**Session Three: Division of Whole Numbers**

**Common Core Standards Addressed**

#### Division is advanced for Grades 1 and 2. Students at this level should refine their addition and subtraction skills to prepare them for the division operation.

#### Grade 3

#### Represent and solve problems involving multiplication and division.

[CCSS.Math.Content.3.OA.A.1](http://www.corestandards.org/Math/Content/3/OA/A/1/)  
Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7*.

[CCSS.Math.Content.3.OA.A.2](http://www.corestandards.org/Math/Content/3/OA/A/2/)  
Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8*.

[CCSS.Math.Content.3.OA.A.3](http://www.corestandards.org/Math/Content/3/OA/A/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.1

[CCSS.Math.Content.3.OA.A.4](http://www.corestandards.org/Math/Content/3/OA/A/4/)  
Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = \_ ÷ 3, 6 × 6 = ?*

#### Understand properties of multiplication and the relationship between multiplication and division.

[CCSS.Math.Content.3.OA.B.5](http://www.corestandards.org/Math/Content/3/OA/B/5/)  
Apply properties of operations as strategies to multiply and divide.2 *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

[CCSS.Math.Content.3.OA.B.6](http://www.corestandards.org/Math/Content/3/OA/B/6/)  
Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8*.

#### Multiply and divide within 100.

[CCSS.Math.Content.3.OA.C.7](http://www.corestandards.org/Math/Content/3/OA/C/7/)  
Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

#### Solve problems involving the four operations, and identify and explain patterns in arithmetic.

[CCSS.Math.Content.3.OA.D.8](http://www.corestandards.org/Math/Content/3/OA/D/8/)  
Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.3

[CCSS.Math.Content.3.OA.D.9](http://www.corestandards.org/Math/Content/3/OA/D/9/)  
Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *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*.

#### Grade 4

#### Use the four operations with whole numbers to solve problems.

[CCSS.Math.Content.4.OA.A.1](http://www.corestandards.org/Math/Content/4/OA/A/1/)  
Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

[CCSS.Math.Content.4.OA.A.2](http://www.corestandards.org/Math/Content/4/OA/A/2/)  
Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.1

[CCSS.Math.Content.4.OA.A.3](http://www.corestandards.org/Math/Content/4/OA/A/3/)  
Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

#### Gain familiarity with factors and multiples.

[CCSS.Math.Content.4.OA.B.4](http://www.corestandards.org/Math/Content/4/OA/B/4/)  
Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

#### Generate and analyze patterns.

[CCSS.Math.Content.4.OA.C.5](http://www.corestandards.org/Math/Content/4/OA/C/5/)  
Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way*.

#### Grade 5

#### Write and interpret numerical expressions.

[CCSS.Math.Content.5.OA.A.1](http://www.corestandards.org/Math/Content/5/OA/A/1/)  
Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

[CCSS.Math.Content.5.OA.A.2](http://www.corestandards.org/Math/Content/5/OA/A/2/)  
Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product*.

#### Grades 6

#### Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

[CCSS.Math.Content.6.NS.A.1](http://www.corestandards.org/Math/Content/6/NS/A/1/)  
Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*.

#### Compute fluently with multi-digit numbers and find common factors and multiples.

[CCSS.Math.Content.6.NS.B.2](http://www.corestandards.org/Math/Content/6/NS/B/2/)  
Fluently divide multi-digit numbers using the standard algorithm.

[CCSS.Math.Content.6.NS.B.3](http://www.corestandards.org/Math/Content/6/NS/B/3/)  
Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

[CCSS.Math.Content.6.NS.B.4](http://www.corestandards.org/Math/Content/6/NS/B/4/)  
Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*.

#### Grade 7

[CCSS.Math.Content.7.NS.A.2.a](http://www.corestandards.org/Math/Content/7/NS/A/2/a/)  
Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

[CCSS.Math.Content.7.NS.A.2.b](http://www.corestandards.org/Math/Content/7/NS/A/2/b/)  
Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then -(*p*/*q*) = (-*p*)/*q* = *p*/(-*q*). Interpret quotients of rational numbers by describing real-world contexts.

[CCSS.Math.Content.7.NS.A.2.c](http://www.corestandards.org/Math/Content/7/NS/A/2/c/)  
Apply properties of operations as strategies to multiply and divide rational numbers.

[CCSS.Math.Content.7.NS.A.2.d](http://www.corestandards.org/Math/Content/7/NS/A/2/d/)  
Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

[CCSS.Math.Content.7.NS.A.3](http://www.corestandards.org/Math/Content/7/NS/A/3/)  
Solve real-world and mathematical problems involving the four operations with rational numbers.1

#### Students Grade 8 should demonstrate mastery of the skills presented in this session.