Lake Washington School District
Teaching and Learning Framework

Fourth Grade Mathematics

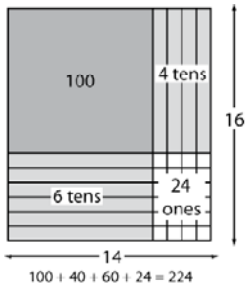
Power Standards | 2009-2010

Core Content: Multi-digit Multiplication

(Numbers, Operations, Algebra)

PS 1: Students multiply two- and three-digit numbers efficiently and accurately.
PS 2: Students recall multiplication facts through 10 x 10 and the related division facts.

Students learn basic multiplication facts and efficient procedures for multiplying two- and three-digit numbers. They explore the relationship between multiplication and division as they learn related division and multiplication facts in the same fact family. These skills, along with mental math and estimation, allow students to solve problems that call for multiplication. Building on an understanding of how multiplication and division relate to each other, students prepare to learn efficient procedures for division, which will be developed in fifth grade. Multiplication of whole numbers is not only a basic skill, it is also closely connected to Core Content in this grade level on area, and this connection reinforces understanding of both concepts. Multiplication is also central to students' study of many other topics in mathematics across the grades, including fractions, volume, and algebra.

Performance Expectations	Examples
4.1.A Quickly recall multiplication facts through 10x10 and the related division facts.	
4.1.B Identify factors and multiples of a number.	The factors of 12 are 1, 2, 3, 4, 6, and 12. The multiples of 12 are 12, 24, 36, 48, …
4.1.C Represent multiplication of a two-digit number by a two-digit number with place value models.	Representations can include pictures or physical objects, or students can describe the process in words (14 times 16 is the same as 14 time 10 added to 14 times 6). 14 x 16 = 224  The algorithm for multiplication is addressed in expectation 4.1.F
4.1.D Multiply by 10, 100, and 1,000.	Multiplying by 10, 100, and 1,000 extends place value concepts to large numbers through the millions. Students can use place value and properties of operations to determine these products. • 10 x 5,000 = 50,000 • 100 x 5,000 = 500,000 • 1,000 x 5,000 = 5,000,000 40 x 300 = (4 x 10) x (3 x 100) = (4 x 3) x (10 x 100) = 12 x 1,000 =12,000

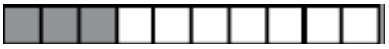
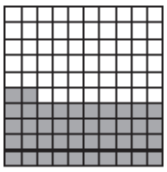
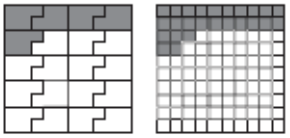
Core Content: Multi-Digit Multiplication (continued)

Performance Expectations	Examples
4.1.E Compare the values represented by digits in whole numbers using place value.	Compare the values represented by the digit 4 in 4,000,000 and 40,000. (The value represented by the 4 in the millions place is 100 times as much as the value represented by the 4 in the ten-thousands place.)
4.1.F Fluently and accurately multiply up to a three-digit number by one-and two-digit numbers using the standard multiplication algorithm.	245 X 7 3 3 245 x 7 1715 Teachers should be aware that in some countries the algorithm might be recorded differently.
4.1.G Mentally multiply two-digit numbers by numbers through 10 and by multiples of 10.	4 x 32 = (4 x 30) + (4 x 2) 4 x 99 = 400 - 4 25 x 30 = 75 x 10
4.1.H Estimate products to approximate solutions to problems and determine reasonableness of answers.	28 x 120 is approximately 30 times 100, so the product should be around 3000.
4.1.I Solve single- and multi-step word problems involving multi-digit multiplication and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Problems could include multi-step problems that use operations other than multiplication.
4.1.J Solve single- and multi-step word problems involving division and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Division problems should reinforce connections between multiplication and division. The example can be solved using multiplication along with some addition and subtraction: • A class of 20 students shares a box containing 385 animal crackers. What is each student's equal share? How many crackers are left over? Division algorithms, including long division, are developed in fifth grade.

Core Content: Fractions, Decimals, and Mixed Numbers *(Numbers, Algebra)*

PS 3: Students determine common factors and multiples of numbers.
PS 4: Students represent, compare, and order fractions (including mixed numbers) and decimals.

Students solidify and extend their understanding of fractions (including mixed numbers) to include decimals and the relationship between fractions and decimals. Students work with common factors and common multiples as preparation for learning procedures for fraction operations in grades five and six. When they are comfortable with and knowledgeable about fractions, students are likely to be successful with the challenging skills of learning how to add, subtract, multiply, and divide fractions.

Performance Expectations	Examples
4.2.A Represent decimals through hundredths with place value models, fraction equivalents, and the number line.	Students should know how to write decimals and show them on the number line and should understand their mathematical connections to place value models and fraction equivalents. Students should be able to represent decimals with words, pictures, or physical objects, and connect these representations to the corresponding decimal.
4.2.B Read, write, compare, and order decimals through hundredths.	Decimals may be compared using benchmarks, such as 0, 0.5, 1, or 1.5. Decimals may also be compared using place value. • List in increasing order: 0.7, 0.2, 1.4 • Write an inequality that compares 0.05 and 0.50
4.2.C Convert a mixed number to a fraction and vice versa, and visually represent the number.	Students should be able to use either the fraction or mixed-number form of a number as appropriate to a given situation, and they should be familiar with representing these numbers with words, pictures, and physical objects.
4.2.D Convert a decimal to a fraction and vice versa, and visually represent the number.	Students should be familiar with using pictures and physical objects to visually represent decimals and fractions. For this skill at this grade, fractions should be limited to those that are equivalent to fractions with denominators of 10 or 100. $\frac{3}{10} = 0.3$  • $0.42 = \frac{42}{100}$  • $\frac{5}{20} = 0.25$ 

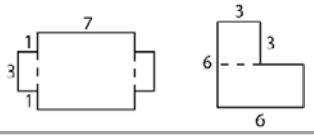
Core Content: Fractions, Decimals, and Mixed Numbers (continued)

Performance Expectations	Example
4.2.E Compare and order decimals and fractions (including mixed numbers) on the number line, lists, and using the symbols <, >, or =.	Compare each pair of numbers using <, >, or =. $\frac{6}{10}$ ☐ 0.8 $1\frac{1}{2}$ ☐ $\frac{3}{2}$ 0.75 ☐ $\frac{1}{2}$ Correctly show 3 $\frac{1}{2}$, 0.35, $\frac{3}{5}$ on the number line. Order the following numbers from least to greatest: $\frac{7}{6}$, 6.2, $\frac{1}{12}$, 0.88.
4.2.F Write a fraction equivalent to a given fraction.	Write at least two fractions equivalent to each fraction given below: $\frac{1}{2}$, $\frac{5}{6}$, $\frac{2}{3}$
4.2.G Simplify fractions using common factors.	
4.2.H Round fractions and decimals to the nearest whole number.	
4.2.I Solve single- and multi-step word problems involving comparison of decimals and fractions (including mixed numbers), and verify solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Example: Ms. Ortiz needs $1\frac{1}{2}$ pounds of sliced turkey. She picked up a package labeled "1.12 lbs." Would she have enough turkey with this package? Explain why or why not.

Core Content: Concept of Area *(Geometry/Measurement, Algebra)*

PS 5: Students use appropriate units, tools, and strategies, including formulas, to determine perimeter and area of rectangles.

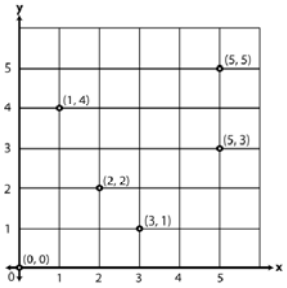
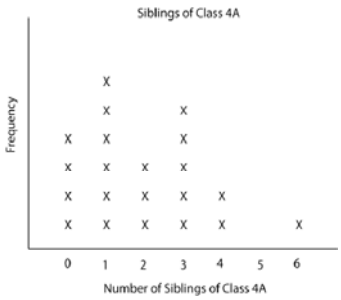
Student learns how to find the area of a rectangle as a basis for later work with areas of other geometric figures. They select appropriate units, tools, and strategies, including formulas, and use them to solve problems involving perimeter and area. Solving such problems helps students develop spatial skills, which are critical for dealing with a wide variety of geometric concepts. The study of area is closely connected to Core Content on multiplication, and connections between these concepts should be emphasized whenever possible.

Performance Expectations	Examples
4.3.A Determine congruence of two-dimensional figures.	At this grade level, students determine congruence primarily by making direct comparisons (i.e., tracing or cutting). They may also use informal notions of transformations described as flips, turns, and slides. Both the language and the concepts of transformations are more formally developed in grade eight.
4.3.B Determine the approximate area of a figure using square units.	• Draw a rectangle 3.5 cm by 6 cm on centimeter grid paper. About how many squares fit inside the footprint? • Cover a footprint with square tiles or outline it on grid paper. About how many squares fit inside the footprint?
4.3.C Determine the perimeter and area of a rectangle using formulas, and explain why the formulas work.	This is an opportunity to connect area to the concept of multiplication, a useful model for multiplication that extends into algebra. Students should also work with squares as special rectangles. • Outline on grid paper a rectangle that is 4 units long and 3 units wide. Without counting the squares, how can you determine the area? Other than measuring, how could you use a shortcut to find the perimeter of the rectangle?
4.3.D Determine the areas of figures that can be broken down into rectangles.	Find the area of each figure: 
4.3.E Demonstrate that rectangles with the same area can have different perimeters, and that rectangles with the same perimeter can have different areas.	Draw different rectangles, each with an area of 24 square units, and compare their perimeters. What patterns do you notice in the data? Record your observations.
4.3.F Solve single- and multi-step word problems involving perimeters and areas of rectangles and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Problems include those involving U.S. customary and metric units, including square units.

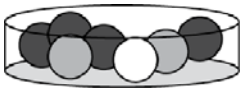
Additional Key Content *(Geometry/Measurement, Algebra, Data/Statistics/Probability)*

PS 6: Students graph on coordinate grids.
PS 7: Students describe sets of data using median, mode, and range.
PS 8: Students find simple probabilities and display and interpret results of probability experiments.
PS 9: Students solve problems using familiar unit conversions, including time, within either the U.S. customary or metric system.

Students use coordinate grids to connect numbers to basic ideas in algebra and geometry. This connection between algebra and geometry runs throughout advanced mathematics and allows students to use tools from one branch of mathematics to solve problems related to another branch. Students also extend and reinforce their work with whole numbers and fractions to describe sets of data and find simple probabilities. Students combine measurement work with their developing ideas about multiplication and division as they do basic measurement conversions. They begin to use algebraic notation while solving problems in preparation for formalizing algebraic thinking in later grades.

Performance Expectations	Examples
4.4.A Represent an unknown quantity in simple expressions, equations, and inequalities using letters, boxes, and other symbols.	There are 5 jars. Lupe put the same number of marbles in each jar. Write an equation or expression that shows how many marbles are in each jar if there are 40 marbles total. 5 x ☐ = 40 or 5 x M = 40
4.4.B Solve single- and multi-step problems involving familiar unit conversions, including time, within either the U.S. customary or metric system.	• Jill bought 3 meters of ribbon and cut it into pieces 25 centimeters long. How many 25 centimeter pieces of ribbon did she have? • How many quarts of lemonade are needed to make 25 one-cup servings?
4.4.C Estimate and determine elapsed time using a calendar, a digital clock, and an analog clock.	
4.4.D Graph and identify points in the first quadrant of the coordinate plane using ordered pairs.	
4.4.E Determine the median, mode, and range of a set of data and describe what each measure indicates about the data.	What is the median number of siblings that students in this class have? What is the mode of the data? What is the range of the number of siblings? What does each of these values tell you about the students in the class? 

Additional Key Content (continued)

Performance Expectations	Examples
4.4.F Describe and compare the likelihood of events.	For introduction to probability, an event can be described as *certain, impossible, likely, or unlikely*. Two events can be compared as being *equally likely, not equally likely,* or one event being *more likely* than the other.
4.4.G Determine a simple probability from a context that includes a picture.	Probability is expressed as a number from 0 to 1. What is the probability of a blindfolded person choosing a black marble from the bowl? 
4.4.H Display the results of probability experiments and interpret the results.	Displays include tallies, frequency tables, graphs, pictures, and fractions.

Core Processes: Reasoning, Problem Solving, and Communication

PS 10: Students solve problems with core mathematical concepts, make strategic decisions that lead to reasonable solutions and explain the reasoning behind those decisions.
PS 11: Students make generalizations about processes and apply those generalizations to similar problems.

Students in grade four solve problems that extend their understanding of core mathematical concepts—such as multiplication of multi-digit numbers, area, probability, and the relationships between fractions and decimals—as they make strategies-decisions that bring them to reasonable solutions. Students use pictures, symbols, or mathematical language to explain the reasoning behind their decisions and solutions. They further develop their problem-solving skills by making generalizations about the processes used and applying these generalizations to similar problem situations. These critical reasoning, problem-solving, and communication skills represent the kind of mathematical thinking that equips students to use the mathematics they know to solve a growing range of useful and important problems and to made decisions based on quantitative information.

Performance Expectations	Examples
4.5.A Determine the question(s) to be answered given a problem situation.	Descriptions of solution processes and explanations can include numbers, words (including mathematical language), pictures, physical objects, or equations. Students should be able to use all of these representations as needed. For a particular solution, students should be able to explain or show their work using at least one of these representations and verify that their answer is reasonable. Examples: • Jake's family adopted a small dog, Toto. They have a rectangular dog pen that is 10 feet by 20 feet. Toto needs only half that area, so Jake plans to make the pen smaller by cutting each dimension in half. Jake's mother asked him to rethink his plan or Toto won't have the right amount of space. o Whose reasoning is correct—Jake's or his mother's? Why? o According to Jake's plan, what fractional part of the old pen will be the area of the new pen? Give the answer in simplest form. o Make a new plan so that the area of the new pen is half the area of the old pen. • The city is paying for a new deck around the community pool. The rectangular pool measures 50 meters by 25 meters. The deck, which will measure 5 meters wide, will surround the pool like a picture frame. If the cost of the deck is $25 for each square meter, what will be the total cost for the new deck? Explain your solution.
4.5.B Identify information that is given in a problem and decide whether it is essential or extraneous to the solution of the problem.	
4.5.C Identify missing information that is needed to solve a problem.	
4.5.D Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.	
4.5.E Select and use one or more appropriate strategies to solve a problem and explain why that strategy was chosen.	
4.5.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.	
4.5.G Explain why a specific problem-solving strategy or procedure was used to determine a solution.	
4.5.H Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.	
4.5.I Summarize mathematical information, draw conclusions, and explain reasoning.	
4.5.J Make and test conjectures based on data (or information) collected from explorations and experiments.	