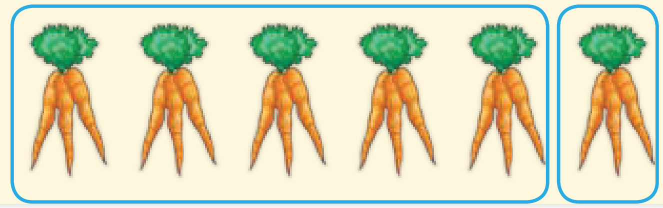
SMP TIP Reason Abstractly and Quantitatively
Students make sense of quantities and their relationships in problem situations and are developing skills in representing problems using numbers and symbols. *(SMP 2)*

Lesson 3 Introduction
Split Numbers to Multiply

Use What You Know

In Lesson 2, you learned some ways to make multiplying numbers easier. Take a look at this problem.

Ty has 6 bunches of carrots. There are 3 carrots in each bunch. How many carrots does Ty have altogether?



a. Circle 5 of the bunches.
What multiplication equation can you write to find how many carrots are in 5 bunches? ____5 × 3 = 15____

b. Circle the 1 bunch that is left.
What multiplication equation can you write to find how many carrots are in 1 bunch? ____1 × 3 = 3____

c. Look at the two sets of bunches you circled. You found the number of carrots in each set.
Explain how you could use those two numbers to find the total number of carrots.
There are 15 carrots in the first set of bunches and 3 carrots in the second set of bunches. I could add 15 and 3 to get 18 total carrots.

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▶ Mathematical Discourse

1 *Does the total number of carrots change when you break apart the 6 bunches of carrots into two smaller groups? Explain why or why not.*

No; the number in each bunch stays the same, 3, and there are still 6 bunches. They are just split into 5 bunches of 3 and 1 bunch of 3.

2 *How might knowing about breaking apart a factor into lesser numbers be helpful to you?*

It can help me solve a hard problem by breaking it apart into two easier problems.

▶ Visual Model

Explore another way of breaking apart 6.

- Draw a simplified drawing of the 6 bunches of carrots on the board. Ask a volunteer to break apart the 6 bunches of carrots into two sets in a way other than a group of 5 and a group of 1. Have the volunteer draw a circle around each set.
- Together, determine the multiplication equation shown by each set and then add the two products to find the total number of carrots. For example, if the drawing shows the 6 bunches divided into a set of 4 bunches and a set of 2 bunches, write: "4 × 3 = 12, 2 × 3 = 6, and 12 + 6 = 18."

Find Out More

You can break apart numbers to help you figure out multiplication problems you do not know.

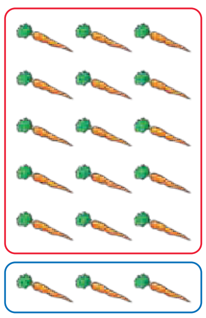
Ty did not know what 6 groups of 3 were, but he did know what 5 groups of 3 were. That left 1 group of 3.

Ty broke apart **6** into **5 + 1**. Then he multiplied each part by 3 and added the products together.

You can write 5 bunches of 3 carrots plus 1 bunch of 3 carrots like this:
(5×3) + **(1×3)**

The parentheses show you that you multiply each set of numbers first, and then add the products together.

You can also show this using an array.



$5 \times 3 = 15$

$1 \times 3 = 3$

You can write what the array shows three ways:
6×3 or $(5 + 1) \times 3$ or $(5 \times 3) + (1 \times 3)$

Reflect

1 What if Ty had 4 carrots in each bunch instead of 3? Explain how he could break apart the numbers to find the product of 6×4.

Possible answer: Ty could break apart the 6 into 3 and 3. He would multiply 3×4 and 3×4, then add the products. $3 \times 4 = 12$. $12 + 12 = 24$.

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Step By Step

- Read **Find Out More** as a class.
- Draw the 6 groups of 3 carrots on the board. Explain that Ty didn't know the product of 6×3, but he knew what 5 groups of 3 was. Make it clear that Ty looked at the number of groups (6) and he knew that he could find the product for 5 groups and for 1 group and then add them together.
- Write "$(5 \times 3) + (1 \times 3)$" under the drawing. Underline the 5 and the 1 to help students understand that the expression describes what they just did (breaking apart the 6 groups of 3). Discuss the use of parentheses in the expression.

Concept Extension

- Draw students' attention to the array shown, and discuss how it is similar to and different from the drawing on the board. Write the three expressions shown for the array on the board. Ask volunteers to relate the numbers in the expressions to the drawing.
- Read the **Reflect** problem together. Draw 6 bunches of 4 carrots on the board. Ask students to work in pairs to find a way to break apart the 6 bunches and circle the two groups.
- Have pairs hold up their papers or whiteboard. Ask them to share. Help pairs use words and then numbers and symbols to describe what they did. For example, pairs might say, "3 groups of 4 plus 3 groups of 4." Write on the board "$(3 \times 4) + (3 \times 4) = 24$." Ask students questions such as: *Is there another way to break apart the numbers? Do you agree with what other groups have described? Why or why not?*
- Have each pair write an equation under their drawing to show how they broke apart 24.

Real-World Connection

Ready Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 23–24** after students have completed this section.

Concept Extension

Change verbal expression into numerical expressions.

- Choose one way to write the problem, such as $(5 \times 3) + (1 \times 3)$. Ask students to use words to describe this expression: *Five groups of three is added to one group of three*. This helps them make the connection between using numbers and symbols and using words to describe the problem.

Real-World Connection

Ask students to think of a multiplication fact that is hard for them to remember or that they don't know. Write a few on the board. Tell them that they will get an opportunity to practice the breaking-apart strategy on these facts later on in the lesson.

At A Glance

Students explore breaking apart a factor into lesser numbers using equal groups, arrays, and words. Then students revisit this problem and figure out how to solve the problem using equations. They also find other ways to break apart factors of 24 and 12.

Step By Step

- Read the problem at the top of the page as a class.

Picture It

- Encourage students to picture the problem in their own minds. Ask them how you could draw it on the board and then create the drawing. Discuss the different ways to break apart the one set of 6 vases into two sets. Ask students to describe the way it is shown in **Picture It**. Then circle the 4 groups of 4 and 2 groups of 4 and use language to describe this: *four groups of four plus two groups four.*

SMP TIP Model with Mathematics
Students practice visualizing and using models to understand and solve problems. *(SMP 4)*

Model It

- In **Model It**, help students to make the connection between the drawing of vases and the array (the number of rows is the same as the number of vases). Point out how Mario used the array to show how to break apart the factor 6 into 4 and 2.

▶**Mathematical Discourse 1–4**

Solve It

- After reading **Solve It** together, return to the original drawing of vases on the board and have the class describe the drawing in words as you point to the groups of vases on the board.

▶**Concept Extension**

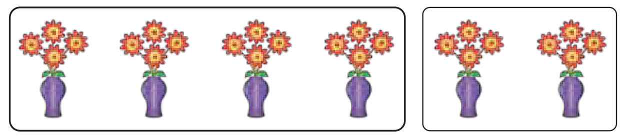
Learn About Breaking Apart Numbers to Multiply

Read the problem below. Then explore different ways to break apart one of the numbers to solve the problem.

Mario has 6 vases of flowers. There are 4 flowers in each vase. How many flowers does Mario have in all? Break apart one of the numbers to find the answer.

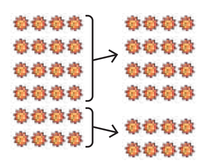
Picture It **You can use equal groups to help understand the problem.**

Mario chose to break apart the number of groups to find the answer.



Model It **You can also use an array to help understand the problem.**

Mario made an array and then broke apart the rows to show the new groups.



Solve It **You can also use words to help understand the problem.**

6 vases of 4 flowers is the same as 4 vases of 4 flowers plus 2 vases of 4 flowers.

▶Mathematical Discourse

1 *How are the picture of the vases and the array alike?*
They both show 6 groups of 4 and a total of 24 flowers.

2 *How are they different?*
Each group of 4 flowers is arranged into a row in the array.

3 *How can a picture of the vases or an array help you figure out how you might break apart a factor?*
I can draw circles on the picture or array to show how I will break apart the groups of flowers.

4 *Why do you think Mario chose this way to split up the 6 vases?*
Mario probably knew the products for 4 × 4 and 4 × 2.

Connect It

Now you will explore different ways to solve the problem from the previous page.

2 What numbers did Mario break 6 into to help him solve the problem?

4 and 2

3 What two multiplication equations did Mario use then?

$4 \times 4 = 16$ and $2 \times 4 = 8$

4 What is another way you could break apart 6?

Possible answer: $3 \times 4 = 12$ and $3 \times 4 = 12$. Then add 12 and 12 to get 24.

5 What numbers could Mario break 4 into to help him solve the problem?

3 and 1 or 2 and 2

6 What two multiplication equations would Mario use if he broke apart the 4?

Possible answer: $6 \times 3 = 18$ and $6 \times 1 = 6$.

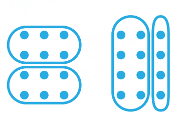
7 Explain why Mario's way of solving the problem is not the only way.

Possible answer: There is more than one way to break apart the numbers in the problem.

Try It

Use what you just learned to solve this problem.

8 Show two different ways to break apart the numbers to solve 4×3. Draw models and show the math equations you used.



Possible answers: Way 1: $2 \times 3 = 6$ and $2 \times 3 = 6$; $6 + 6 = 12$.

Way 2: $4 \times 2 = 8$ and $4 \times 1 = 4$; $8 + 4 = 12$.

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▶Concept Extension

Decide how to break apart numbers.

- Students may be confused as to what number they should break apart in a problem, or how to write it.
- Model with students how to picture a problem in their minds and create a drawing or array from it.
- To help them identify which number to break apart, ask questions such as: *How can I break apart the groups? What number did I start with? What numbers do I have now?* Then have them use numbers and symbols to represent what they did.

Step By Step

Connect It

- Work through the **Connect It** problems together. Write "6×4" on the board and review with students what they did with pictures and the array (broke apart the 6 groups into 4 groups of 4 and 2 groups of 4).
- For problem 4, focus students on the factor 6 and ask if they could break apart the 6 groups another way. Have students think of two other ways to break apart the 6 groups of 4, and write the equations on the board. [$5 \times 4 = 20$, $1 \times 4 = 4$, and $20 + 4 = 24$; $3 \times 4 = 12$, $3 \times 4 = 12$, and $12 + 12 = 24$]
- Before discussing problem 5, write "$6 \times 4 = 24$" and draw an array of 6 rows of 4 on the board. Point to the 4 in the equation and explain that you can also break apart the second factor, 4, and then multiply each number by 6. On the board, divide the array in half by circling 2 columns of 6 twice. Together, write the equations shown. [$6 \times 2 = 12$, $6 \times 2 = 12$, and $12 + 12 = 24$].
- Draw another array of 6 rows of 4. Ask a student to show another way to break apart 4. [3 and 1] Together, write the equations shown. [$6 \times 3 = 18$, $6 \times 1 = 6$, and $18 + 6 = 24$] Discuss problem 5 together.

Try It

- Before asking pairs to complete the **Try It** problem, use the 6×4 arrays to review the different ways they broke apart the product 24.

8 Solution

$2 \times 3 = 6$ and $2 \times 3 = 6$, $6 + 6 = 12$;
$4 \times 2 = 8$ and $4 \times 1 = 4$, $8 + 4 = 12$.

Error Alert Make sure students write equations that represent their drawings. If students can't write equations to represent the drawings, it's likely they don't fully understand what they are doing, even if they have correctly broken apart the arrays in two different ways.

Ready® Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 25–26** after students have completed this section.

Modeled and Guided Instruction

At A Glance

Students use arrays to explore another way to simplify multiplication, focusing on ways to break apart the second factor. Then students revisit this problem. They think about why breaking apart a factor can make it easier to find products and solve problems. They apply the strategy to solving other multiplication problems.

Step By Step

▶ Hands-On Activity

- Read the problem at the top of the page as a class.

Model It

- Write the problem 8 × 7 on the board. Refer students to the array in **Model It** that shows 8 rows of 7. Remind students that the array also shows 7 columns of 8. Explain that they can break apart the second factor by separating the columns into two groups as shown by the array: 5 columns of 8 and 2 columns of 8.

▶ Mathematical Discourse

- Focus students' attention on the 7 in the expression 8 × 7 on the board and underline the 7. Remind students that the factor 7 (the number of columns) was split into 5 and 2, with each column having 8 crackers, one for each friend.

Solve It

- Read **Solve It** together, using the words given to describe what they just saw modeled. Go over the different ways to write it. Make sure students understand that "(5 + 2)" in the expression 8 × (5 + 2) means you split the columns into 5 columns and 2 columns and that each column has 8 crackers in it, one for each friend. Remind them you must add what is in the parentheses first and then multiply.

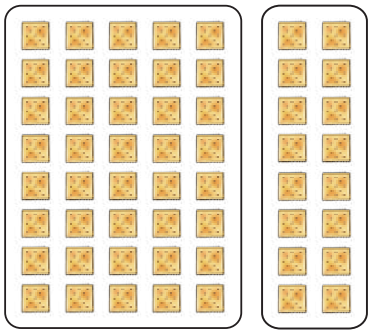
Learn About Breaking Apart Numbers to Multiply

Read the problem below. Then explore ways to break apart a number to make one hard multiplication equation into two easier multiplication equations.

Matt shared some crackers with 8 friends. He gave each friend 7 crackers. How many crackers did Matt give away? Break apart one of the numbers to find the answer.

Model It **You can use an array to help understand the problem.**

Instead of breaking apart the rows (the number of friends), Matt broke apart the columns (the number of crackers).



Solve It **You can also use words and multiplication expressions to help understand the problem.**

Giving 8 friends 7 crackers is the same as giving 8 friends 5 crackers each, then giving each of them 2 more crackers. You can write the multiplication three ways:

8 × 7 or 8 × (5 + 2) or (8 × 5) + (8 × 2)

▶ Mathematical Discourse

Why do you think Matt broke up the crackers so there were 5 columns plus 2 columns of crackers?

He probably knows the products of the facts 5 × 8 and 2 × 8.

Connect It

Now you will think more about the problem from the previous page.

9 What numbers did Matt break 7 into to help him solve the problem? 5 and 2

10 What two multiplication expressions did Matt use then? 8×5 and 8×2

11 Show how to use the two multiplication expressions to find the answer.

First multiply: $8 \times 5 = 40$ and $8 \times 2 = 16$. Then add: $40 + 16 = 56$.

12 Madison knows the answer to 4×7. How can this help her multiply 8×7?

Possible answer: She could break apart the 8 into 4 and 4. Then she could multiply $4 \times 7 = 28$ and $4 \times 7 = 28$. Finally, she could add 28 and 28 to get 56.

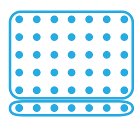
13 Explain why someone might want to break apart one of the numbers in a multiplication equation.

Possible answer: Breaking apart a number into 2 lesser numbers can turn one difficult multiplication problem into two easier problems.

Try It

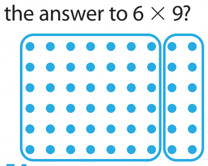
Use what you learned about breaking apart numbers to solve these problems.

14 Alice knows the answer to 5×7. How can that help her find the answer to 6×7? Draw a model and show the math equations you used.



Possible answer: $5 \times 7 = 35$ and $1 \times 7 = 7$. $35 + 7 = 42$.

15 Tim knows the answer to 6×7. How can that help him find the answer to 6×9? Draw a model and show the math equations you used.



Possible answer: $6 \times 7 = 42$ and $6 \times 2 = 12$. $42 + 12 = 54$.

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Step By Step

Connect It

- Work through **Connect It** problems 9–11 as a class. Focus students' attention on the 7 in the expression 8×7. Remind them Matt broke apart 7 columns into 5 columns of 8 and 2 columns of 8. Write "$(8 \times 5) + (8 \times 2) =$ ______." To check students' understanding, ask questions such as: *What does the 8 tell us? How does the equation show that the 7 columns have been split apart?*
- Organize students into pairs or groups to answer problem 12. To assess understanding, instruct them to write the equations Madison uses to find the product of 8×7. Ask pairs to share and explain why this might make it easier for Madison to multiply 8×7.

Try It

- Organize students into pairs or groups to discuss and solve the **Try It** problems. Walk around to each group, listen to, and join in on discussions at different points. Choose several pairs or groups to share.

14 Solution

Students show an array with 5 rows of 7 circled and 1 row of 7 circled; $5 \times 7 = 35$ and $1 \times 7 = 7$, $35 + 7 = 42$.

15 Solution

Students show an array with 6 rows of 7 circled and 6 rows of 2 circled; $6 \times 7 = 42$ and $6 \times 2 = 12$, $42 + 12 = 54$.

Error Alert Some students may have difficulty drawing the model to break apart the 9. Using graph paper may help students to better see the rows and columns and mark the model to show where they are splitting it apart. Ask: *Is 9 the number of rows or the number of columns in the model?* [the number of columns].

Ready® Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 27–28** after students have completed this section.

Hands-On Activity

Use tiles to explore ways to break apart factors.

Materials: 20 tiles or base-ten unit cubes per pair.

- Before working on the problem at the top of the page, have students try a simpler problem. Draw an array of 3 rows of 2 on the board. Together, write the expression it shows. $[3 \times 2]$
- Ask students to build the array using tiles on a piece of paper. Underline "2" in the expression and ask: *How can we break 2 apart*? [1 and 1] Divide the array on the board in half vertically by circling 3 rows of 1 and 3 rows of 1. Ask students to show this on their papers by drawing circles around the 2 columns of tiles. Ask them to write the equations shown. $[3 \times 1 = 3, 3 \times 1 = 3$, and $3 + 3 = 6.]$
- Ask students to turn over their papers and repeat the steps, this time for the expression 2×5.

Guided Practice

At A Glance

Students practice breaking apart factors using arrays and equations.

Step By Step

- Ask students to solve the problems on the page individually.
- **Pair/Share** When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group. Choose pairs or groups to share their solutions and thinking with the class.
- Have each pair or group you've chosen present their solution so students hear how others thought about and solved the problems. You may wish to ask questions such as: *Did anyone solve this a different way? Can you explain your model? Can you use the math words "product" and "factor" in your explanation?*

Solutions

Example 28 silver beads; Students may also use an array showing the factor 7 instead of 4 broken apart. For example, 7 broken apart into 4×5 and 4×2.

16 Solution

$5 \times 6 = 30$ and $1 \times 6 = 6$, $30 + 6 = 36$; Students could also break apart the second factor and, for example, write $6 \times 1 = 6$ and $6 \times 5 = 30$, $6 + 30 = 36$.

DOK 2

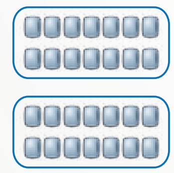
Practice Breaking Apart Numbers to Multiply

Study the example below. Then solve problems 16–18.

Example

Stacy is making 4 bracelets. Each bracelet uses 7 silver beads. How many silver beads does Stacy need? Show how to break apart one of the numbers to make the problem easier to solve.

Look at how you could show your work using an array.



$2 \times 7 = 14$

$2 \times 7 = 14$

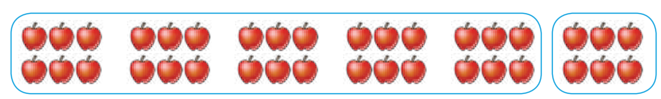
$14 + 14 = 28$

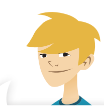
Solution 28 silver beads

The student broke apart the 4 into $2 + 2$ and then added the two products together.

Pair/Share
How else could you have broken apart one of the numbers to solve this problem?

16 There are 6 bowls of apples. There are 6 apples in each bowl. Show how to break apart the number 6 to make the problem easier to solve.





Possible answer:

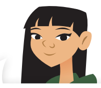
$5 \times 6 = 30$ and $1 \times 6 = 6$. Then add 30 and 6 to get 36.

What ways do you know to break apart the number 6? Which way do you think is easiest?

Pair/Share
What is another model you could have used to show how to break the number apart?

Teacher Notes

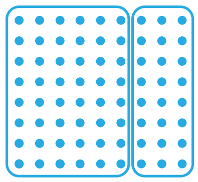
17 Joe has 8 shelves with 9 books on each shelf. How many books does Joe have altogether? Show how to break apart one of the numbers to make the problem easier to solve.



You can break apart the number 9 many different ways.

Possible student work using equations and an array:

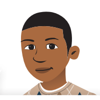
$8 \times 6 = 48$ and $8 \times 3 = 24$. Then add 48 and 24 to get 72.



Pair/Share
How did you and your partner decide how to break apart one of the numbers?

Solution **72 books**

18 Jordan found 6×8 by breaking apart the 6 into $5 + 1$. Which of the following correctly shows the next step in finding the result? Circle the letter of the correct answer.



Jordan broke apart the 6 in 6×8. What will he do with the 8?

A $(5 \times 6) + (1 \times 6)$

B $(6 \times 8) + (1 \times 8)$

C $(5 + 8) \times (1 + 8)$

D $(5 \times 8) + (1 \times 8)$

Avery chose **A** as the correct answer. How did she get that answer?

Possible answer: Avery used the 5 and the 1 correctly, but she multiplied them by the 6 instead of by the 8.

Pair/Share
Does Avery's answer make sense?

27

Teacher Notes

Solutions

17 Solution
72 books; See Student Book page for possible model; $8 \times 6 = 48$, $8 \times 3 = 24$, and $48 + 24 = 72$.
DOK 2

18 Solution
D; Use the distributive property to identify the equation that multiplies 5 and 1 by 8 separately and then adds the products.

Explain to students why the other two answer choices are not correct:

B is not correct because 6 is broken apart into 5 and 1 so 8 should be multiplied by 5 and 1, not 6 and 1.

C is not correct because the operation signs are wrong.

DOK 3

Ready® Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 29–30** after students have completed this section.

Independent Practice

At A Glance

Students solve problems that might appear on a mathematics test. They break apart factors using arrays, numbers, and equations to make multiplication easier.

Solutions

1 Solution
B; The second factor, 5, is broken apart into 3 + 2. 3 is shown multiplied by 7, so 2 is the missing number.
DOK 1

2 Solution
A; The array shows the number of packs, 8, broken apart into 4 + 4.
DOK 2

Practice Breaking Apart Numbers to Multiply

Solve the problems.

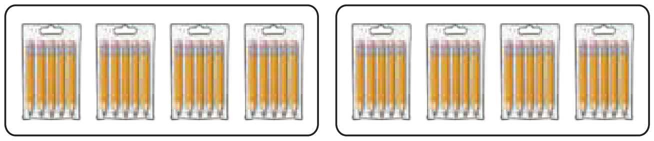
1 Tucker solved 7 × 5 by breaking it apart as shown below.

(7 × 3) + (7 × ____)

What number belongs in the blank?

A 1
B 2
C 4
D 8

2 Cole has 8 packs of pencils. There are 5 pencils in each pack. He wants to know how many pencils he has in all. The model below shows how he breaks apart one number in the problem.



Which expression shows how Cole solves the problem?

A (4 × 5) + (4 × 5)
B (8 × 2) + (8 × 2)
C (4 × 2) + (4 × 2)
D (3 × 5) + (5 × 5)

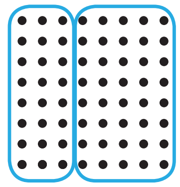
Quick Check and Remediation

- Ask students to find a way to break apart one of the factors in the problem 6 × 9 into lesser numbers using an array. Have them show their work using numbers and symbols.
- For students who are struggling, use the chart to guide remediation.
- After providing remediation, check students' understanding. Ask students to break apart one of the factors in the problem 7 × 4 using an array or graph paper. Have them use numbers and symbols to show the answer.

If the error is . . .	Students may . . .	To remediate . . .
(5 × 6) and (1 × 6)	know they can split apart 6 into 5 and 1, but do not understand that they are then multiplying 5 groups of 9 and 1 group of 9.	Hand out graph paper and have students outline a rectangle with 6 rows of 9 squares. Have them ask themselves, "How can I split apart 6 rows of 9?" Have students circle 5 rows of 9 and write "5 × 9." Then circle the last row of 9 and write "1 × 9." Have them write the expression (5 × 9) + (1 × 9) and explain how each number in the expression relates to the drawing. Then show another way to split 6 × 9.
an incorrect array or being unable to create the array.	not have an understanding of how to split the factors into smaller ones.	Have students work with a smaller product such as 3 × 4. On the board, draw the model. Draw a circle around 2 rows of 4 and write 2 × 4. Then draw a circle around the remaining 1 row of 4 and write 1 × 4. Have students practice with other products such as 4 × 4 and 5 × 6.

3 Use the array below to solve 8 × 8. First draw circles to break the array into two groups. Then fill in the blanks to show how you broke the numbers apart.

Sample answer given.



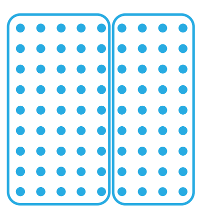
8 × 8 = (8 × __3__) + (8 × __5__)

4 Is each expression equivalent to the product of 6 and 9? Choose *Yes* or *No*.

a.	(6 × 3) + (6 × 3)	☐ Yes	☒ No
b.	(6 × 4) + (6 × 5)	☒ Yes	☐ No
c.	6 × (6 + 3)	☒ Yes	☐ No
d.	9 × (2 + 4)	☒ Yes	☐ No
e.	(9 × 3) + (9 × 3)	☒ Yes	☐ No

5 There are 9 rows in Mrs. Mitchell's flower garden. Each row has 9 flowers planted in it. How many flowers are planted in the garden? Show how to break apart the numbers to find the answer.

Possible student answer using an array:



Answer There are __81__ flowers in the garden.

Self Check **Go back and see what you can check off on the Self Check on page 1.**

29

Solutions

3 Solution

See array on Student Book page. Students break apart one factor into 3 and 5. Multiplying 8 × 3 and 8 × 5 and then adding the two products together is the same as multiplying 8 × 8.

DOK 2

4 Solution

a. **No**;
b. **Yes**;
c. **Yes**;
d. **Yes**;
e. **Yes**

DOK 1

5 Solution

81; See possible model on Student Book page showing 5 columns of 9 (9 × 5, or 45) and 4 columns of 9 (9 × 4, or 36).

DOK 2

▶ Hands-On Activity

Practice breaking apart multiplication facts.

Materials: cm graph paper cut into 10-cm by 10-cm squares, crayons

- Organize students into pairs. Have them list 5 multiplication facts they still need to learn or need to practice.
- Instruct students to create flash cards by writing each fact on the back side of the graph paper (without the product). On the other side of the card have students outline the rectangle showing the fact (for example, 9 rows of 6). Instruct them to think of one way to break apart one of the factors that would help them figure out the product. Have them outline the lesser products, write the facts (such as "5 × 6 = 30" and "4 × 6 = 24") in each area, and color in each smaller area using a different color.

▶ Challenge Activity

Split apart products using subtraction.

Materials: cm graph paper

- Write the problem 9 × 9 on the board.
- Remind students that multiplying by 10 is usually pretty easy. Explain that they can use 9 × 10 = 90 to find the product of 9 × 9.
- Model this by outlining a 9 by 10 rectangle on the board. Tell students they can break apart this rectangle (because they only need to know 9 rows of 9) into (9 × 9) and (9 × 1). Circle the 9 × 1 and cross it out. Show students that they can write this as (9 × 10) − (9 × 1) = 81.
- Have them use these steps to find the products of 7 × 9, 8 × 9, and 4 × 9.

LESSON QUIZ

Lesson 3
Split Numbers to Multiply

Teacher-Toolbox.com

Overview

Assign the Lesson 3 Quiz and have students work independently to complete it.

Use the results of the quiz to assess students’ understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson for suggested instructional resources.

Tested Skills

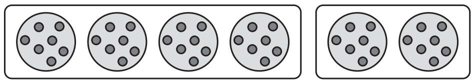
Problems on this assessment form require students to be able to break apart a factor as a strategy for multiplying and apply the distributive property to solve a multiplication problem. Students will also need to be familiar with multiplying whole numbers and be able to solve word problems involving equal groups.

Ready® Mathematics

Lesson 3 **Quiz**

Solve the problems.

1 Claire has 6 plates. She puts 7 muffins on each plate. She finds the total number of muffins by using the model below.



Which expressions show Claire’s model?

Circle all the correct answers.

A $(7 + 4) \times (7 + 2)$

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

C $7 \times (4 + 2)$

D $(4 \times 3) + (4 \times 4)$

E $(7 \times 4) + (7 \times 2)$

2 Blake wants to break apart the 7 in 5×7. Complete the equations to show two different ways Blake could break apart the 7.

Choose numbers from the box. Numbers may be used more than once.

1	2	3	4	5	6	7

$5 \times 7 = 5 \times (5 + \_\_\_\_)$

$5 \times 7 = 5 \times (\_\_\_\_ + \_\_\_\_)$

Lesson 3 **Quiz** continued

3 Is the expression equal to 4×9?

Choose *Yes* or *No* for each expression.

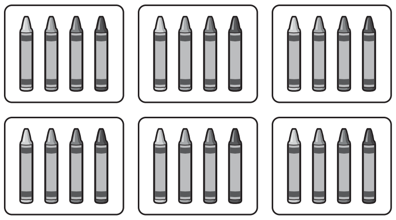
a. $4 \times (3 + 6)$ ☐ Yes ☐ No

b. $(1 + 3) \times 9$ ☐ Yes ☐ No

c. $(2 \times 9) + (2 \times 9)$ ☐ Yes ☐ No

d. $(4 \times 4) + (4 \times 4)$ ☐ Yes ☐ No

4 Brian has 6 packs of crayons. There are 4 crayons in each pack. He wants to know how many crayons he has in all.



Brian says that the expression $(2 + 2) + 6$ can be used to find the total number of crayons.

What is Brian doing wrong? Explain your answer.

Common Misconceptions and Errors

Errors may result if students:

- break apart a factor into two numbers whose product, not sum, is the factor.
- break apart a factor into two lesser numbers, but do not understand how to use these lesser numbers to make the multiplication easier.
- incorrectly apply the distributive property by adding or multiplying all of the numbers or only distributing to the first number inside the parentheses.

***Ready*® Mathematics**

Lesson 3 Quiz Answer Key

1. C, E
DOK 2

2. 2
6, 1 or 4, 3 or 3, 4 or 2, 5 or 1, 6
DOK 2

3. **a.** Yes
b. Yes
c. Yes
d. No
DOK 1

4. Possible explanation: Brian added $(2 + 2)$ and 6 instead of multiplying $(2 + 2)$ by 6. He should use the expression $(2 + 2) \times 6$. He has 24 crayons in all.
DOK 3