Lesson 3

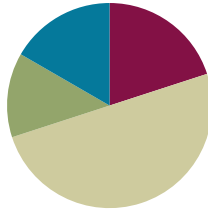## Objective: Multiply and divide with familiar facts using a letter to represent the unknown.

Related Topics: [More Lesson Plans for the Common Core Math](#)

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Application Problem	(8 minutes)
■ Concept Development	(30 minutes)
■ Student Debrief	(10 minutes)
Total Time	**(60 minutes)**

Fluency Practice (12 minutes)

- Familiar Facts **3.OA.4**   (5 minutes)
- Multiply Using the Distributive Property **3.OA.5**   (5 minutes)
- Make Tens **3.OA.5**   (2 minutes)

Familiar Facts (5 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews the relationship between multiplication and division from Module 1 in anticipation of their use in today's lesson.

> T: (Write $5 \times 3 =$ ____.) Say the multiplication sentence.
> S: $5 \times 3 = 15$.
> T: (Write $5 \times 3 = 15$. To the right, write $15 \div 3 =$ ____.) On your boards, write the division sentence.
> S: (Write $15 \div 3 = 5$.)

Repeat process for 4×3 and 7×2.

> T: (Write ____ $\times 2 = 10$.) Say the missing factor.
> S: 5.
> T: (Write $10 \div 2 =$ ____.) On your boards, write the division sentence.
> S: (Write $10 \div 2 = 5$.)

Repeat process for ____ $\times 3 = 6$ and ____ $\times 2 = 16$.

> T: (Write $20 =$ ____ $\times 10$.) Say the missing factor.
> S: 2.

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T: (Write 20 ÷ 10 = _____.) On your boards, write the division sentence.

S: (Write 20 ÷ 10 = 2.)

Repeat process for 18 = _____ × 3 and 45 = _____ × 5.

Multiply Using the Distributive Property (5 minutes)

Materials: (S) Personal white boards

Note: This fluency reviews the *n* + 1 strategy from Lesson 2.

T: (Project a 5 × 9 array, covering a sixth row of 9.) How many groups of 9 are there?

S: 5.

T: Let's find how many are in the array counting by fives. (Point as students count.)

S: 5, 10, 15, 20, 25, 30, 35, 40, 45.

T: Let's find how many are in the array counting by nines. (Point as students count.)

S: 9, 18, 27, 36, 45.

T: Write two multiplication sentences for this array.

S: (Write 9 × 5 = 45 and 5 × 9 = 45.)

T: (Reveal the sixth row of 9.) How many groups of 9 are there now?

S: 6.

T: Add 1 more group of 9 to 45. (Write 45 + 9 = ____.) On your boards, write the addition sentence.

S: (Write 45 + 9 = 54.)

T: On your boards, write two multiplication sentences for this array.

S: (Write 9 × 6 = 54 and 6 × 9 = 54.)

Continue with the following suggested sequence: 5 × 8 → 6 × 8, 5 × 7 → 6 × 7, and 5 × 6 → 6 × 6.

Make Tens (2 minutes)

Note: This fluency prepares students for the skip-counting strategies used to multiply units of 6 and 7 in Lessons 4 and 5.

T: I'll say a number between 0 and 10. You say the number that you add to it to make a ten. 9.

S: 1.

Continue with the following suggested sequence: 8, 7, 6, 5, 9, 1, 8, 2, 7, 3, 6, 4, 8, 4, 7, 3, 6, 1, 2, 5, 9.
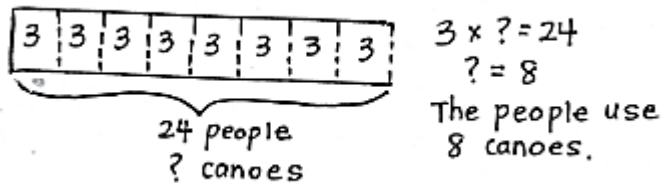
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Application Problem (8 minutes)

Twenty-four people line up to use the canoes at the park. Three people are assigned to each canoe. How many canoes are used?

Note: Students may choose to model either as division or as multiplication. In the Concept Development this problem provides a context for using a letter to represent the unknown.

> **NOTES ON MULTIPLE MEANS OF REPRESENTATION:**
>
> Challenge above grade level learners by adding complexity to the Application Problem.
>
> For example: Twenty-eight people lined up for canoes. Three people are assigned to each canoe. What are at least two possible solutions to make it possible for those people who don't make a threesome to go canoeing?

Concept Development (30 minutes)

Materials: (S) Personal white boards

Problem 1: Use a letter to represent the unknown in multiplication.

T: (Show a student's tape diagram and equation for the Application Problem, or example work above.) This is Student A's work on the Application Problem. What do the question marks in her work represent?

S: The unknown. → The number of canoes that are used.

T: We can use a letter to represent the unknown value instead of a question mark. For this problem, we might choose letter c to help us express that the unknown stands for how many *canoes* are used in the problem. How will using a letter to express the unknown value change the way we model and solve?

S: There will be c's where the question marks were on the tape diagram and in the equation. I don't think it changes the way you solve though.

T: Let's confirm your thinking. On your board, solve the Application Problem, this time using letter c to express the unknown on your model and in your equation. Solve, and then compare with your work on the Application Problem.

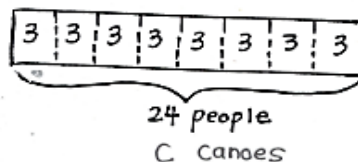S: (Solve and compare, possible work below.)

MP.4

> **NOTES ON MULTIPLE MEANS OF REPRESENTATION:**
>
> Clarify unknowns for English language learners and others by pre-teaching using a few simple equations with letters, such as $2 + 2 = h$; $h = 4$, or the Familiar Facts fluency in Lesson 4.

MP.4

T: In a complete sentence, what is the value of *c*?

S: The value of *c* is 8 canoes.

Problem 2: Use a letter to represent the unknown in division.

(Project or show the following problem: Twenty-one students are grouped in threes to go on a field trip. How many groups of students are there?)

T: Read the problem with your partner, then whisper what the unknown represents.

S: (Read problem.) The unknown represents the number of groups.

T: Before we solve, talk with your partner about which letter you might choose to express the unknown on your model and in your equation.

S: We could use *s* for students. → I think *n* will remind me we are looking for the number of groups. → *g* is best because it stands for *groups*.

T: Model the problem and write an equation to solve. Let's use the letter *g* to express the unknown.

S: (Students model and write $21 ÷ 3 = g$.)

T: In a complete sentence, tell the value of *g*.

S: The value of *g* is 7 groups.

Continue with the following suggested sequence to show unknowns in various positions:

- $24 = 4 × r$
- $5 = 50 ÷ m$
- $27 ÷ b = 3$
- $d ÷ 6 = 3$

Call attention to the way that you write the value of the unknown (e.g., $n = 14$ after finding it). Students should emulate this in their work.

Depending on time, extend the lesson by assigning each student (or pair of students) a letter of the alphabet. Task them with writing a simple word problem in which their assigned letter represents the unknown. They first solve their own problem, and then exchange with another student to solve a new one.

> **NOTES ON CHOOSING VARIABLES:**
>
> Point out that some letters may potentially be confused with other symbols. Letters *s*, o, *l*, *x, and t* respectively resemble 5, 0, 1, the multiplication symbol (×), and the addition symbol (+). Encourage students to use other letters if possible.

> **NOTES ON NUMBER CHOICES:**
>
> This lesson intentionally uses known facts from Module 1. Ideally students are fairly automatic with these facts so that focus stays on naming the unknown represented by the letter rather than the calculation.

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Problem Set (15 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes.

For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

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The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

You may choose to use any combination of the questions below to lead the discussion.

- ▪ Invite students to share the steps they took to model and solve Problem 4, the problem that likely posed the greatest challenge.
- ▪ Share student work for Problem 3 that shows different approaches (e.g., $4 \times p = 28$ and $28 \div 4 = p$). Discuss the thinking behind each approach to review division as both an *unknown factor* and *equal groups* problem.
- ▪ Why is using a letter to represent the unknown more helpful than using a question mark?

Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.

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Name _____ Date _____

1. Each equation contains a letter representing the unknown. Find the value of the unknowns, then write the letters that match the answers to solve the riddle.

$5 \times 4 = e$

e = _____

$21 \div 3 = \ell$

ℓ = _____

$24 \div i = 4$

i = _____

$21 = c \times 7$

c = _____

$32 = s \times 8$

s = _____

$t \div 10 = 7$

t = _____

$8 = 80 \div n$

n = _____

$4 = 36 \div k$

k = _____

$24 \div b = 12$

b = _____

$8 = a \div 3$

a = _____

h = _____

$35 = 7 \times h$

Which tables do you NOT have to learn?

____ ____ ____ ____ ____ ____ ____   ____ ____ ____ ____ ____ ____
  9   6   70   3   5   20   10   70   24   2   7   20   4

2. Lonna buys 3 t-shirts for $8 each.

   a. What is the total amount Lonna spends on 3 t-shirts? Use the letter *m* to represent the total amount Lonna spends, and then solve the problem.

   b. If Lonna hands the cashier 3 ten dollar bills, how much change will she receive? Use the letter *c* to represent the change in an equation, and then find the value of *c*.

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3. Miss Potts used a total of 28 cups of flour to bake some bread. She put 4 cups of flour in each pan. How many pans of bread did she bake? Represent the problem using multiplication and division sentences and a letter for the unknown. Then, solve the problem.

   _____ × _____ = _____

   _____ ÷ _____ = _____

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4. At a table tennis tournament, two games went on for a total of 32 minutes. One game took 12 minutes longer than the other. How long did it take to complete each game? Use letters to represent the unknowns. Solve the problem.

   CHALLENGE!

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Name _____   Date _____

Find the value of the unknown in Problems 1–4.

1. $z = 5 \times 9$

    $z =$ _____

2. $30 \div 6 = v$

    $v =$ _____

3. $8 \times w = 24$

    $w =$ _____

4. $y \div 4 = 7$

    $y =$ _____

5. Mr. Strand waters his rose bushes for a total of 15 minutes. He waters each rose bush for 3 minutes. How many rose bushes does Mr. Strand water? Represent the problem using multiplication and division sentences and a letter for the unknown. Then, solve the problem.
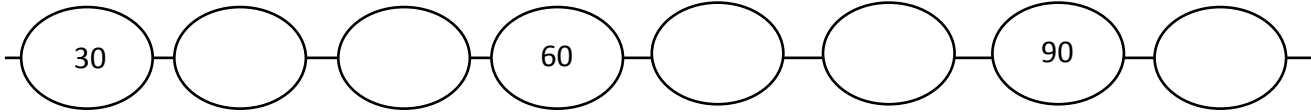
    _____ × _____ = _____

    _____ ÷ _____ = _____

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Name _____   Date _____

1. a. Complete the pattern.

○ 30 ─ ○ ─ ○ ─ ○ 60 ─ ○ ─ ○ ─ ○ 90 ─ ○ ─

   b. Find the value of the unknown.

   $10 \times 2 = d$ d = __20__ $10 \times 6 = w$ w = _____

   $3 \times 10 = e$ e = _____ $10 \times 7 = n$ n = _____

   $f = 4 \times 10$ f = _____ $g = 8 \times 10$ g = _____

   $p = 5 \times 10$ p= _____

2. Each equation contains a letter representing the unknown. Find the value of the unknown.

$8 \div 2 = n$	n = _____
$3 \times a = 12$	a = _____
$p \times 8 = 40$	p = _____
$18 \div 6 = c$	c = _____
$d \times 4 = 24$	d = _____
$h \div 7 = 5$	h = _____
$6 \times 3 = f$	f = _____
$32 \div y = 4$	y = _____

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3. Pedro buys 4 books at the fair for $7 each.

   a. What is the total amount Pedro spends on 4 books? Use the letter *b* to represent the total amount Pedro spends, and then solve the problem.

   b. Pedro hands the cashier 3 ten dollar bills. How much change will he receive? Write an equation to solve. Use the letter *c* to represent the unknown.

4. On field day, the first grade dash is 25 meters long. The third grade dash is twice the distance of the first grade dash. How long is the third grade dash? Use a letter to represent the unknown and solve.