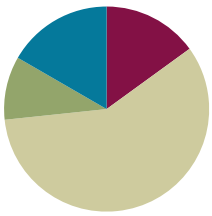
Lesson 6

Objective: Interpret the unknown in division using the array model.

Related Topics: More Lesson Plans for the Common Core Math

Suggested Lesson Structure

Fluency Practice	(9 minutes)
Application Problem	(6 minutes)
Concept Development	(35 minutes)
Student Debrief	(10 minutes)
Total Time	**(60 minutes)**



Fluency Practice (9 minutes)

- Group Counting **3.OA.1** (4 minutes)
- Divide Equal Groups **3.OA.2** (5 minutes)

Group Counting (4 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition. Counting by twos and threes in this activity supports work with those factors in Topic B.

T: Let's count by twos. (Direct students to count forward and backward to 20, emphasizing the 8 to 10, 10 to 12, and 18 to 20 transitions.)

T: Let's count by threes. (Direct students to count forward and backward to 30, periodically changing directions. Emphasize the 9 to 12, 18 to 21, and 27 to 30 transitions.)

Divide Equal Groups (5 minutes)

Materials: (S) Personal white boards

Note: Students directly relate repeated addition to division. They interpret the unknown in division. This activity bridges Lessons 5 and 6.

T: (Project an array with 3 groups of 5 circled.) Say the total as a repeated addition sentence.

S: 5 + 5 + 5 = 15.

T: Write a division sentence for 15 divided into 3 equal groups.

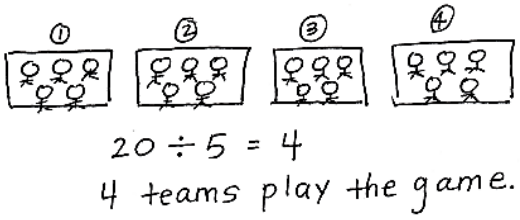
S: (Write 15 ÷ 3 = 5.)

Continue with possible sequence: 5 groups of 3, 4 groups of 3, 3 groups of 4, 9 groups of 2, and 2 groups of 9.

Alternate between students writing division sentences where the quotient represents either the number of objects in a group or the number of groups.

Application Problem (6 minutes)

20 children play a game. There are 5 children on each team. How many teams play the game? Write a division sentence to represent the problem.



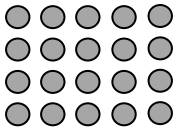
Note: This problem reviews division from Lesson 5 where the unknown represents the number of groups. It also leads into problem 1 of today's lesson as it relates division to the array model.

Concept Development (35 minutes)

Materials: (S) Personal white boards, application problem

Problem 1: Relate division to an array model.

T: (Draw an array representing the application problem.)



Have students analyze the array and describe the following relationships:

- Total number of children and total number of dots
- Number of children on each team and number of dots in each row
- Number of teams and number of rows

Repeat the process with the following suggested examples. This time guide students to draw the array from the division sentences below. Alternate between having the quotient represent the size of the groups and the number of groups.

- 8 ÷ 2 = 4
- 18 ÷ 6 = 3

NOTES TO THE TEACHER ON ARRAYS:

Problem 1 in this lesson introduces students to relating division to an array model for the first time. In Lesson 2, students relate the rows in an array to the number of equal groups and the number of dots in each row to the size the group. The same concept applies for division arrays, but now the problems begin with the total number.

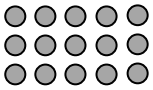
NOTES ON MULTIPLE MEANS OF REPRESENATION:

Some students may benefit from working with a partner. They may underline each row to literally show division and circle each row to show the size of each group. They should explain each step they take. This may be particularly helpful for children who prefer visual or kinesthetic practice along with auditory.

Problem 2: Use an array to relate the unknown factor in multiplication to the quotient in division.

T: Draw an array that shows the division sentence 15 ÷ 3 = 5, where the **quotient**—that means the answer—represents the size of the groups.

S: (Draw array below.)



T: Now write both a division and a multiplication sentence for the array.

S: (Write 15 ÷ 3 = 5, 3 × 5 = 15.)

T: Where do you find the quotient in our multiplication sentence?

S: It's the second number. → It's the size of the groups. → It's a factor.

T: Circle the size of the groups in both problems.

S: (Circle the 5 in both problems.)

Repeat the process with the following suggested examples. Alternate between having the quotient represent the size of the groups and the number of groups.

- 4 rows of 2
- 7 rows of 3

T: Use our equations to explain to your partner how the factors in a multiplication problem can help you find the quotient in division.

Problem 3: Relate multiplication and division.

T: (Write ___ × 3 = 24 on the board.) Skip-count and track the number of threes to solve.

S: 3, 6, 9, 12, 15, 18, 21, 24. (Write 8 to complete the equation.)

T: How many threes make 24? Answer in a complete sentence.

S: 8 threes make 24.

T: Write a related division sentence where the quotient represents the unknown factor.

S: (Write 24 ÷ 3 = 8.)

T: 24 divided into threes makes how many groups? Answer in a complete sentence.

S: 24 divided into threes makes 8 groups.

T: How are the unknown factor and the quotient related in these equations?

S: The unknown factor represents the same as the quotient.

NOTES ON MULTIPLE MEANS FOR ENGAGEMENT:

Some students may still benefit from the visual of an array in this problem. If necessary, encourage your students to scaffold themselves by drawing it.

Repeat the process with the following suggested examples:

- 2 × ____ = 18 and 18 ÷ 2 = ____
- ____ × 9 = 27 and 27 ÷ 9 = ____

T: (Write __ × 3 = 24 and 24 ÷ 3 = __.) True or false: Both equations ask "How many threes are in 24?"

S: They look different, but they mean the same thing. In both we're talking about 8 groups of 3 and a total of 24. So it's true. → The quotient in a division problem is like finding the unknown factor in a multiplication problem.

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.

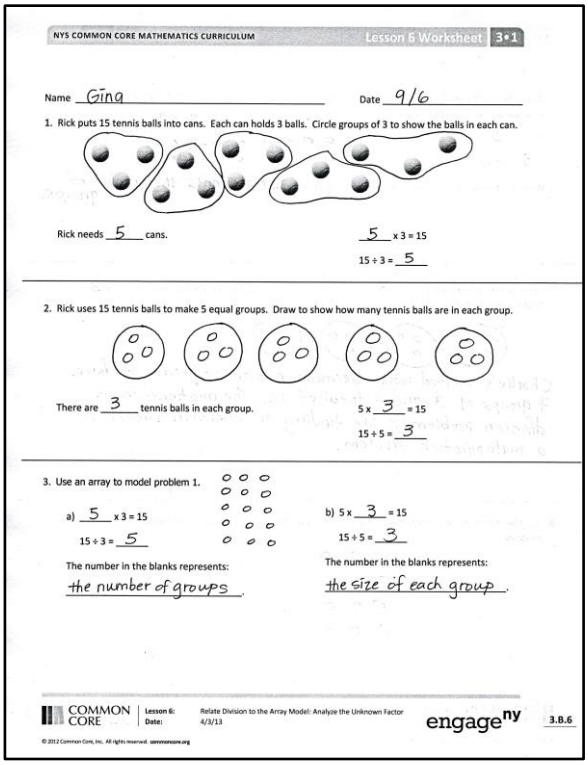
Student Debrief (10 minutes)

Lesson Objective: Interpret the unknown in division using the array model.

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 ideas below to lead the discussion.

- Analyze the 4 number sentences in Problem 3. Compare the multiplication and division sentences, noticing differences in how the problem is represented by each one.


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Worksheet 3•1

Name Gina Date 9/6

1. Rick puts 15 tennis balls into cans. Each can holds 3 balls. Circle groups of 3 to show the balls in each can.

Rick needs 5 cans.

5 x 3 = 15
15 ÷ 3 = 5

2. Rick uses 15 tennis balls to make 5 equal groups. Draw to show how many tennis balls are in each group.

There are 3 tennis balls in each group.

5 x 3 = 15
15 ÷ 5 = 3

3. Use an array to model problem 1.

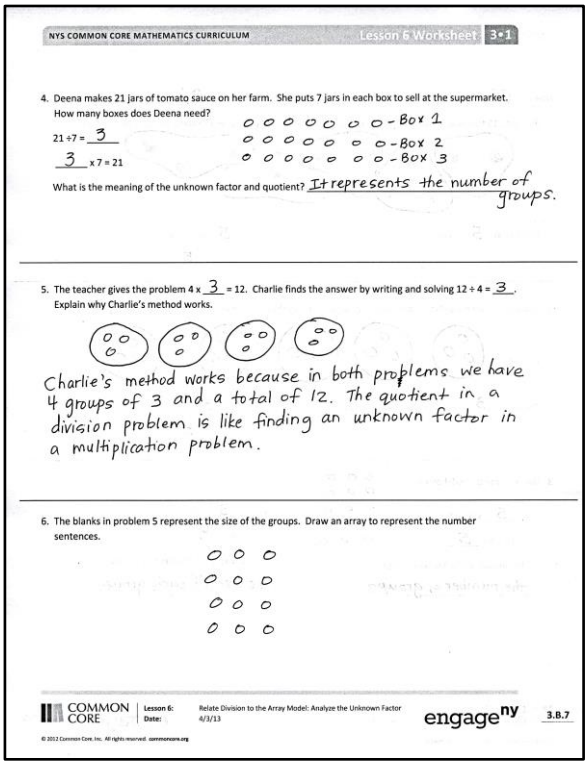
a) 5 x 3 = 15
15 ÷ 3 = 5

The number in the blanks represents: the number of groups.

b) 5 x 3 = 15
15 ÷ 5 = 3

The number in the blanks represents: the size of each group.

COMMON CORE Lesson 6: Date: Relate Division to the Array Model: Analyze the Unknown Factor 4/3/13 engage^ny 3.B.6


NYS COMMON CORE MATHEMATICS CURRICULUM Lesson 6 Worksheet 3•1

4. Deena makes 21 jars of tomato sauce on her farm. She puts 7 jars in each box to sell at the supermarket. How many boxes does Deena need?

21 ÷ 7 = 3
3 x 7 = 21

Box 1
Box 2
Box 3

What is the meaning of the unknown factor and quotient? It represents the number of groups.

5. The teacher gives the problem 4 x 3 = 12. Charlie finds the answer by writing and solving 12 ÷ 4 = 3. Explain why Charlie's method works.

Charlie's method works because in both problems we have 4 groups of 3 and a total of 12. The quotient in a division problem is like finding an unknown factor in a multiplication problem.

6. The blanks in problem 5 represent the size of the groups. Draw an array to represent the number sentences.

COMMON CORE Lesson 6: Date: Relate Division to the Array Model: Analyze the Unknown Factor 4/3/13 engage^ny 3.B.7

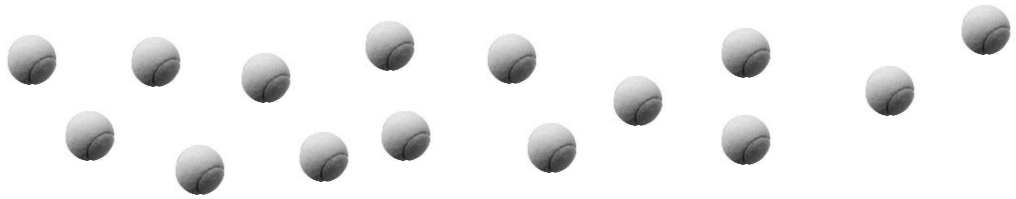
- How do arrays represent both multiplication and division?
- Based on your observation of arrays, what do multiplication and division have in common?
- What is the relationship between the **quotient** in division and the unknown factor in a related multiplication sentence?

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.

Name _____ Date _____

1. Rick puts 15 tennis balls into cans. Each can holds 3 balls. Circle groups of 3 to show the balls in each can.



Rick needs _____ cans.

_____ × 3 = 15

15 ÷ 3 = _____

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2. Rick uses 15 tennis balls to make 5 equal groups. Draw to show how many tennis balls are in each group.

There are _____ tennis balls in each group.

5 × _____ = 15

15 ÷ 5 = _____

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3. Use an array to model Problem 1.

a) _____ × 3 = 15

15 ÷ 3 = _____

The number in the blanks represents:

_____.

b) 5 × _____ = 15

15 ÷ 5 = _____

The number in the blanks represents:

_____.

4. Deena makes 21 jars of tomato sauce on her farm. She puts 7 jars in each box to sell at the supermarket. How many boxes does Deena need?

21 ÷7 = _____

_____ × 7 = 21

What is the meaning of the unknown factor and quotient? _____

5. The teacher gives the problem 4 × ____ = 12. Charlie finds the answer by writing and solving 12 ÷ 4 = ____. Explain why Charlie's method works.

6. The blanks in Problem 5 represent the size of the groups. Draw an array to represent the number sentences.

Name _____ Date _____

1. Cesar arranges 12 notecards into rows of 6 for his presentation. Draw an array to represent the problem.

12 ÷ 6 = _____

_____ × 6 = 12

What do the unknown factor and quotient represent? _____

Name _____ Date _____

1. Mr. Hannigan puts 12 pencils into boxes. Each box holds 4 pencils. Circle groups of 4 to show the pencils in each box.

Mr. Hannigan needs _____ boxes.

_____ × 4 = 12

12 ÷ 4 = _____

2. Mr. Hannigan places 12 pencils into 3 equal groups. Draw to show how many pencils are in each group.

There are _____ pencils in each group.

3 × _____ = 12

12 ÷ 3 = _____

3. Use an array to model Problem 1.

a) _____ × 4 = 12

12 ÷ 4 = _____

The number in the blanks represents:

_____.

b) 3 × _____ = 12

12 ÷ 3 = _____

The number in the blanks represents:

_____.

4. Judy washes 24 dishes. She then dries and stacks the dishes equally into 4 piles. How many dishes are in each pile?

   24 ÷ 4 = _____

   4 × _____ = 24

   What is the meaning of the unknown factor and quotient? _____

5. Nate solves the problem _____ × 5 = 15 by writing and solving 15 ÷ 5 = ____. Explain why Nate's method works.

6. The blanks in Problem 5 represent the number of groups. Draw an array to represent the number sentences.