



## Topic D

# Multiplication and Division Using Units of 9

3.OA.3, 3.OA.4, 3.OA.5, 3.OA.7, 3.OA.9, 3.OA.1, 3.OA.2, 3.OA.6

|                               |                   |   |   |
|-------------------------------|-------------------|---|---|
| <b>Focus Standards:</b>       | 3.OA.3            | Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.  |   |
|                               | 3.OA.4            | Determine the unknown whole number in a multiplication or division equation relating three whole numbers. <i>For example, determine the unknown number that makes the equation true in each of the equations <math>8 \times ? = 48</math>, <math>5 = \_ \div 3</math>, <math>6 \times 6 = ?</math></i>  |   |
|                               | 3.OA.5            | Apply properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.) <i>Examples: If <math>6 \times 4 = 24</math> is known, then <math>4 \times 6 = 24</math> is also known. (Commutative property of multiplication.) <math>3 \times 5 \times 2</math> can be found by <math>3 \times 5 = 15</math>, then <math>15 \times 2 = 30</math>, or by <math>5 \times 2 = 10</math>, then <math>3 \times 10 = 30</math>. (Associative property of multiplication.) Knowing that <math>8 \times 5 = 40</math> and <math>8 \times 2 = 16</math>, one can find <math>8 \times 7</math> as <math>8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56</math>. (Distributive property.)</i> |   |
|                               | 3.OA.7            | Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$ , one knows $40 \div 5 = 8$ ) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.  |   |
|                               | 3.OA.9            | Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i>  |   |
| <b>Instructional Days:</b>    | 4                 |   |   |
| <b>Coherence -Links from:</b> | G2–M3             | Place Value, Counting, and Comparison of Numbers to 1,000   |   |
|                               | G2–M6             | Foundations of Multiplication and Division  |   |
|                               | G3–M1             | Properties of Multiplication and Division and Solving Problems with Units of 2–5 and 10   |   |
|                               | <b>-Links to:</b> | G3–M4   | Multiplication and Area                 |
|                               |                   | G4–M3   | Multi-Digit Multiplication and Division |
|                               | G4–M5             | Fraction Equivalence, Ordering, and Operations  |   |
|                               | G4–M7             | Exploring Measurement with Multiplication   |   |

In Lesson 12, students use the distributive property to establish the  $9 = 10 - 1$  pattern for multiplication. Conceptual understanding of the pattern enables students to see this method of multiplication as a tool rather than a trick. This lesson lays the foundation for exploring other patterns that emerge with multiplication using units of 9 in the subsequent lessons.

Lessons 13 and 14 focus on the study of patterns as they relate to the fact  $9 = 10 - 1$ . Students discover that the tens digit in the product of a nines fact is 1 less than the multiplier and that the ones digit in the product is 10 minus the multiplier. For example,  $9 \times 3 = 27$ ,  $2 = 3 - 1$ , and  $7 = 10 - 3$ . They also see that the digits of the nines facts' products produce a sum of 9, as in the example above ( $2 + 7 = 9$ ).

Lesson 15 parallels the final lessons of Topics B and C. Students analyze multiplication and division problems using units of 9, drawing models, and writing equations using a letter to represent the unknown. These lessons are intended to provide students with continuous experience relating three numbers to find the unknown, as well as to deepen their understanding of the relationship between multiplication and division.

### A Teaching Sequence Toward Mastery of Multiplication and Division Using Units of 9

**Objective 1: Apply the distributive property and the fact  $9 = 10 - 1$  as a strategy to multiply.**  
(Lesson 12)

**Objective 2: Identify and use arithmetic patterns to multiply.**  
(Lessons 13–14)

**Objective 3: Interpret the unknown in multiplication and division to model and solve problems.**  
(Lesson 15)