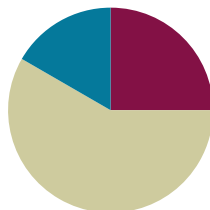# Lesson 11

Objective: Interpret the unknown in multiplication and division to model and solve problems.

Related Topics: More Lesson Plans for the Common Core Math

Suggested Lesson Structure

■ Fluency Practice   (15 minutes)

  Concept Development   (35 minutes)

■ Student Debrief   (10 minutes)

  Total Time   **(60 minutes)**

Fluency Practice (15 minutes)

▪ Multiply by 8 **3.OA.7**   (7 minutes)

▪ Group Counting **3.OA.1**   (4 minutes)

▪ Decompose the Multiplication Sentence **3.OA.5**   (4 minutes)

Multiply by 8 (7 minutes)

Materials: (S) Multiply by 8 Pattern Sheet (1–5)

Note: This activity builds fluency with multiplication facts using units of 8. It works toward students knowing from memory all products of two one-digit numbers. See G3–M3–Lesson 5 for the directions for administration of Multiply By Pattern Sheet.

T: (Write $8 \times 5 =$ _____.) Let's skip-count by eights to find the answer. I'll raise a finger for each eight. (Count with fingers to 5 as students count.)

S: 8, 16, 24, 32, 40.

T: (Circle 40 and write $8 \times 5 = 40$ above it. Write $8 \times 3 =$ _____.) Let's skip-count up by eight again. (Count with fingers to 3 as students count.)

S: 8, 16, 24.

T: Let's see how we can skip-count down to find the answer, too. Start at 40 with 5 fingers, 1 for each eight. (Count down with your fingers as students say numbers.)

S: 40 (5 fingers), 32 (4 fingers), 24 (3 fingers).

Repeat the process for 8×4.

T: (Distribute the Multiply by 8 Pattern Sheet.) Let's practice multiplying by 8. Be sure to work left to right across the page.

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Group Counting (4 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition. Counting by sixes and sevens reviews multiplication using those units in Topic B. Group counting nines anticipates multiplication in the next topic. Direct students to count forward and backward, occasionally changing the direction of the count.

- Sixes to 60
- Sevens to 70
- Nines to 90

Decompose the Multiplication Sentence (4 minutes)

Materials: (S) Personal white boards

Note: This activity reviews multiplying using the distributive property from G3–M3–Lesson 10.

T: (Write $8 \times 8 = (5 + \underline{}) \times 8$.) On your boards, write out and complete the equation.

S: (Write $8 \times 8 = (5 + 3) \times 8$.)

T: (Write $= (\underline{} \times 8) + (\underline{} \times 8)$.) Write out and complete the equation.

S: (Write $(5 \times 8) + (3 \times 8)$.)

T: Solve the multiplication and write an addition sentence. Below it, write your answer.

S: (Write $40 + 24$ and 64 below it.)

8×8	$= (5 + 3) \times 8$
	$= (5 \times 8) + (3 \times 8)$
	$= 40 + 24$
	$= 64$

Continue with the following suggested sequence: 7×8, 6×8, and 9×8.

Concept Development (35 minutes)

Materials: (S) Personal white boards

Problem 1: Interpret the unknown in multiplication.

Write the following problem: Asmir buys 8 boxes of 9 candles for his dad's birthday. After putting some candles on the cake, there are 28 candles left. How many candles does Asmir use?
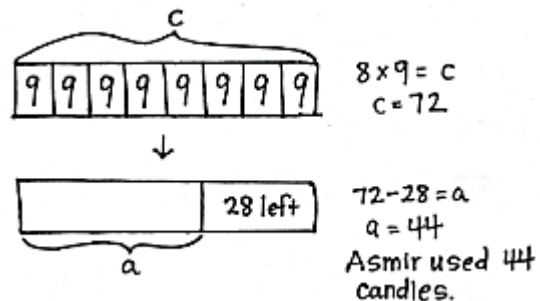
T: Model the problem. Then tell your partner the steps you'll need to take to solve.

S: (Model.) First you have to find out how many candles Asmir has. → After that you could subtract 28 from the total to see how many he used.
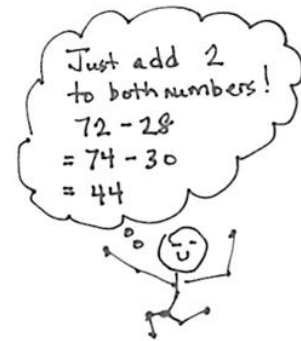
T: Write an equation to find the total number of candles. Instead of using a question mark, use letter *c* to represent the unknown.

T: Read your equation out loud.

S: 8 times 9 equals *c*.

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T: What does *c* represent?

S: The product. → The total number of candles.

T: Choose a strategy and find the value of *c*. (Possible strategies: known from memory, skip-count, distributive property, associative property.)

T: Use a complete sentence to tell what *c* equals.

S: *c* equals 72. → He bought 72 candles.

T: Did we solve the problem?

S: No, we have to find how many candles Asmir uses.

T: Solve the second step of the problem, this time using letter *a* to represent the unknown.

S: 72 − 28 = *a*.

T: Find the value of *a*. This is a good problem to practice your mental math strategies. (Allow time for solving.) What is the value of *a*?

S: 44 candles.

T: Answer the question in a complete sentence.

S: Asmir uses 44 candles.

Problem 2: Interpret the unknown in division.

Write the following problem: The fabric store sells 1 meter of cloth for $8. Maria buys some cloth that costs a total of $56. She then uses 3 meters to sew a dress. How many meters of cloth does she have left?

T: Draw a model to represent the problem. Choose letters to represent the unknowns.

T: What is unknown in this problem?

S: The total meters of cloth Maria buys → There's something else too. We don't know how many meters of cloth Maria has left.

T: Tell your partner why you need to know how many meters of cloth Maria buys.

S: First you have to find out how many meters of cloth Maria buys. → After that you could subtract 3 meters from the total to see how many meters she has left.

T: What will be your first step to solving this problem?

S: Finding the total meters of cloth Maria buys.

T: Whisper to your partner how you'll do that, then write an equation using a letter for the unknown.

S: I'm going to do the total cost divided by the cost of 1 meter of fabric. So, $56 ÷ $8 = *t*.

T: Tell your partner why you picked the letter you used to represent the unknown. How does it relate to the problem?
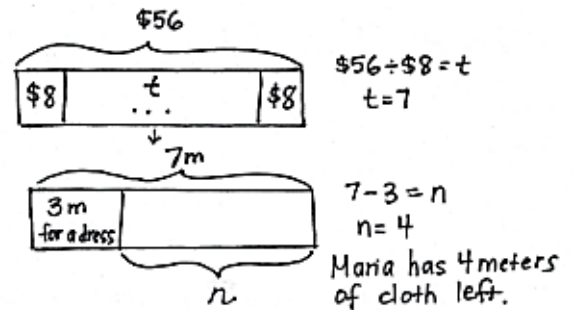
> **NOTES ON MULTIPLE MEANS FOR ACTION AND EXPRESSION:**
>
> Many learners will benefit from this step-by-step guidance from planning a strategy to finding a solution.
>
> Students above grade level and others may be motivated by more choice and autonomy. In addition, welcome various strategies, plans for solving, and modeling.

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S: (Possible response: I chose letter *t* to stand for the *total* meters of cloth Maria buys.)

T: Whisper what *t* equals.

S: (Possible response: *t* equals 7 meters.)

T: Tell your partner your next step for solving. Then, write an equation using a letter for the unknown.

S: Now that I know that Maria bought a total of 7 meters, I'll do $7 - 3 = n$. Letter *n* stands for the *number* of meters she has left.

T: Is your letter the same as the one you used for the first step? Why or why not?

S: It's different because it represents something different. → Oh yeah, I need to change mine!

T: Finish solving, and then answer the question using words.

S: (Solve to find *n* is 4 meters. Write: Maria has 4 meters of cloth left.)

T: Does Maria have enough cloth to sew another dress? Why or why not?

S: Yes, she has 4 meters left and she only needs 3 meters. → So, even after making a second dress, she will still have 1 meter of cloth left.

> **NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**
>
> Students working above grade level and others may want to omit the tape diagram as they mentally solve the first few problems of the Problem Set. Redirect their focus to the accurate labeling of the unknown. After accurately labeling their tape diagrams, ask students to erase the values and experiment with numbers they choose.

Problem Set (10 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.

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Student Debrief (10 minutes)

Lesson Objective: Interpret the unknown in multiplication and division to model and solve problems.

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.

- In Problem 1, did you need to solve to find the number of groups or the number of items in each group?
- What equations can be used to solve Problem 1?
- In Problem 4, how many parts did each pack need to be split into in order for each boy to get 1 part? (Two equal parts.) Could we use that fact to solve the problem without first finding the total number of cards?
- Problems 4–6 are multiple-step problems. Why is it useful to use different letters to represent two unknowns in the same problem?

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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Multiply.

8 x 1 = _____   8 x 2 = _____   8 x 3 = _____   8 x 4 = _____

8 x 5 = _____   8 x 1 = _____   8 x 2 = _____   8 x 1 = _____

8 x 3 = _____   8 x 1 = _____   8 x 4 = _____   8 x 1 = _____

8 x 5 = _____   8 x 1 = _____   8 x 2 = _____   8 x 3 = _____

8 x 2 = _____   8 x 4 = _____   8 x 2 = _____   8 x 5 = _____

8 x 2 = _____   8 x 1 = _____   8 x 2 = _____   8 x 3 = _____

8 x 1 = _____   8 x 3 = _____   8 x 2 = _____   8 x 3 = _____

8 x 4 = _____   8 x 3 = _____   8 x 5 = _____   8 x 3 = _____

8 x 4 = _____   8 x 1 = _____   8 x 4 = _____   8 x 2 = _____

8 x 4 = _____   8 x 3 = _____   8 x 4 = _____   8 x 5 = _____

8 x 4 = _____   8 x 5 = _____   8 x 1 = _____   8 x 5 = _____

8 x 2 = _____   8 x 5 = _____   8 x 3 = _____   8 x 5 = _____

8 x 4 = _____   8 x 2 = _____   8 x 4 = _____   8 x 3 = _____

8 x 5 = _____   8 x 3 = _____   8 x 2 = _____   8 x 4 = _____

8 x 3 = _____   8 x 5 = _____   8 x 2 = _____   8 x 4 = _____

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3.C.41

Name _____   Date _____

1. Ms. Santor divides 32 students into 8 equal groups for a field trip. Draw a tape diagram and label the number of students in each group as *n*. Write an equation and solve for *n*.

2. Tara buys 6 packs of printer paper. Each pack of paper costs $8. Draw a tape diagram and label the total amount she spends as *m*. Write an equation and solve for *m*.

3. Mr. Reed spends $24 on coffee beans. How many kilograms of coffee beans does he buy? Draw a tape diagram and label the total amount of coffee beans he buys as *c*. Write an equation and solve for *c*.

$8 for 1 kg

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4. Eight boys equally share 4 packs of baseball cards. Each pack contains 10 cards. How many cards does each boy get?

5. There are 8 bags of yellow and green balloons. Each bag contains 7 balloons. If there are 35 yellow balloons, how many green balloons are there?

6. The fruit seller packs 72 oranges into bags of 8 each. He sells all the oranges at $4 a bag. How much money did he receive?

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3.C.43

Name _____   Date _____

1. Erica buys some packs of rubber bracelets. There are 8 bracelets in each pack.

    a. How many packs of rubber bracelets does she buy if she has a total of 56 bracelets? Draw a tape diagram and label the total number of packages as *p*. Write an equation and solve for *p*.

    b. After giving some bracelets away, Erica has 18 bracelets left. How many did she give away?

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Name _____   Date _____

1. Jenny bakes 10 cookies. She puts 7 chocolate chips on each cookie. Draw a tape diagram and label the total of amount of chocolate chips as *c*. Write an equation and solve for *c*.

2. Mr. Lopez arranges 48 dry erase markers into 8 equal groups for his math stations. Draw a tape diagram and label the number of dry erase markers in each group as *v*. Write an equation and solve for *v*.

3. There are 35 computers in the lab. Five students each turn off an equal number of computers. How many computers does each student turn off? Label the unknown as *m*, then solve.

4. There are 9 bins of books. Each bin has 6 comic books. How many comic books are there altogether?

5. There are 8 trail mix bags in one box. Clarissa buys 5 boxes. She gives an equal number of bags of trail mix to 4 friends. How many bags of trail mix does each friend receive?

6. Leo earns $8 a week for doing chores. After 7 weeks, he buys a gift and has $38 left. How much does he spend on the gift?