Washington State K–8 Mathematics Standards
April 2008

Numbers Strand

In Kindergarten through Grade 2, students learn to use whole numbers to describe sets of objects and locations on the number line. Students in Grades 3-5 extend their understanding of numbers and place value to include fractions and decimals for describing parts of wholes, parts of sets, and locations on the number line. In Grades 6-8, students extend their understanding of positive numbers in fraction and decimal forms and develop an understanding of negative numbers, which along with 0 complete the set of rational numbers. By the end of high school, students are using real numbers, along with complex numbers, to write numerical and algebraic expressions.

This is one of six strand documents that accompany the Washington State K–8 Mathematics Standards, tracking the development of important mathematical ideas and skills across grades K–8. Where content of an expectation may address more than one strand, that expectation may appear in more than one strand document.

Kindergarten

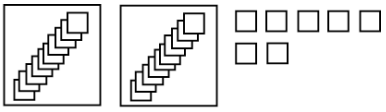
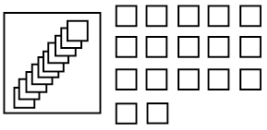
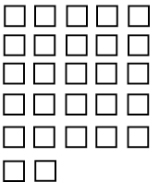
K.1. Core Content: *Whole numbers*

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
K.1.A Rote count by ones forward from 1 to 100 and backward from any number in the range of 10 to 1.	
K.1.B Read aloud numerals from 0 to 31.	Shown numeral cards in random order from 0 to 31, students respond with the correct name of the numerals. Students also demonstrate that they can distinguish 12 from 21 and 13 from 31—a common challenge for kindergartners. The choice of 31 corresponds to the common use of calendar activities in kindergarten.
K.1.D Order numerals from 1 to 10.	The student takes numeral cards (1 to 10) that have been shuffled and puts them in correct ascending order.
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.	
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.	Students should be able to do this without having to start counting at 1.

Grade 1

1.1. Core Content: *Whole number relationships*

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
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.	Research suggests that when students count past 100, they often make errors such as "99, 100, 200" and "109, 110, 120." However, once a student counts to 120 consistently, it is highly improbable that additional counting errors will be made. Example: • Start at 113. Count backward. I'll tell you when to stop. [Stop when the student has counted backward ten numbers.]
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.	The patterns in the base ten number system become clearer to students when they count in the hundreds. Therefore, learning the names of three-digit numbers supports the learning of more difficult two-digit numbers (such as numbers in the teens and numbers ending in 0 or 1).
1.1.D Order objects or events using ordinal numbers.	Students use ordinal numbers to describe positions through the twentieth. Example: • John is fourth in line.
1.1.E Write, compare, and order numbers to 120.	Students arrange numbers in lists or talk about the relationships among numbers using the words *equal to*, *greater than*, *less than*, *greatest*, and *least*. Example: • Write the numbers 27, 2, 111, and 35 from least to greatest. Students might also describe which of two numbers is closer to a given number. This is part of developing an understanding of the relative value of numbers.

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
1.1.G Group numbers into tens and ones in more than one way.	Students demonstrate that the value of a number remains the same regardless of how it is grouped. Grouping of numbers lays a foundation for future work with addition and subtraction of two-digit numbers, where renaming may be necessary. For example, twenty-seven objects can be grouped as 2 tens and 7 ones, regrouped as 1 ten and 17 ones, and regrouped again as 27 ones. The total (27) remains constant. 27 can be shown as  $27 = 10 + 10 + 7$ 27 can be shown as  $27 = 10 + 17$ 27 can be shown as 
1.1.H Group and count objects by tens, fives, and twos.	Given 23 objects, the student will count them by tens as 10, 20, 21, 22, 23; by fives as 5, 10, 15, 20, 21, 22, 23; and by twos as 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 23.
1.1.I Classify a number as odd or even and demonstrate that it is odd or even.	Students use words, objects, or pictures to demonstrate that a given number is odd or even. Example: • 13 is odd because 13 counters cannot be regrouped into two equal piles. • 20 is even because every counter in this set of 20 counters can be paired with another counter in the set.

Grade 2

2.1. Core Content: *Place value and the base ten system*

Performance Expectations		*Explanatory Comments and Examples*
Students are expected to:		
2.1.A	Count by tens or hundreds forward and backward from 1 to 1,000, starting at any number.	Example: • Count forward by tens out loud starting at 32.
2.1.B	Connect place value models with their numerical equivalents to 1,000.	Understanding the relative value of numbers using place value is an important element of our base ten number system. Students should be familiar with representing numbers using words, pictures (including those involving grid paper), or physical objects such as base ten blocks. Money can also be an appropriate model.
2.1.C	Identify the ones, tens, and hundreds place in a number and the digits occupying them.	Examples: • 4 is located in what place in the number 834? • What digit is in the hundreds place in 245?
2.1.D	Write three-digit numbers in expanded form.	Examples: • 573 = 500 + 70 + 3 • 600 + 30 + 7 = 637
2.1.E	Group three-digit numbers into hundreds, tens, and ones in more than one way.	Students should become fluent in naming and renaming numbers based on number sense and their understanding of place value. Examples: • In the number 647, there are 6 hundreds, there are 64 tens, and there are 647 ones. • There are 20 tens in 200 and 10 hundreds in 1,000. • There are 23 tens in 230. • 3 hundreds + 19 tens + 3 ones describes the same number as 4 hundreds + 8 tens + 13 ones.
2.1.F	Compare and order numbers from 0 to 1,000.	Students use the words equal to, greater than, less than, greatest, or least and the symbols =, <, and >.

Grade 2

2.4. Additional Key Content

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
2.4.E Interpret a fraction as a number of equal parts of a whole or a set.	Examples: • Juan, Chan, and Hortense are going to share a large cookie in the shape of a circle. Draw a picture that shows how you can cut up the cookie in three fair shares, and tell how big each piece is as a fraction of the whole cookie. • Ray has two blue crayons, one red crayon, and one yellow crayon. What fraction of Ray's crayons is red? What fraction of the crayons is blue?

Grade 3

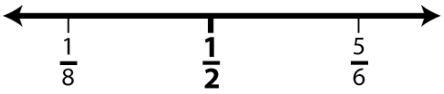
3.1. Core Content: *Addition, Subtraction, and Place Value*

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
3.1.A Read, write, compare, order, and represent numbers to 10,000 using numbers, words, and symbols.	This expectation reinforces and extends place value concepts. Symbols used to describe comparisons include <, >, =. Examples: • Fill in the box with <, >, or = to make a true sentence: 3,546 ☐ 4,356. • Is 5,683 closer to 5,600 or 5,700?
3.1.B Round whole numbers through 10,000 to the nearest ten, hundred, and thousand.	Example: • Round 3,465 to the nearest ten and then to the nearest hundred.

Grade 3

3.3. Core Content: *Fraction concepts*

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
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.	The focus is on numbers less than or equal to 1. Students should be familiar with using words, pictures, physical objects, and equations to represent fractions.

Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
3.3.B Compare and order fractions that have denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.	Fractions can be compared using benchmarks (such as $\frac{1}{2}$ or 1), common numerators, or common denominators. Symbols used to describe comparisons include <, >, =. Fractions with common denominators may be compared and ordered using the numerators as a guide. $\frac{2}{6} < \frac{3}{6} < \frac{5}{6}$ Fractions with common numerators may be compared and ordered using the denominators as a guide. $\frac{3}{10} < \frac{3}{8} < \frac{3}{4}$ Fractions may be compared using $\frac{1}{2}$ as a benchmark. 
3.3.C Represent and identify equivalent fractions with denominators of 2, 3, 4, 5, 6, 8, 9, 10, and 12.	Students could represent fractions using the number line, physical objects, pictures, or numbers.
3.3.D Solve single- and multi-step word problems involving comparison of fractions 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, physical objects, or equations. Examples: • Emile and Jordan ordered a medium pizza. Emile ate $\frac{1}{3}$ of it and Jordan ate $\frac{1}{4}$ of it. Who ate more pizza? Explain how you know. • Janie and Li bought a dozen balloons. Half of them were blue, $\frac{1}{3}$ were white, and $\frac{1}{6}$ were red. Were there more blue, red, or white balloons? Justify your answer.

Grade 4

4.1. Core Content: *Multi-digit multiplication*

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
4.1.B Identify factors and multiples of a number.	Examples: • The factors of 12 are 1, 2, 3, 4, 6, 12. • The multiples of 12 are 12, 24, 36, 48, . . .
4.1.E Compare the values represented by digits in whole numbers using place value.	Example: • 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.)

Grade 4

4.2. Core Content: *Fractions, decimals, and mixed numbers*

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
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. Examples: • 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.

Performance Expectations

Students are expected to:

Explanatory Comments and Examples

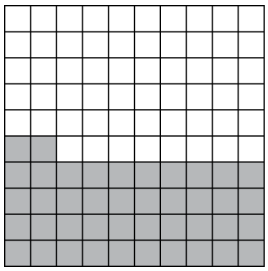
4.2.D Convert a decimal to a fraction and vice versa, and visually represent the number.

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.

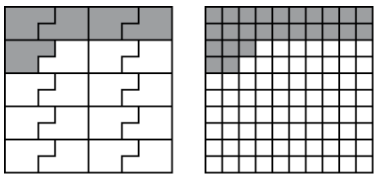
Examples:

- $\frac{3}{10} = 0.3$

- $0.42 = \frac{42}{100}$



- $\frac{5}{20} = 0.25$



4.2.E Compare and order decimals and fractions (including mixed numbers) on the number line, lists, and the symbols <, >, or =.

Examples:

- Compare each pair of numbers using <, >, or =:

$\frac{6}{10} \square 0.8$

$1\frac{1}{2} \square \frac{3}{2}$

$0.75 \square \frac{1}{2}$

- Correctly show $\frac{3}{5}$, 0.35, $3\frac{1}{2}$ on the number line.
- Order the following numbers from least to greatest: $\frac{7}{6}$, 6.2, $\frac{1}{12}$, 0.88.

Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
4.2.F Write a fraction equivalent to a given fraction.	Example: • 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 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. 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.

Grade 5

5.2. Core Content: *Addition and subtraction of fractions and decimals*

Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
5.2.C Given two fractions with unlike denominators, rewrite the fractions with a common denominator.	Fraction pairs include denominators with and without common factors. When students are fluent in writing equivalent fractions, it helps them compare fractions and helps prepare them to add and subtract fractions. Examples: • Write equivalent fractions with a common denominator for $\frac{2}{3}$ and $\frac{3}{4}$. • Write equivalent fractions with a common denominator for $\frac{3}{8}$ and $\frac{1}{6}$.

Performance Expectations	Explanatory Comments and Examples
Students are expected to:	
5.2.D Determine the greatest common factor and the least common multiple of two or more whole numbers.	Least common multiple (LCM) can be used to determine common denominators when adding and subtracting fractions. Greatest common factor (GCF) can be used to simplify fractions.

Grade 5

5.5. Additional Key Content

Performance Expectations	Explanatory Comments and Examples
Students are expected to:	
5.5.A Classify numbers as prime or composite.	Divisibility rules can help determine whether a number has particular factors.

Grade 6

6.1. Core Content: Multiplication and division of fractions and decimals

Performance Expectations	Explanatory Comments and Examples
Students are expected to:	
6.1.A Compare and order non-negative fractions, decimals, and integers using the number line, lists, and the symbols <, >, or =.	Examples: • List the numbers $2\frac{1}{3}$, $\frac{4}{5}$, 0.94, $\frac{5}{4}$, 1.1, and $\frac{43}{50}$ in increasing order, and then graph the numbers on the number line. • Compare each pair of numbers using <, >, or =. $\frac{4}{5} \square 1.2$ $\frac{7}{4} \square 1\frac{3}{4}$ $2\frac{7}{8} \square 2.5$

Grade 6

6.3. Core Content: *Ratios, rates, and percents*

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
6.3.A Identify and write ratios as comparisons of part-to-part and part-to-whole relationships.	Example: • If there are 10 boys and 12 girls in a class, what is the ratio of boys to girls? What is the ratio of the number of boys to the total number of students in the class?
6.3.B Write ratios to represent a variety of rates.	Example: • Julio drove his car 579 miles and used 15 gallons of gasoline. How many miles per gallon did his car get during the trip? Explain your answer.

Grade 6

6.5. Additional Key Content

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
6.5.B Locate positive and negative integers on the number line and use integers to represent quantities in various contexts.	Contexts could include elevation, temperature, or debt, among others.
6.5.C Compare and order positive and negative integers using the number line, lists, and the symbols <, >, or =.	Examples: • Compare each pair of numbers using <, >, or =. –11 ☐ –14 –7 ☐ 4 –101 ☐ –94

Grade 7

7.1. Core Content: *Rational numbers and linear equations*

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
7.1.A Compare and order rational numbers using the number line, lists, and the symbols <, >, or =.	Examples: • List the numbers $\frac{2}{3}, -\frac{2}{3}$, 1.2, $\frac{4}{3}, -\frac{4}{3}$, –1.2, and $-\frac{7}{4}$ in increasing order, and graph the numbers on the number line. • Compare each pair of numbers using <, >, or =. $\frac{-11}{20} \square \frac{-13}{21}$ $\frac{-7}{5} \square$ -1.35 $-2\frac{3}{4} \square$ -2.75
7.1.D Define and determine the absolute value of a number.	Students define absolute value as the distance of the number from zero. Examples: • Explain why 5 and –5 have the same absolute value. • Evaluate |7.8 – 10.3|.

Grade 7

7.5. Additional Key Content

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
7.5.B Write the prime factorization of whole numbers greater than 1, using exponents when appropriate.	Writing numbers in prime factorization is a useful tool for determining the greatest common factor and least common multiple of two or more numbers. Example: • Write the prime factorization of 360 using exponents.

Grade 8

8.2. Core Content: *Properties of geometric figures*

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
8.2.E Quickly recall the square roots of the perfect squares from 1 through 225 and estimate the square roots of other positive numbers.	Students can use perfect squares of integers to determine squares and square roots of related numbers, such as 1.96 and 0.0049. Examples: • Determine: $\sqrt{36}$, $\sqrt{0.25}$, $\sqrt{144}$, and $\sqrt{196}$. • Between which two consecutive integers does the square root of 74 lie?

Grade 8

8.4. Additional Key Content

Performance Expectations	*Explanatory Comments and Examples*
Students are expected to:	
8.4.A Represent numbers in scientific notation, and translate numbers written in scientific notation into standard form.	Examples: • Represent 4.27×10^{-3} in standard form. • Represent 18,300,000 in scientific notation. • Throughout the year 2004, people in the city of Cantonville sent an average of 400 million text messages a day. Using this information, about how many total text messages did Cantonville residents send in 2004? (2004 was a leap year.) Express your answer in scientific notation.
8.4.D Identify rational and irrational numbers.	Students should know that rational numbers are numbers that can be represented as the ratio of two integers; that the decimal expansions of rational numbers have repeating patterns, or *terminate*; and that there are numbers that are not rational. Example: • Identify whether each number is rational or irrational and explain your choice. $3.14,\quad 4.\overline{6},\quad \frac{1}{11},\quad \sqrt{2},\quad \sqrt{25},\quad \pi$