Lesson 7: 9s

Lesson Objective

- Students will apply the distributive property of multiplication over addition to visually represent and solve multiplication problems.

Instructional Materials

Material	Quantity	Description
Timer	1	
How Am I Doing? graph	1 per student	
Fact Practice graph	1 per student	
Colored Pencils	1 per student	
Display Masters	1 each	• Preview: Key Idea: 9s • Demonstrate: Partially Completed Multiplication Table • Demonstrate: Take Apart 9 • Demonstrate: 9 x 6 Array A • Demonstrate: 9 x 6 Array B • Demonstrate: 9 x 6 Array C • Demonstrate: 9 x 6 Array D • Demonstrate: 9 x 6 Array E • Demonstrate: 6 x 9 Array A • Demonstrate: 6 x 9 Array B • Demonstrate: Taking Apart 9 into 4 and 5 A • Demonstrate: Taking Apart 9 into 4 and 5 B • Demonstrate: 9s

Instructional Materials (cont.)

Material	Quantity	Description
Handouts	1 per student	• Timed Fact Practice 7 • Cumulative Review • Blank Multiplication Table (optional) • Taking Apart 9 into 4 and 5 • Practice 1 • Practice 2 • Independent Practice
Answer Keys	1 each	• Timed Fact Practice 7 • Cumulative Review • Practice 1 • Practice 2 • Independent Practice

Timed Fact Practice

Distribute the Timed Fact Practice 7 handout of the chosen set of facts: multiplication, division, or mixed. Remember to use the same set of facts throughout the module.

Say: *When I say, "begin," you will have one minute to complete the 20 multiplication/division/mixed facts. Start with the first one, going across the rows. If you make a mistake, cross out the wrong answer and write the correct answer next to it. When I say, "stop" or the timer goes off, put your pencil down.*

Say: *Ready? Begin.*

After the timer goes off, display the Timed Fact Practice 7 Answer Key and have students use a colored pencil or marker to check their work and write the number correct on the score line on the Facts Practice Graph.

Then have students graph the number correct. As the lessons go along, connect the new point with the previous lesson's point.

Cumulative Review

Have students answer the questions on the Cumulative Review handout. Go over the answers. Correct misconceptions. Have students use a colored pencil to make corrections as needed. Collect student papers to determine who needs additional instruction.

Preview

This lesson will build on students' conceptual knowledge of the easy facts, 3s, 4s, 7s, and 8s. In this lesson, students will apply the distributive property of multiplication over addition to find unknown facts (9s). Students will use the knowledge taught in this lesson to continue building fact fluency and to develop alternate strategies for determining unknown multiplication facts.

Display and introduce through a brief explanation of the key idea for this lesson:

- Unknown facts can be found by taking apart a known fact.

Use the Key Idea: 9s DM display master as needed.

Engage Prior/Informal Knowledge

To open the lesson, present questions to activate students' background knowledge related to the content to be taught in this lesson. Ask students questions such as:

TEACHER NOTE

Students may answer these questions by describing the sum. For example, to find 3 x 7, a student may say: Take apart 3 into 1 + 2. Find 1 x 7 and 2 x 7. Add these sums together to find 3 x 7. Some students may have difficulty adding two products. These students may require additional work with whole number computation.

- How can you find the answer to 3 x 7? ((1 x 7) + (2 x 7))
- How can you find the answer to 7 x 6? ((2 x 6) + (5 x 6))
- How can you find the answer to 3 x 5 by drawing a picture? (Draw a picture representing (1 x 5) + (2 x 5))
- In the equation 3 x 5 = 15, which number is the product? (15) Which numbers are the factors? (3 and 5)

If students cannot correctly answer these questions, stop and explicitly teach the material.

Demonstrate

1. Explain to students that this lesson will focus on a strategy for figuring out the answers to the 9s facts they do not already know.

> **Say:** *Today we are going to learn a way to solve problems with products that are multiples of 9. We are going to add 4 and 5 to solve the 9 facts.*

2. Review with students the 9s facts that they already know. Have them write the 9s facts on a piece of paper and answer the facts individually. Then, write the 9s facts on the board and call for answers. Have students write the number of facts they answered correctly at the top of their paper; circulate to review quickly. This quick exercise will provide information about how well students know these facts.

3. Display the Partially Completed Multiplication Table DM display master that is filled in with all of the facts explicitly taught in previous lessons.

Examine the table with the students to identify the facts that remain to be solved.

Explain that for those 9s facts that they do not know automatically, there are strategies for figuring out the answers.

4. Take apart 9 into 4 and 5.

Say: *For the 9s facts that I do not know automatically, I can take apart the 9. I want to find two facts I know automatically that add to 9. I automatically know the 4s and 5s, and 4 + 5 = 9 and 5 + 4 = 9, so I can take apart 9 into 4 and 5.*

Display the Take Apart 9 DM display master.

Draw attention to the ways an array with 9 rows or columns can be taken apart into 4 and 5. Relate the diagrams to the commutative property of multiplication (orientation changes) and the commutative property of addition (4 + 5 = 5 + 4).

5. Visually model taking apart an unknown fact (9) into known facts. 2

Display a 9 x 6 array. Use the 9 x 6 Array A DM display master as needed.

Say: *What multiplication problem is represented by the array? (9 x 6)*

Say: *If I do not automatically know this fact, I can take apart the unknown factors into known factors. I do not know my 9s, but I know my 4s and 5s. I can take apart 9 into 4 and 5.* 3

Display a 9 x 6 array with a line drawn so that a 4 x 6 and 5 x 6 array are shown. Use the 9 x 6 Array B DM display master as needed.

Say: *I am going to draw a line to take apart the 9. First, I want to find the part of the array that represents 9. In*

2 **TEACHER NOTE**
Some students may have problems with whole number computations. For those students, a mini-lesson on this skill may be necessary.

3 **TEACHER NOTE**
In this example, some students may say that they would solve the problem by taking apart the 6. Acknowledge that strategy as being another good way to approach this problem, but point out that for this lesson, we are taking apart the 9.

this example, there are 9 rows. I want to take apart the 9 rows so that on one side of the line there are 4 rows and on the other side there are 5 rows. The side with 4 rows represents 4 x 6 and the side with 5 rows represents 5 x 6.

Say: *The entire array represents 9 x 6, which is taken apart to represent 4 x 6 and 5 x 6.*

Display (4 x 6) and (5 x 6) next to the array they represent. Use the 9 x 6 Array C **DM** display master as needed.

Draw attention to the factor that changed (9 into 4 and 5) and did not change (6). As needed, think aloud to identify why 6 is the second factor.

Say: *Now I can write a new expression to show how the products can be added together to equal the original expression, 9 x 6.*

Display (4 x 6) + (5 x 6). Use the 9 x 6 Array D **DM** display master as needed.

Say: *The 9 was taken apart into 4 and 5. Now, to solve 9 x 6, I need to find the products of the parts of the new expression and then add them together. What is 4 x 6? (24) What is 5 x 6? (30) What is 24 + 30? (54) So, 9 x 6 = 54.*

Display the addition problem. Use the 9 x 6 Array E **DM** display master as needed.

Say: *9 x 6 is 9 rows of 6, which can be taken apart into 4 rows of 6 and 5 rows of 6.*

Relate the commutative property of multiplication to finding an unknown fact.

Say: *If I know 9 x 6, what other fact do I automatically know? (6 x 9)*

Display a 6 x 9 array. Use the 6 x 9 Array A **DM** display master as needed.

Say: *I can take apart this array in the same way I took apart the previous array. I will take apart 9 into 4 and 5. The 9 is in a different place in this example, so I am going to take it apart differently. There are 9 columns. I need to take*

apart the 9 columns into 4 columns and 5 columns by drawing a line.

Display the 6 x 9 array divided into an 6 x 4 and 6 x 5 array. Use the 6 x 9 Array B DM display master as needed.

Say: *Either way the array is shown, 6 x 9 or 9 x 6, I can solve the problem by taking apart the unknown factor, 9, into known factors, 4 and 5.*

6. Calculate the 9s facts by taking apart 9 into 4 and 5.

Distribute one copy of the Taking Apart 9 into 4 and 5 handout to each student. 4

As needed, explain to students that this handout has some characteristics of a multiplication table. One factor is shown in the left column, and the factors 4, 5, and 9 are shown on the top row. The column "4s + 5s" is to help students calculate the 9s by taking 9 apart into 4 + 5.

Have students complete the 4s, 5s and 9s facts that they know automatically.

Display the Taking Apart 9 into 4 and 5 A DM display master with the cells completed that students know automatically.

Think aloud as you take apart 9 to complete the 4s + 5s and 9s columns.

Display 4 + 5 in the first column of the 4s + 5s column.

Say: *4 + 5 = 9. 9 x 1 = 9. This verifies that this strategy, taking apart 9 into 4 and 5, works. If I already know the fact, then I do not need to take 9 apart.*

4 **TEACHER NOTE**

For more advanced students, you may want to use a multiplication table instead of the Taking Apart 9 into 4 and 5 handout, which is an adapted version of the multiplication table with additional scaffolding. Display 4 + 5 above the 9s column and to the left of the 9s row before performing the think aloud.

Repeat for each fact by selecting students to help complete the 9s column. Have students complete their table as you do. Use the Taking Apart 9 into 4 and 5 B DM display master as needed.

Practice

For each practice activity, provide detailed feedback to students, highlighting what was done correctly and what needs improvement. Provide opportunities for students to correct their errors. Collect student work to review and monitor student progress.

Activity 1: Help students complete the activity on the Practice 1 handout. Select a few students to verbalize their reasoning and each step in the process.

Activity 2: Have students work in pairs or small groups to complete the activity on the Practice 2 handout. Have students verbalize their reasoning and each step in the process to their partners.

Circulate to monitor student progress. Randomly stop, draw attention to a completed cell, and ask: How did you get this answer? If you know this fact, what other fact do you know? Why?

Example: Draw attention to the cell containing 9 x 12 on the Practice 21 handout. Listen for a student to explain that 9 can be taken apart into 4 + 5, so the products from 4 x 12 and 5 x 12 were added to solve 9 x 12 because the 9s facts can be found by taking apart the 9s facts into 4s facts plus the 5s facts. Listen for students to explain that if 9 x 12 is known, 12 x 9 is also known because of the commutative property of multiplication and watch for students to complete the row and column.

Display a completed multiplication table. Draw attention to the facts that were completed in this lesson on the multiplication table.

Display the way 9 was taken apart above the 9s column and to the left of the

9s row (4 + 5). Use the 9s DM display master as needed. Have students do the same on their multiplication table.

Independent Practice

1. Have students work independently to complete the activity on the Independent Practice handout.

2. Go over the answers (students self-check and correct, using a colored pencil).

3. Have students record the number correct in the box and complete their How Am I Doing? graph.

4. Collect the papers to review and monitor student progress.

Closure

Review the key idea. Have students provide examples from the lesson.

Have students discuss their answer to the following questions.

- Why does taking apart an unknown fact into two unknown facts help you find the solution?
- What are the similarities between the doubling and taking apart strategies?

Clear up any misconceptions. Students who believe the facts in rows and columns are not related need additional instruction.