K.5. Core Processes:
### Reasoning, problem solving, and communication

Students begin to build the understanding that doing mathematics involves solving problems and discussing how they solved them. Problems at this level emphasize counting and activities that lead to emerging ideas about addition and subtraction. Students begin to develop their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?" and "Why is that true?"

Grade K
K
Adopted Washington State
Mathematics
Standards . . . .
April 28, 2008
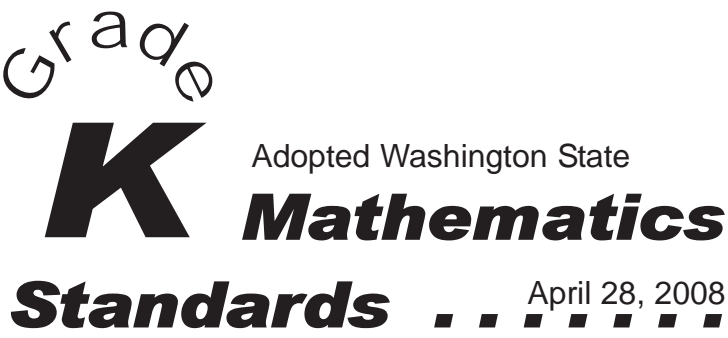
K.1. Core Content:
Whole numbers   (Numbers, Operations)

Students begin to develop basic notions of numbers and use numbers to think about objects and the world around them. They practice counting objects in sets, and they think about how numbers are ordered by showing the numbers on the number line. By putting together and taking apart simple numbers, students lay the groundwork for learning how to add and subtract. Understanding numbers is perhaps the most central idea in all of mathematics, and if students build and maintain a strong foundation of number sense and number skills, they will be able to succeed with increasingly sophisticated numerical knowledge and skills from year to year.

K.2. Core Content:
Patterns and operations   (Operations, Algebra)

Students learn what it means to add and subtract by joining and separating sets of objects. Working with patterns helps them strengthen this understanding of addition and subtraction and moves them toward the important development of algebraic thinking. Students study simple repetitive patterns in preparation for increasingly sophisticated patterns that can be represented with algebraic expressions in later grades.

K.3. Core Content:
Objects and their locations   (Geometry/Measurement)

Students develop basic ideas related to geometry as they name simple two- and three dimensional figures and find these shapes around them. They expand their understanding of space and location by describing where people and objects are. Students sort and match shapes as they begin to develop classification skills that serve them well in both mathematics and reading— matching numbers to sets, shapes to names, patterns to rules, letters to sounds, and so on.

K.4. Additional Key Content   (Geometry/Measurement)

Students informally develop early measurement concepts. This is an important precursor to Core Content on measurement in later grades, when students measure objects with tools. Solving measurement problems connects directly to the student's world and is a basic component of learning mathematics.

Kindergarten Performance Expectations . . . .

Whole Numbers (numbers, operations)

K.1.A Rote count by ones forward from 1 to 100 and backward from any number in the range of 10 to 1. (1.1.A)

K.1.B Read aloud numerals from 0 to 31. (1.1.C)

K.1.C Fluently compose and decompose numbers to 5. (1.1.F)

K.1.D Order numerals from 1 to 10. (1.1.E)

K.1.E Count objects in a set of up to 20, and count out a specific number of up to 20 objects from a larger set. (1.1.H)

K.1.F Compare two sets of up to 10 objects each and say whether the number of objects in one set is equal to, greater than, or less than the number of objects in the other set.

K.1.G Locate numbers from 1 to 31 on the number line.

K.1.H Describe a number from 1 to 9 using 5 as a benchmark number.

Patterns and Operations (operations, algebra)

K.2.A Copy, extend, describe, and create simple repetitive patterns. (1.2.I)

K.2.B Translate a pattern among sounds, symbols, movements, and physical objects.

K.2.C Model addition by joining sets of objects that have 10 or fewer total objects when joined and model subtraction by separating a set of 10 or fewer objects. (1.2.A)

K.2.D Describe a situation that involves the actions of joining (addition) or separating (subtraction) using words, pictures, objects, or numbers. (1.2.A)

Objects and their Locations (geometry/measurement)

K.3.A Identify, name, and describe circles, triangles, rectangles, squares (as special rectangles), cubes, and spheres. (1.3.B)

K.3.B Sort shapes using a sorting rule and explain the sorting rule. (1.3.A)

K.3.C Describe the location of one object relative to another object using words such as in, out, under, above, below, between, next to, behind, and in front of.

Additional Key Content (geometry/measurement)

K.4.A Make direct comparisons using measurable attributes such as length, weight, and capacity. (1.4.A) (1.4.D)

Reasoning, Problem Solving, and Communication

K.5.A Identify the question(s) asked in a problem. (1.6.A)

K.5.B Identify the given information that can be used to solve a problem. (1.6.B)

K.5.C Recognize when additional information is required to solve a problem. (1.6.C)

K.5.D Select from a variety of problem-solving strategies and use one or more strategies to solve a problem. (1.6.D)

K.5.E Answer the question(s) asked in a problem. (1.6.E)

K.5.F Describe how a problem was solved. (1.6.G)

K.5.G Determine whether a solution to a problem is reasonable. (1.6.H)

The performance expectation identified in the parentheses represents a connection to a previous or future grade level performance expectation.

1.5. Additional Key Content (Data/Statistics/Probability)

Students are introduced to basic ideas of statistics by collecting and visually representing data. These ideas reinforce their understanding of the Core Content areas related to whole numbers and addition and subtraction as students ask and answer questions about the data. As they move through the grades, students will continue to apply what they learn about data, making mathematics relevant and connecting numbers to applied situations.

1.6. Core Processes:
Reasoning, problem solving, and communication

Students further develop the concept that doing mathematics involves solving problems and discussing what they did to solve them. Problems in first grade emphasize addition, subtraction, and solidifying number concepts, and sometimes include precursors to multiplication. Students continue to develop their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?"; "Why did you do that?"; and "How do you know that?" Students begin to build their mathematical vocabulary as they use correct mathematical language appropriate to first grade.

Grade 1

Adopted Washington State

Mathematics

Standards . . . .
April 28, 2008

1.1. Core Content:
Whole number relationships (Numbers, Operations)

Students continue to work with whole numbers to quantify objects. They consider how numbers relate to one another. As they expand the set of numbers they work with, students start to develop critical concepts of ones and tens that introduce them to place value in our base ten number system. An understanding of how ones and tens relate to each other allows students to begin adding and subtracting two-digit numbers, where thinking of ten ones as one ten and vice versa is routine. Some students will be ready to work with numbers larger than those identified in the *Expectations* and should be given every opportunity to do so.

1.2. Core Content:
Addition and subtraction (Operations, Algebra)

Students learn how to add and subtract, when to add and subtract, and how addition and subtraction relate to each other. Understanding that addition and subtraction undo each other is an important part of learning these operations efficiently and accurately. Students notice patterns involving addition and subtraction, and they work with other types of patterns as they learn to make generalizations about what they observe.

1.3. Core Content:
Geometric attributes (Geometry/Measurement)

Students expand their knowledge of two- and three-dimensional geometric figures by sorting, comparing, and contrasting them according to their characteristics. They learn important mathematical vocabulary used to name the figures. Students work with composite shapes made out of basic two-dimensional figures as they continue to develop their spatial sense of shapes, objects, and the world around them.

1.4. Core Content:
Concepts of measurement (Geometry/Measurement)

Students start to learn about measurement by measuring length. They begin to understand what it means to measure something, and they develop their measuring skills using everyday objects. As they focus on length, they come to understand that units of measure must be equal in size and learn that standard-sized units exist. They develop a sense of the approximate size of those standard units (like inches or centimeters) and begin using them to measure different objects. Students learn that when a unit is small, it takes more of the unit to measure an item than it does when the units are larger, and they relate and compare measurements of objects using units of different sizes. Over time they apply these same concepts of linear measurement to other attributes such as weight and capacity. As students practice using measurement tools to measure objects, they reinforce their numerical skills and continue to develop their sense of space and shapes.

Grade One Performance Expectations . . . .

Whole Number Relationships (numbers, operations)

1.1.A Count by ones forward and backward from 1 to 120, starting at any number, and count by twos, fives, and tens to 100. (K.1.A) (2.1.A)

1.1.B Name the number that is one less or one more than any number given verbally up to 120.

1.1.C Read aloud numerals from 0 to 1,000. (K.1.B)

1.1.D Order objects or events using ordinal numbers.

1.1.E Write, compare, and order numbers to 120. (K.1.D) (2.1.F)

1.1.F Fluently compose and decompose numbers to 10. (K.1.C) (2.1.D)

1.1.G Group numbers into tens and ones in more than one way. (2.1.B)

1.1.H Group and count objects by tens, fives, and twos. (K.1.E)

1.1.I Classify a number as odd or even and demonstrate that it is odd or even.

The performance expectation identified in the parentheses represents a connection to a previous or future grade level performance expectation.

Addition and Subtraction (operations, algebra)

1.2.A Connect physical and pictorial representations to addition and subtraction equations. (K.2.C) (K.2.D)

1.2.B Use the equal sign (=) and the word equals to indicate that two expressions are equivalent.

1.2.C Represent addition and subtraction on the number line.

1.2.D Demonstrate the inverse relationship between addition and subtraction by undoing an addition problem with subtraction and vice versa.

1.2.E Add three or more one-digit numbers using the commutative and associative properties of addition.

1.2.F Apply and explain strategies to compute addition facts and related subtraction facts for sums to 18. (2.2.C)

1.2.G Quickly recall addition facts and related subtraction facts for sums equal to 10. (2.2.A) (2.2.D)

1.2.H Solve and create word problems that match addition or subtraction equations. (2.2.B)

1.2.I Recognize, extend, and create number patterns. (K.2.A) (2.2.F)

Geometric Attributes (geometry/ measurement)

1.3.A Compare and sort a variety of two- and three-dimensional figures according to their geometric attributes. (K.3.B) (2.4.A)

1.3.B Identify and name two-dimensional figures, including those in real-world contexts, regardless of size or orientation. (K.3.A)

1.3.C Combine known shapes to create shapes and divide known shapes into other shapes.

Concepts of Measurement (geometry/ measurement)

1.4.A Recognize that objects used to measure an attribute (length, weight, capacity) must be consistent in size. (K.4.A)

1.4.B Use a variety of non-standard units to measure length. (2.3.A)

1.4.C Compare lengths using the transitive property.

1.4.D Use non-standard units to compare objects according to their capacities or weights. (K.4.A)

1.4.E Describe the connection between the size of the measurement unit and the number of units needed to measure something.

1.4.F Name the days of the week and the months of the year, and use a calendar to determine a day or month.

Additional Key Content (data/statistics/ probability)

1.5.A Represent data using tallies, tables, picture graphs, and bar-type graphs. (2.4.B)

1.5.B Ask and answer comparison questions about data.

Reasoning, Problem Solving, and Communication

1.6.A Identify the question(s) asked in a problem. (K.5.A) (2.5.A)

1.6.B Identify the given information that can be used to solve a problem. (K.5.B) (2.5.B)

1.6.C Recognize when additional information is required to solve a problem. (K.5.C) (2.5.C)

1.6.D Select from a variety of problem-solving strategies and use one or more strategies to solve a problem. (K.5.D) (2.5.D)

1.6.E Answer the question(s) asked in a problem. (K.5.E)

1.6.F Identify the answer(s) to the question(s) in a problem. (2.5.E)

1.6.G Describe how a problem was solved. (K.5.F) (2.5.F)

1.6.H Determine whether a solution to a problem is reasonable. (K.5.G) (2.5.G)

2.5. Core Processes: Reasoning, problem solving, and communication

Students further develop the concept that doing mathematics involves solving problems and talking about what they did to solve those problems. Second-grade problems emphasize addition and subtraction with increasingly large numbers, measurement, and early concepts of multiplication and division. Students communicate their mathematical thinking and make increasingly more convincing mathematical arguments. Students participate in mathematical discussions involving questions like "How did you get that?"; "Why did you use that strategy?"; and "Why is that true?" Students continue to build their mathematical vocabulary as they use correct mathematical language appropriate to grade two when discussing and refining solutions to problems.

Grade **2** Adopted Washington State **Mathematics Standards** . . . . . . April 28, 2008

2.1. Core Content:
Place value and the base ten system
(Numbers)

Students refine their understanding of the base ten number system and use place value concepts of ones, tens, and hundreds to understand number relationships. They become fluent in writing and renaming numbers in a variety of ways. This fluency, combined with the understanding of place value, is a strong foundation for learning how to add and subtract two-digit numbers.

2.2. Core Content:
Addition and subtraction (Operations, Geometry/Measurement, Algebra)

Students focus on what it means to add and subtract as they become fluent with single-digit addition and subtraction facts and develop addition and subtraction procedures for two-digit numbers. Students make sense of these procedures by building on what they know about place value, number relationships, and putting together or taking apart sets of objects. This is students' first time to deal formally with step-by-step procedures (algorithms)—an important component of mathematics that allows students to use a generalizable technique in similar situations. Students begin to use estimation to determine if their answers are reasonable.

2.3. Core Content:
Measurement (Geometry/Measurement)

Students understand the process of measuring length and progress from measuring length with objects such as toothpicks or craft sticks to the more practical skill of measuring length with standard units and tools such as rulers, tape measures, or meter sticks. As students are well acquainted with two-digit numbers by this point, they tell time on different types of clocks.

2.4. Additional Key Content (Numbers, Operations, Geometry/Measurement, Data/Statistics/Probability)

Students make predictions and answer questions about data as they apply their growing understanding of numbers and the operations of addition and subtraction. They extend their spatial understanding of Core Content in geometry developed in kindergarten and grade one by solving problems involving two- and three-dimensional geometric figures. Students are introduced to a few critical concepts that will become Core Content in grade three. Specifically, they begin to work with multiplication and division and learn what a fraction is.

Grade Two Performance Expectations . . . .

Place Value and the Base Ten System (numbers)

2.1.A   Count by tens or hundreds forward and backward from 1 to 1,000, starting at any number.   (1.1.A)

2.1.B   Connect place value models with their numerical equivalents to 1,000.   (1.1.G)

2.1.C   Identify the ones, tens, and hundreds place in a number and the digits occupying them.

2.1.D   Write three-digit numbers in expanded form.   (1.1.F)

2.1.E   Group three-digit numbers into hundreds, tens, and ones in more than one way.

2.1.F   Compare and order numbers from 0 to 1,000.   (1.1.E) (3.1.A)

Addition and Subtraction (operations, geometry/measurement, algebra)

2.2.A   Quickly recall basic addition facts and related subtraction facts for sums through 20.   (1.2.G)

2.2.B   Solve addition and subtraction word problems that involve joining, separating, and comparing and verify the solution.   (1.2.H) (3.1.E)

2.2.C   Add and subtract two-digit numbers efficiently and accurately using a procedure that works with all two-digit numbers and explain why the procedure works.   (1.2.F) (3.1.C)

2.2.D   Add and subtract two-digit numbers mentally and explain the strategies used.   (1.2.G)

2.2.E   Estimate sums and differences.

2.2.F   Create and state a rule for patterns that can be generated by addition and extend the pattern.   (1.2.I) (5.4.A)

2.2.G   Solve equations in which the unknown number appears in a variety of positions.

2.2.H   Name each standard U.S. coin, write its value using the $ sign and the ¢ sign, and name combinations of other coins with the same total value.

2.2.I   Determine the value of a collection of coins totaling less than $1.00.

Measurement (geometry/measurement)

2.3.A   Identify objects that represent or approximate standard units and use them to measure length.   (1.4.B)

2.3.B   Estimate length using metric and U.S. customary units.   (3.5.D)

2.3.C   Measure length to the nearest whole unit in both metric and U.S. customary units.   (3.5.C)

2.3.D   Describe the relative size among minutes, hours, days, weeks, months, and years.   (4.4.C)

2.3.E   Use both analog and digital clocks to tell time to the minute.

Additional Key Content (numbers, operations, geometry/measurement, data/statistics/probability)

2.4.A   Solve problems involving properties of two and three-dimensional figures.   (1.3.A)

2.4.B   Collect, organize, represent, and interpret data in bar graphs and picture graphs.   (1.5.A) (3.5.E)

2.4.C   Model and describe multiplication situations in which sets of equal size are joined.   (3.2.A)

2.4.D   Model and describe division situations in which sets are separated into equal parts.   (3.2.B)

2.4.E   Interpret a fraction as a number of equal parts of a whole or a set.   (3.3.A)

Reasoning, Problem Solving, and Communication

2.5.A   Identify the question(s) asked in a problem and any other questions that need to be answered in order to solve the problem.   (1.6.A) (3.6.A)

2.5.B   Identify the given information that can be used to solve a problem.   (1.6.B) (3.6.B)

2.5.C   Recognize when additional information is required to solve a problem.   (1.6.C) (3.6.C)

2.5.D   Select from a variety of problem-solving strategies and use one or more strategies to solve a problem.   (1.6.D) (3.6.E)

2.5.E   Identify the answer(s) to the question(s) in a problem.   (1.6.F) (3.6.H)

2.5.F   Describe how a problem was solved.   (1.6.G) (3.6.G)

2.5.G   Determine whether a solution to a problem is reasonable.   (1.6.H) (3.6.H)

The performance expectation identified in the parentheses represents a connection to a previous or future grade level performance expectation.

3.6. Core Processes:
Reasoning, problem solving, and communication

Students in grade three solve problems that extend their understanding of core mathematical concepts—such as geometric figures, fraction concepts, and multiplication and division of whole numbers—as they make strategic 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 make decisions based on quantitative information.

Grade 3

Adopted Washington State

Mathematics

Standards . . . . April 28, 2008

3.1. Core Content:
Addition, subtraction, and place value
(Numbers, Operations)

Students solidify and formalize important concepts and skills related to addition and subtraction. In particular, students extend critical concepts of the base ten number system to include large numbers, they formalize procedures for adding and subtracting large numbers, and they apply these procedures in new contexts.

3.2. Core Content:
Concepts of multiplication and division   (Operations, Algebra)

Students learn the meaning of multiplication and division and how these operations relate to each other. They begin to learn multiplication and division facts and how to multiply larger numbers. Students use what they are learning about multiplication and division to solve a variety of problems. With a solid understanding of these two key operations, students are prepared to formalize the procedures for multiplication and division in grades four and five.

3.3. Core Content:
Fraction concepts   (Numbers, Algebra)

Students learn about fractions and how they are used. Students deepen their understanding of fractions by comparing and ordering fractions and by representing them in different ways. With a solid knowledge of fractions as numbers, students are prepared to be successful when they add, subtract, multiply, and divide fractions to solve problems in later grades.

3.4. Core Content:
Geometry   (Geometry/Measurement)

Students learn about lines and use lines, line segments, and right angles as they work with quadrilaterals. Students connect this geometric work to numbers, operations, and measurement as they determine simple perimeters in ways they will use when calculating perimeters of more complex figures in later grades.

3.5. Additional Key Content   (Numbers, Operations, Algebra, Geometry/Measurement, Data/Statistics/Probability)

Students solidify and formalize a number of important concepts and skills related to Core Content studied in previous grades. In particular, students demonstrate their understanding of equivalence as an important foundation for later work in algebra. Students also reinforce their knowledge of measurement as they use standard units for temperature, weight, and capacity. They continue to develop data organization skills as they reinforce multiplication and division concepts with a variety of types of graphs.

Grade Three Performance Expectations ....

Addition, Subtraction, and Place Value (numbers, operations)

3.1.A *Read,* **write, compare, order, and represent numbers to 10,000 using** numbers, **words, and symbols.**
(2.1.F) (4.2.B)

3.1.B **Round whole numbers through 10,000 to the nearest ten, hundred, and thousand.**

3.1.C *Fluently and* **accurately add and subtract whole numbers** *using the standard regrouping algorithms.* (2.2.C)

3.1.D **Estimate sums and differences to approximate solutions to problems and determine reasonableness of answers. ****

3.1.E **Solve single- and multi-step word problems involving addition and subtraction of whole numbers and verify the solutions.** (2.2.B)

Concepts of Multiplication and Division (operations, algebra)

3.2.A **Represent multiplication as repeated addition, arrays, counting by multiples, and equal jumps on the number line, and connect each representation to the related equation.** (2.4.C)

3.2.B **Represent division as equal sharing, repeated subtraction, equal jumps on the number line, and formation of equal groups of objects, and connect each representation to the related equation.**
(2.4.D)

3.2.C **Determine products, quotients, and missing factors using the inverse relationship between multiplication and division.**

3.2.D *Apply and explain strategies to compute multiplication facts to 10 X 10 and the related division facts.* (4.1.A)

3.2.E *Quickly recall those multiplication facts for which one factor is 1, 2, 5, or 10 and the related division facts.* (4.1.A)

3.2.F *Solve and create word problems that match multiplication or division equations.*

3.2.G **Multiply any number from 11 through 19 by a single-digit number** *using the distributive property and place value concepts.* (4.1.C)

3.2.H **Solve single- and multi-step word problems involving multiplication and division and verify the solutions.**
(4.1.I) (4.1.J)

Fraction Concepts (numbers, algebra)

3.3.A **Represent fractions that have denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12 as parts of a whole, parts of a set, and points on the number line.**
(2.4.E)

3.3.B **Compare and order fractions that have denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.** (4.2.E)

3.3.C **Represent and identify equivalent fractions with denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.** (4.2.F)

3.3.D **Solve single- and multi-step word problems involving comparison of fractions and verify the solutions.**
(4.2.I)

Geometry (geometry/measurement)

3.4.A **Identify** *and sketch* **parallel, intersecting, and perpendicular lines and line segments.**

3.4.B **Identify** *and sketch* **right angles.** (5.3.B)

3.4.C **Identify and describe special types of quadrilaterals.** (5.3.A)

3.4.D **Measure and calculate perimeters of quadrilaterals.** (4.3.C)

3.4.E **Solve single- and multi-step word problems involving perimeters of quadrilaterals and verify the solutions.**
(4.3.F)

Additional Key Content (numbers, operations, algebra, geometry/measurement, data/statistics/probability)

3.5.A **Determine whether two expressions are equal and use "=" to denote equality.** (4.4.A)

3.5.B **Measure temperature in degrees Fahrenheit and degrees Celsius using a thermometer.**

3.5.C *Estimate,* **measure, and compare weight** *and mass* **using appropriate-sized U.S. customary** *and metric* **units.**
(2.3.C) (4.4.B)

3.5.D *Estimate,* **measure, and compare capacity using appropriate-sized U.S. customary** *and metric* **units.**
(2.3.B) (4.4.B)

3.5.E **Construct and analyze pictographs, frequency tables, line plots, and bar graphs.** (2.4.B) (5.5.C)

Reasoning, Problem Solving, and communication

3.6.A *Determine the question(s) to be answered given a problem situation.* (2.5.A) (4.5.A)

3.6.B **Identify information that is given in a problem and decide whether it is necessary or unnecessary to the solution of the problem.** (2.5.B) (4.5.B)

3.6.C **Identify missing information that is needed to solve a problem.**
(2.5.C) (4.5.C)

3.6.D *Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.* (4.5.D)

3.6.E **Select and use one or more appropriate strategies to solve a problem.**
(2.5.D) (4.5.E)

3.6.F **Represent a problem situation using words, numbers, pictures,** *physical* **objects, or symbols.** (4.5.F)

3.6.G *Explain why a specific problem-solving strategy or procedure was used to determine a solution.* (2.5.F) (4.5.G)

3.6.H **Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.** (2.5.E) (2.5.G) (4.5.H)

3.6.I **Summarize mathematical information, draw conclusions, and explain reasoning.** (4.5.I)

3.6.J *Make and test conjectures based on data (or information) collected from explorations and experiments.* (4.5.J)

The performance expectation identified in the parentheses represents a connection to a previous or future grade level performance expectation.

Bold and *italicized* formatting based on the most current version of the MSP Mathematics Item Specifications. Expectations for the state assessment are in **bold text**. Expectations for local instruction and assessment appear in *italicized* text. ** This performance expectation may be included in items assessing process performance expectaions.

4.5. Core Processes: Reasoning, problem solving, and communication

Students in grade four solve problems that extend their understanding of core mathematical concepts—such as multiplication of multi-digit numbers, area, and the relationships between fractions and decimals—as they make strategic 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 make decisions based on quantitative information.

Mathematics content based on Adopted Washington State K-8 Mathematics Standards, April 28, 2008, Office of the Superintendent of Public Instruction

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Grade 4

Adopted Washington State

Mathematics Standards . . . .

April 28, 2008

4.1. Core Content: Multi-digit multiplication (Numbers, Operations, Algebra)

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 grade four 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.

4.2. Core Content: Fractions, decimals, and mixed numbers (Numbers, Algebra)

Students solidify and extend their understanding of fractions (including mixed numbers) to include decimals and the relationships 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.

4.3. Core Content: Concept of area (Geometry/ Measurement, Algebra)

Students learn 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 range 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.

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

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.

Grade Four Performance Expectations . . . .

Multi-digit Multiplication (numbers, operations, algebra)

4.1.A   *Quickly recall multiplication facts through 10 X 10 and the related division facts.* (3.2.D) (3.2.E)

4.1.B   **Identify factors and multiples of a number.** (5.2.D) (5.5.A)

4.1.C   *Represent multiplication of a two-digit number by a two-digit number with place value models.* (3.2.G)

4.1.D   **Multiply by 10, 100, and 1,000.**

4.1.E   **Compare the values represented by digits in whole numbers using place value.**

4.1.F   *Fluently and* **accurately multiply up to a three-digit number by one- and two-digit numbers** *using the standard multiplication algorithm.* (6.1.F)

4.1.G   *Mentally multiply two-digit numbers by numbers through 10 and by multiples of 10.*

4.1.H   **Estimate products to approximate solutions to problems and determine reasonableness of answers. ****

4.1.I   **Solve single- and multi-step word problems involving multi-digit multiplication and verify the solutions.** (3.2.H)

4.1.J   **Solve single- and multi-step word problems involving division and verify the solutions.** (3.2.H) (5.1.F)

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Fractions, Decimals, and Mixed Numbers (numbers, algebra)

4.2.A   **Represent decimals through hundredths with place value models, fraction equivalents, and the number line.**

4.2.B   *Read,* **write***, compare, and order decimals through hundredths.* (3.1.A)

4.2.C   **Convert a mixed number to a fraction and vice versa, and visually represent the number.**

4.2.D   **Convert a decimal to a fraction and vice versa, and visually represent the number.**

4.2.E   **Compare and order decimals and fractions (including mixed numbers) on the number line, lists and the symbols <, >, or =.** (3.3.B) (6.1.A) (6.5.C)

4.2.F   **Write a fraction equivalent to a given fraction**. (3.3.C) (5.2.C)

4.2.G   **Simplify fractions** *using common factors.* (5.2.C)

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 the solutions.** (3.3.D) (5.2.H)

Concept of Area (geometry/measurement, algebra)

4.3.A   **Determine congruence of two-dimensional figures.**

4.3.B   **Determine the approximate area of a figure using square units.**

4.3.C   **Determine the perimeter and area of a rectangle using formulas,** *and explain why the formulas work*. (3.4.D) (5.3.D) (5.3.F)

4.3.D   **Determine the areas of figures that can be broken down into rectangles.** (5.3.F)

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.**

4.3.F   **Solve single- and multi-step word problems involving perimeters and areas of rectangles and verify the solutions.** (3.4.E) (5.3.I)

Additional Key Content (geometry/measurement, algebra, data/statistics/probability)

4.4.A   **Represent an unknown quantity in simple expressions, equations, and inequalities using letters, boxes, and other symbols.** (3.5.A) (5.4.C)

4.4.B   **Solve single- and multi-step problems involving familiar unit conversions, including time, within either the U.S. customary or metric system.** (3.5.C) (3.5.D)

4.4.C   *Estimate and* **determine elapsed time using a calendar, a digital clock, and an analog clock.** (2.3.D)

4.4.D   *Graph and* **identify points in the first quadrant of the coordinate plane using ordered pairs.** (5.4.D)

4.4.E   **Determine the median, mode, and range of a set of data** *and describe what each measure indicates about the data.* (5.5.B)

4.4.F   **Describe and compare the likelihood of events.**

4.4.G   **Determine a simple probability from a context that includes a picture.** (6.3.G)

4.4.H   **Display the results of probability experiments and interpret the results.** (6.3.F)

Reasoning, Problem Solving, and Communication

4.5.A   *Determine the question(s) to be answered given a problem situation.* (3.6.A) (5.6.A)

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.** (3.6.B) (5.6.B)

4.5.C   **Identify missing information that is needed to solve a problem.** (3.6.C) (5.6.C)

4.5.D   *Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.* (3.6.D) (5.6.D)

4.5.E   **Select and use one or more appropriate strategies to solve a problem** *and explain why that strategy was chosen.* (3.6.E) (5.6.E)

4.5.F   **Represent a problem situation using words, numbers, pictures,** *physical objects,* **or symbols.** (3.6.F) (5.6.F)

4.5.G   *Explain why a specific problem-solving strategy or procedure was used to determine a solution.* (3.6.G) (5.6.G)

4.5.H   **Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.** (3.6.H) (5.6.H)

4.5.I   **Summarize mathematical information, draw conclusions, and explain reasoning.** (3.6.I) (5.6.I)

4.5.J   *Make and test conjectures based on data (or information) collected from explorations and experiments.* (3.6.J) (5.6.J)

5.5. Additional Key Content (Numbers, Geometry/Measurement, Data/Statistics/Probability)

Students extend their work with common factors and common multiples as they deal with prime numbers. Students extend and reinforce their use of numbers, operations, and graphing to describe and compare data sets for increasingly complex situations they may encounter in other school subjects and in their lives.

5.6. Core Processes: Reasoning, problem solving, and communication

Students in grade five solve problems that extend their understanding of core mathematical concepts— such as division of multi-digit numbers, surface area and volume of rectangular prisms, addition and subtraction of fractions and decimals, and use of variables in expressions and equations—as they make strategic decisions leading 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 make decisions based on quantitative information.

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5.1. Core Content: Multi-digit division (Operations, Algebra)

Students learn efficient ways to divide whole numbers. They apply what they know about division to solve problems, using estimation and mental math skills to decide whether their results are reasonable. This emphasis on division gives students a complete set of tools for adding, subtracting, multiplying, and dividing whole numbers—basic skills for everyday life and further study of mathematics.

5.2. Core Content: Addition and subtraction of fractions and decimals (Numbers, Operations, Algebra)

Students extend their knowledge about adding and subtracting whole numbers to learning procedures for adding and subtracting fractions and decimals. Students apply these procedures, along with mental math and estimation, to solve a wide range of problems that involve more of the types of numbers students see in other school subjects and in their lives.

5.3. Core Content: Triangles and quadrilaterals (Geometry/Measurement, Algebra)

Students focus on triangles and quadrilaterals to formalize and extend their understanding of these geometric shapes. They classify different types of triangles and quadrilaterals and develop formulas for their areas. In working with these formulas, students reinforce an important connection between algebra and geometry. They explore symmetry of these figures and use what they learn about triangles and quadrilaterals to solve a variety of problems in geometric contexts.

5.4. Core Content: Representations of algebraic relationships (Operations, Geometry/Measurement, Algebra)

Students continue their development of algebraic thinking as they move toward more in-depth study of algebra in middle school. They use variables to write simple algebraic expressions describing patterns or solutions to problems. They use what they have learned about numbers and operations to evaluate simple algebraic expressions and to solve simple equations. Students make tables and graphs from linear equations to strengthen their understanding of algebraic relationships and to see the mathematical connections between algebra and geometry. These foundational algebraic skills allow students to see where mathematics, including algebra, can be used in real situations and prepare students for success in future grades.

Grade Five Performance Expectations . . . .

Multi-digit Division (operations, algebra)

5.1.A *Represent multi-digit division using place value models and connect the representation to the related equation.*

5.1.B **Determine quotients for multiples of 10 and 100** *by applying knowledge of place value and properties of operations.* (6.1.E)

5.1.C *Fluently and* **accurately divide up to four digit number by one- and two-digit divisors** *using the standard long-division algorithm.* (6.1.F)

5.1.D **Estimate quotients to approximate solutions and determine reasonableness of answers in problems involving up to two-digit divisors. **** (6.1.C)

5.1.E *Mentally divide two-digit numbers by one-digit divisors and explain the strategies used.* (6.5.A)

5.1.F **Solve single- and multi-step word problems involving multi-digit division and verify the solutions.** (4.1.J)

Addition and Subtraction of Fractions and Decimals (numbers, operations, algebra)

5.2.A **Represent addition and subtraction of fractions and mixed numbers using visual and numerical models, and connect the representation to the related equation.**

5.2.B **Represent addition and subtraction of decimals using place value models and connect the representation to the related equation.**

5.2.C **Given two fractions with unlike denominators, rewrite the fractions with a common denominator.** (4.2.F) (4.2.G)

5.2.D **Determine the greatest common factor and the least common multiple of two or more whole numbers.** (4.1.B) (7.5.B)

5.2.E *Fluently and* **accurately add and subtract fractions, including mixed numbers.**

5.2.F *Fluently and* **accurately add and subtract decimals.**

5.2.G **Estimate sums and differences of fractions, mixed numbers, and decimals to approximate solutions to problems and determine reasonableness of answers. ****

5.2.H **Solve single- and multi-step word problems involving addition and subtraction of whole numbers, fractions (including mixed numbers), and decimals, and verify the solutions**. (4.2.I) (6.1.H)

Triangles and Quadrilaterals (geometry/ measurement, algebra)

5.3.A **Classify quadrilaterals.** (3.4.C)

5.3.B **Identify,** *sketch*, **and measure acute, right, and obtuse angles.** (3.4.B)

5.3.C **Identify, describe, and classify triangles by angle measure and number of congruent sides.**

5.3.D *Determine the formula for the area of a parallelogram by relating it to the area of a rectangle.* (4.3.C)

5.3.E *Determine the formula for the area of a triangle by relating it to the area of a parallelogram.*

5.3.F **Determine the perimeters and areas of triangles and parallelograms.** (4.3.C) (4.3.D) (6.4.B)

5.3.G **Draw quadrilaterals and triangles from given information about sides and angles. ****

5.3.H **Determine the number and location of lines of symmetry in triangles and quadrilaterals.**

5.3.I **Solve single- and multi-step word problems about the perimeters and areas of quadrilaterals and triangles and verify the solutions.** (4.3.F)

Representations of Algebraic Relationships (operations, geometry/ measurement, algebra)

5.4.A **Describe and create a rule for numerical and geometric patterns and extend the patterns.** (2.2.F)

5.4.B **Write a rule to describe the relationship between two sets of data that are linearly related.** (6.2.A)

5.4.C **Write algebraic expressions that represent simple situations and evaluate the expressions using substitution when variables are involved.** (4.4.A) (6.2.A) (6.2.C)

5.4.D **Graph ordered pairs in the coordinate plane for two sets of data related by a linear rule and draw the line they determine.** (4.4.D) (6.2.B) (7.2.F) (7.5.A)

Additional Key Content (numbers, data/statistics/probability)

5.5.A **Classify numbers as prime or composite.** (4.1.B) (7.5.B)

5.5.B **Determine** *and interpret* **the mean of a small data set of whole numbers.** (4.4.E) (7.4.C)

5.5.C **Construct and interpret line graphs.** (3.5.E)

Reasoning, Problem Solving, and Communication

5.6.A *Determine the question(s) to be answered given a problem situation.* (4.5.A) (6.6.A)

5.6.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.B) (6.6.B)

5.6.C **Determine whether additional information is needed to solve the problem.** (4.5.C) (6.6.B)

5.6.D *Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.* (4.5.D) (6.6.C) (6.6.F)

5.6.E **Select and use one or more appropriate strategies to solve a problem,** *and explain the choice of strategy.* (4.5.E) (6.6.C)

5.6.F **Represent a problem situation using words, numbers, pictures,** *physical* **objects, or symbols.** (4.5.F) (6.6.D)

5.6.G *Explain why a specific problem-solving strategy or procedure was used to determine a solution.* (4.5.G) (6.6.D)

5.6.H **Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.** (4.5.H) (6.6.D)

5.6.I **Summarize mathematical information, draw conclusions, and explain reasoning.** (4.5.I) (6.6.E) (6.6.G)

5.6.J *Make and test conjectures based on data (or information) collected from explorations and experiments.* (4.5.J) (6.6.H)

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