Minnesota K-12 Academic Standards in Mathematics
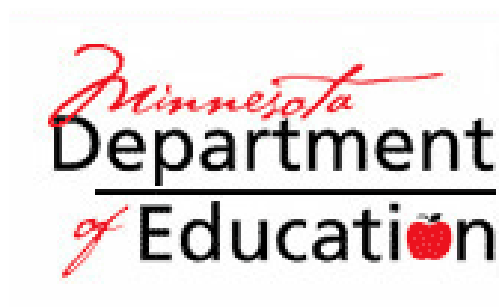
April 14, 2007 Revision

Sorted by Grade Level

	Strand	Standard	No.	Benchmark
K	Number & Operation	Understand the relationship between quantities and whole numbers up to 31.	0.1.1.1	Recognize that a number can be used to represent how many objects are in a set or to represent the position of an object in a sequence. *For example:* Count students standing in a circle and count the same students after they take their seats. Recognize that this rearrangement does not change the total number. Also recognize that rearrangement typically changes the order in which students are counted.
			0.1.1.2	Read, write, and represent whole numbers from 0 to at least 31. Representations may include numerals, pictures, real objects and picture graphs, spoken words, and manipulatives such as connecting cubes. *For example:* Represent the number of students taking hot lunch with tally marks.
			0.1.1.3	Count, with and without objects, forward and backward to at least 20.
			0.1.1.4	Find a number that is 1 more or 1 less than a given number.
			0.1.1.5	Compare and order whole numbers, with and without objects, from 0 to 20. *For example:* Put the number cards 7, 3, 19 and 12 in numerical order.
		Use objects and pictures to represent situations involving combining and separating.	0.1.2.1	Use objects and draw pictures to find the sums and differences of numbers between 0 and 10.
			0.1.2.2	Compose and decompose numbers up to 10 with objects and pictures. *For example:* A group of 7 objects can be decomposed as 5 and 2 objects, or 3 and 2 and 2, or 6 and 1.
	Algebra	Recognize, create, complete, and extend patterns.	0.2.1.1	Identify, create, complete, and extend simple patterns using shape, color, size, number, sounds and movements. Patterns may be repeating, growing or shrinking such as ABB, ABB, ABB or ●,●●,●●●.
1	Number & Operation	Count, compare and represent whole numbers up to 120, with an emphasis on groups of tens and ones.	1.1.1.1	Use place value to describe whole numbers between 10 and 100 in terms of groups of tens and ones. *For example:* Recognize the numbers 11 to 19 as one group of ten and a particular number of ones.
			1.1.1.2	Read, write and represent whole numbers up to 120. Representations may include numerals, addition and subtraction, pictures, tally marks, number lines and manipulatives, such as bundles of sticks and base 10 blocks.
			1.1.1.3	Count, with and without objects, forward and backward from any given number up to 120.
			1.1.1.4	Find a number that is 10 more or 10 less than a given number. *For example:* Using a hundred grid, find the number that is 10 more than 27.
			1.1.1.5	Compare and order whole numbers up to 100.

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			1.1.1.6	Use words to describe the relative size of numbers. *For example:* Use the words equal to, not equal to, more than, less than, fewer than, is about, and is nearly to describe numbers.
			1.1.1.7	Use counting and comparison skills to create and analyze bar graphs and tally charts. *For example:* Make a bar graph of students' birthday months and count to compare the number in each month.
	Number & Operation	Use a variety of models and strategies to solve addition and subtraction problems in real-world and mathematical contexts.	1.1.2.1	Use words, pictures, objects, length-based models (connecting cubes), numerals and number lines to model and solve addition and subtraction problems in part-part-total, adding to, taking away from and comparing situations.
			1.1.2.2	Compose and decompose numbers up to 12 with an emphasis on making ten. *For example:* Given 3 blocks, 7 more blocks are needed to make 10.
			1.1.2.3	Recognize the relationship between counting and addition and subtraction. Skip count by 2s, 5s, and 10s.
	Algebra	Recognize and create patterns; use rules to describe patterns.	1.2.1.1	Create simple patterns using objects, pictures, numbers and rules. Identify possible rules to complete or extend patterns. Patterns may be repeating, growing or shrinking. Calculators can be used to create and explore patterns. *For example:* Describe rules that can be used to extend the pattern 2, 4, 6, 8, □, □, □ and complete the pattern 33, 43, □, 63, □, 83 or 20, □, □, 17.
1	Algebra	Use number sentences involving addition and subtraction basic facts to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.	1.2.2.1	Represent real-world situations involving addition and subtraction basic facts, using objects and number sentences. *For example:* One way to represent the number of toys that a child has left after giving away 4 of 6 toys is to begin with a stack of 6 connecting cubes and then break off 4 cubes.
			1.2.2.2	Determine if equations involving addition and subtraction are true. *For example*: Determine if the following number sentences are true or false $$7 = 7$$ $$7 = 8 - 1$$ $$5 + 2 = 2 + 5$$ $$4 + 1 = 5 + 2.$$
			1.2.2.3	Use number sense and models of addition and subtraction, such as objects and number lines, to identify the missing number in an equation such as: $$2 + 4 = \square$$ $$3 + \square = 7$$ $$5 = \square - 3.$$

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			1.2.2.4	Use addition or subtraction basic facts to represent a given problem situation using a number sentence. *For example*: 5 + 3 = 8 could be used to represent a situation in which 5 red balloons are combined with 3 blue balloons to make 8 total balloons.
2	Number & Operation	Compare and represent whole numbers up to 1000, with an emphasis on place value.	2.1.1.1	Read, write and represent whole numbers up to 1000. Representations may include numerals, addition, subtraction, multiplication, words, pictures, tally marks, number lines and manipulatives, such as bundles of sticks and base 10 blocks.
			2.1.1.2	Use place value to describe whole numbers between 10 and 1000 in terms of groups of hundreds, tens and ones. Know that 100 is ten groups of 10, and 1000 is ten groups of 100. *For example*: Writing 853 is a shorter way of writing 8 hundreds + 5 tens + 3 ones.
			2.1.1.3	Find 10 more or 10 less than any given three-digit number. Find 100 more or 100 less than any given three-digit number. *For example*: Find the number that is 10 less than 382 and the number that is 100 more than 382.
			2.1.1.4	Round numbers up to the nearest 10 and 100 and round numbers down to the nearest 10 and 100. *For example*: If there are 17 students in the class and granola bars come 10 to a box, you need to buy 20 bars (2 boxes) in order to have enough bars for everyone.
			2.1.1.5	Compare and order whole numbers up to 1000.
			2.1.1.6	Use addition and subtraction to create and obtain information from tables, bar graphs and tally charts.
		Demonstrate mastery of addition and subtraction basic facts; add and subtract one- and two-digit numbers in real-world and mathematical problems.	2.1.2.1	Use strategies to generate addition and subtraction facts including making tens, fact families, doubles plus or minus one, counting on, counting back, and the commutative and associative properties. Use the relationship between addition and subtraction to generate basic facts. *For example*: Use the associative property to make ten when adding 5 + 8 = (3 + 2) + 8 = 3 + (2 + 8) = 3 + 10 = 13.
			2.1.2.2	Demonstrate fluency with basic addition facts and related subtraction facts.
		Demonstrate mastery of addition and	2.1.2.3	Estimate sums and differences up to 100. *For example*: Know that 23 + 48 is about 70.

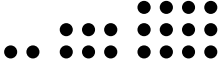|	Strand	Standard	No.	Benchmark
2	Number & Operation	subtraction basic facts; add and subtract one- and two-digit numbers in real-world and mathematical problems.	2.1.2.4	Use mental strategies and algorithms based on knowledge of place value to add and subtract two-digit numbers. Strategies may include decomposition, expanded notation, and partial sums and differences. *For example*: Using decomposition, 78 + 42, can be thought of as: $$78 + 2 + 20 + 20 = 80 + 20 + 20 = 100 + 20 = 120$$ and using expanded notation, 34 - 21 can be thought of as: $$30 + 4 - 20 - 1 = 30 - 20 + 4 - 1 = 10 + 3 = 13.$$
			2.1.2.5	Solve real-world and mathematical addition and subtraction problems involving whole numbers with up to 2 digits.
	Algebra	Recognize, create, describe, and use patterns and rules to solve real-world and mathematical problems.	2.2.1.1	Identify, create and describe simple number patterns involving repeated addition or subtraction, skip counting and arrays of objects such as counters or tiles. Use patterns to solve problems in various contexts. *For example*: Skip count by 5 beginning at 3 to create the pattern 3, 8, 13, 18, …. *Another example*: Collecting 7 empty milk cartons each day for 5 days will generate the pattern 7, 14, 21, 28, 35, resulting in a total of 35 milk cartons.
		Use number sentences involving addition, subtraction and unknowns to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.	2.2.2.1	Understand how to interpret number sentences involving addition, subtraction and unknowns represented by letters. Use objects and number lines and create real-world situations to represent number sentences. *For example*: One way to represent $n + 16 = 19$ is by comparing a stack of 16 connecting cubes to a stack of 19 connecting cubes; $24 = a + b$ can be represented by a situation involving a birthday party attended by a total of 24 boys and girls.
			2.2.2.2	Use number sentences involving addition, subtraction, and unknowns to represent given problem situations. Use number sense and properties of addition and subtraction to find values for the unknowns that make the number sentences true. *For example*: How many more players are needed if a soccer team requires 11 players and so far only 6 players have arrived? This situation can be represented by the number sentence $11 - 6 = p$ or by the number sentence $6 + p = 11$.

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3	Number & Operation	Compare and represent whole numbers up to 10,000, with an emphasis on place value.	3.1.1.1	Read, write and represent whole numbers up to 10,000. Representations may include numerals, expressions with operations, words, pictures, number lines, and manipulatives such as bundles of sticks and base 10 blocks.
			3.1.1.2	Use place value to describe whole numbers between 1000 and 10,000 in terms of groups of thousands, hundreds, tens and ones. *For example*: Writing 4,873 is a shorter way of writing the following sums: 4 thousands + 8 hundreds + 7 tens + 3 ones; 48 hundreds + 7 tens + 3 ones; 487 tens + 3 ones.
			3.1.1.3	Find 1000 more or 1000 less than any given four-digit number. Find 100 more or 100 less than a given four-digit number.
3		Compare and represent whole numbers up to 10,000, with an emphasis on place value.	3.1.1.4	Round numbers to the nearest 1000, 100 and 10. Round up and round down to estimate sums and differences. *For example*: 8726 rounded to the nearest 1000 is 9000, rounded to the nearest 100 is 8700, and rounded to the nearest 10 is 8730. *Another example*: 473 – 291 is between 400 – 300 and 500 – 200, or between 100 and 300.
			3.1.1.5	Compare and order whole numbers up to 10,000.
3	Number & Operation	Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world and mathematical problems using arithmetic.	3.1.2.1	Add and subtract multi-digit numbers, using efficient and generalizable procedures based on knowledge of place value, including standard algorithms.
			3.1.2.2	Use addition and subtraction to solve real-world and mathematical problems involving whole numbers. Assess the reasonableness of results based on the context. Use various strategies, including the use of a calculator and the relationship between addition and subtraction, to check for accuracy. *For example*: The calculation 117 – 83 = 34 can be checked by adding 83 and 34.
			3.1.2.3	Represent multiplication facts by using a variety of approaches, such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line and skip counting. Represent division facts by using a variety of approaches, such as repeated subtraction, equal sharing and forming equal groups. Recognize the relationship between multiplication and division.

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			3.1.2.4	Solve real-world and mathematical problems involving multiplication and division, including both "how many in each group" and "how many groups" division problems. *For example*: You have 27 people and 9 tables. If each table seats the same number of people, how many people will you put at each table? *Another example*: If you have 27 people and tables that will hold 9 people, how many tables will you need?
			3.1.2.5	Use strategies and algorithms based on knowledge of place value and properties of addition and multiplication to multiply a two- or three-digit number by a one-digit number. Strategies may include mental strategies, partial products, the standard algorithm, and the commutative, associative, and distributive properties. *For example*: $9 \times 26 = 9 \times (20 + 6) = 9 \times 20 + 9 \times 6 = 180 + 54 = 234$.
3	Number & Operation	Understand meanings and uses of fractions in real-world and mathematical situations.	3.1.3.1	Read and write fractions with words and symbols. Recognize that fractions can be used to represent parts of a whole, parts of a set, points on a number line, or distances on a number line. *For example*: Parts of a shape (3/4 of a pie), parts of a set (3 out of 4 people), and measurements (3/4 of an inch).
			3.1.3.2	Understand that the size of a fractional part is relative to the size of the whole. *For example*: One-half of a small pizza is smaller than one-half of a large pizza, but both represent one-half.
			3.1.3.3	Order and compare unit fractions and fractions with like denominators by using models and an understanding of the concept of numerator and denominator.
	Algebra	Use single-operation input-output rules to represent patterns and relationships and to solve real-world and mathematical problems.	3.2.1.1	Create, describe, and apply single-operation input-output rules involving addition, subtraction and multiplication to solve problems in various contexts. *For example*: Describe the relationship between number of chairs and number of legs by the rule that the number of legs is four times the number of chairs.
		Use number sentences involving multiplication and division basic	3.2.2.1	Understand how to interpret number sentences involving multiplication and division basic facts and unknowns. Create real-world situations to represent number sentences. *For example*: The number sentence $8 \times m = 24$ could be represented by the question "How much did each ticket to a play cost if 8 tickets totaled $24?"

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		facts and unknowns to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.	3.2.2.2	Use multiplication and division basic facts to represent a given problem situation using a number sentence. Use number sense and multiplication and division basic facts to find values for the unknowns that make the number sentences true. *For example*: Find values of the unknowns that make each number sentence true $$6 = p \div 9$$ $$24 = a \times b$$ $$5 \times 8 = 4 \times t.$$ *Another example*: How many math teams are competing if there is a total of 45 students with 5 students on each team? This situation can be represented by $5 \times n = 45$ or $\frac{45}{5} = n$ or $\frac{45}{n} = 5$.
4	Number & Operation	Compare and represent whole numbers up to 100,000, with an emphasis on place value.	4.1.1.1	Read, write and represent whole numbers up to 100,000. Representations include numerals, words and expressions with operations.
			4.1.1.2	Find 10,000 more and 10,000 less than a given five-digit number. Find 1,000 more and 1,000 less than a given five-digit number.
			4.1.1.3	Use an understanding of place value to multiply a number by 10, 100 and 1000.

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4	Number & Operation	Demonstrate mastery of multiplication and division basic facts; multiply multi-digit numbers; solve real-world and mathematical problems using arithmetic.	4.1.2.1	Demonstrate fluency with multiplication and division facts.
			4.1.2.2	Multiply multi-digit numbers, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms.
			4.1.2.3	Estimate products and quotients of multi-digit whole numbers by using rounding, benchmarks and place value to assess the reasonableness of results in calculations. *For example*: 53×38 is between 50×30 and 60×40, or between 1500 and 2400, and 411/73 is between 400/80 and 500/70, or between 5 and 7.
			4.1.2.4	Solve multi-step real-world and mathematical problems requiring the use of addition, subtraction and multiplication of multi-digit whole numbers. Use various strategies including the relationships between the operations and a calculator to check for accuracy.
			4.1.2.5	Use strategies and algorithms based on knowledge of place value and properties of operations to divide multi-digit whole numbers by one- or two-digit numbers. Strategies may include mental strategies, partial quotients, the commutative, associative, and distributive properties and repeated subtraction. *For example*: A group of 324 students are going to a museum in 6 buses. If each bus has the same number of students, how many students will be on each bus?
		Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how decimals represent quantities.	4.1.3.1	Represent equivalent fractions using fraction models such as parts of a set, fraction circles, fraction strips, number lines and other manipulatives. Use the models to determine equivalent fractions.
			4.1.3.2	Locate fractions on a number line. Use models to order and compare whole numbers and fractions, including mixed numbers and improper fractions. *For example*: Locate $\frac{5}{3}$ and $1\frac{3}{4}$ on a number line and give a comparison statement about these two fractions, such as " $\frac{5}{3}$ is less than $1\frac{3}{4}$."
			4.1.3.3	Use fraction models to add and subtract fractions with like denominators in real-world and mathematical situations. Develop a rule for addition and subtraction of fractions with like denominators.

4	Number & Operation	Represent and compare fractions and decimals in real-world and mathematical situations; use place value to understand how	4.1.3.4	Read and write decimals with words and symbols; use place value to describe decimals in terms of groups of thousands, hundreds, tens, ones, tenths, hundredths and thousandths.
				
				For example: Writing 362.45 is a shorter way of writing the sum:
				
				    3 hundreds + 6 tens + 2 ones + 4 tenths + 5 hundredths,
				
				which can also be written as:
				
				    three hundred sixty-two and forty-five hundredths.

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	decimals represent quantities.	4.1.3.5	Compare and order decimals and whole numbers using place value, a number line and models such as grids and base 10 blocks.
		4.1.3.6	Locate the relative position of fractions, mixed numbers and decimals on a number line.
		4.1.3.7	Read and write tenths and hundredths in decimal and fraction notations using words and symbols; know the fraction and decimal equivalents for halves and fourths. *For example*: $\frac{1}{2} = 0.5 = 0.50$ and $\frac{7}{4} = 1\frac{3}{4} = 1.75$, which can also be written as one and three-fourths or one and seventy-five hundredths.
		4.1.3.8	Round decimal values to the nearest tenth. *For example*: The number 0.36 rounded to the nearest tenth is 0.4.
Algebra	Use input-output rules, tables and charts to represent patterns and relationships and to solve real-world and mathematical problems.	4.2.1.1	Create and use input-output rules involving addition, subtraction, multiplication and division to solve problems in various contexts. Record the inputs and outputs in a chart or table. *For example*: If the rule is "multiply by 3 and add 4," record the outputs for given inputs in a table. *Another example*: A student is given these three arrangements of dots: Identify a pattern that is consistent with these figures, create an input-output rule that describes the pattern, and use the rule to find the number of dots in the 10th figure.

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4	Algebra	Use number sentences involving multiplication, division and unknowns to represent and solve real-world and mathematical problems; create real-world situations corresponding to number sentences.	4.2.2.1	Understand how to interpret number sentences involving multiplication, division and unknowns. Use real-world situations involving division to represent number sentences. *For example*: The number sentence $a \times b = 60$ can be represented by the situation in which chairs are being arranged in equal rows and the total number of chairs is 60.
			4.2.2.2	Use multiplication, division and unknowns to represent a given problem situation using a number sentence. Use number sense, properties of multiplication, and the relationship between multiplication and division to find values for the unknowns that make the number sentences true. *For example*: If \$84 is to be shared equally among a group of children, the amount of money each child receives can be determined using the number sentence $84 \div n = d$. *Another example*: Find values of the unknowns or variables that make each number sentence true: $$12 \times m = 36$$ $$s = 256 \div t.$$

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	Data Analysis	Collect, organize, display and interpret data, including data collected over a period of time and data represented by fractions and decimals.	4.4.1.1	Use tables, bar graphs, timelines and Venn diagrams to display data sets. The data may include fractions or decimals. Understand that spreadsheet tables and graphs can be used to display data.
5	Number & Operation	Divide multi-digit numbers; solve real-world and mathematical problems using arithmetic.	5.1.1.1	Divide multi-digit numbers, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms. Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal. *For example*: Dividing 153 by 7 can be used to convert the improper fraction $\frac{153}{7}$ to the mixed number $21\frac{6}{7}$.
			5.1.1.2	Consider the context in which a problem is situated to select the most useful form of the quotient for the solution and use the context to interpret the quotient appropriately. *For example*: If 77 amusement ride tickets are to be distributed evenly among 4 children, each child will receive 19 tickets, and there will be one left over. If \$77 is to be distributed evenly among 4 children, each will receive \$19.25, with nothing left over.
			5.1.1.3	Estimate solutions to arithmetic problems in order to assess the reasonableness of results of calculations.
			5.1.1.4	Solve real-world and mathematical problems requiring addition, subtraction, multiplication and division of multi-digit whole numbers. Use various strategies, including the use of a calculator and the inverse relationships between operations, to check for accuracy. *For example*: The calculation $117 \div 9 = 13$ can be checked by multiplying 9 and 13.

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5 Number & Operation	Read, write, represent and compare fractions and decimals; recognize and write equivalent fractions; convert between fractions and decimals; use fractions and decimals in real-world and mathematical situations.	5.1.2.1	Read and write decimals using place value to describe decimals in terms of groups from millionths to millions. *For example*: Possible names for the number 0.37 are: 37 hundredths 3 tenths + 7 hundredths; possible names for the number 1.5 are: one and five tenths 15 tenths.
		5.1.2.2	Find 0.1 more than a number and 0.1 less than a number. Find 0.01 more than a number and 0.01 less than a number. Find 0.001 more than a number and 0.001 less than a number.
		5.1.2.3	Order fractions and decimals, including mixed numbers and improper fractions, and locate on a number line. *For example*: Which is larger 1.25 or $\frac{6}{5}$? *Another example*: In order to work properly, a part must fit through a 0.24 inch wide space. If a part is $\frac{1}{4}$ inch wide, will it fit?
		5.1.2.4	Recognize and generate equivalent decimals, fractions, mixed numbers and improper fractions in various contexts. *For example*: When comparing 1.5 and $\frac{19}{12}$, note that $1.5 = 1\frac{1}{2} = 1\frac{6}{12} = \frac{18}{12}$, so $1.5 < \frac{19}{12}$.
		5.1.2.5	Round numbers to the nearest 0.1, 0.01 and 0.001. *For example*: Fifth grade students used a calculator to find the mean of the monthly allowance in their class. The calculator display shows 25.80645161. Round this number to the nearest cent.
	Add and subtract fractions, mixed numbers and decimals to solve real-world and mathematical problems.	5.1.3.1	Add and subtract decimals and fractions, using efficient and generalizable procedures, including standard algorithms.
		5.1.3.2	Model addition and subtraction of fractions and decimals using a variety of representations. *For example*: Represent $\frac{2}{3} + \frac{1}{4}$ and $\frac{2}{3} - \frac{1}{4}$ by drawing a rectangle divided into 4 columns and 3 rows and shading the appropriate parts or by using fraction circles or bars.

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		5.1.3.3	Estimate sums and differences of decimals and fractions to assess the reasonableness of results in calculations. *For example*: Recognize that $12\frac{2}{5} - 3\frac{3}{4}$ is between 8 and 9 (since $\frac{2}{5} < \frac{3}{4}$).
		5.1.3.4	Solve real-world and mathematical problems requiring addition and subtraction of decimals, fractions and mixed numbers, including those involving measurement, geometry and data. *For example*: Calculate the perimeter of the soccer field when the length is 109.7 meters and the width is 73.1 meters.
5	Algebra	Recognize and represent patterns of change; use patterns, tables, graphs and rules to solve real-world and mathematical problems.	5.2.1.1	Create and use rules, tables, spreadsheets and graphs to describe patterns of change and solve problems. *For example*: An end-of-the-year party for 5th grade costs $100 to rent the room and $4.50 for each student. Know how to use a spreadsheet to create an input-output table that records the total cost of the party for any number of students between 90 and 150.
			5.2.1.2	Use a rule or table to represent ordered pairs of positive integers and graph these ordered pairs on a coordinate system.
		Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving whole numbers.	5.2.2.1	Apply the commutative, associative and distributive properties and order of operations to generate equivalent numerical expressions and to solve problems involving whole numbers. *For example*: Purchase 5 pencils at 19 cents and 7 erasers at 19 cents. The numerical expression is $5 \times 19 + 7 \times 19$ which is the same as $(5 + 7) \times 19$.
		Understand and interpret equations and inequalities involving variables and whole numbers, and use them to represent and solve real-world and	5.2.3.1	Determine whether an equation or inequality involving a variable is true or false for a given value of the variable. *For example*: Determine whether the inequality $1.5 + x < 10$ is true for $x = 2.8$, $x = 8.1$, or $x = 9.2$.

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	mathematical problems.	5.2.3.2	Represent real-world situations using equations and inequalities involving variables. Create real-world situations corresponding to equations and inequalities. *For example*: $250 - 27 \times a = b$ can be used to represent the number of sheets of paper remaining from a packet of 250 when each student in a class of 27 is given a certain number of sheets.
		5.2.3.3	Evaluate expressions and solve equations involving variables when values for the variables are given. *For example*: Using the formula, $A = \ell w$, determine the area when the length is 5, and the width 6, and find the length when the area is 24 and the width is 4.
6 Number & Operation	Read, write, represent and compare positive rational numbers expressed as fractions, decimals, percents and ratios; write positive integers as products of factors; use these representations in real-world and mathematical situations.	6.1.1.1	Locate positive rational numbers on a number line and plot pairs of positive rational numbers on a coordinate grid.
		6.1.1.2	Compare positive rational numbers represented in various forms. Use the symbols < and >. *For example*: $\frac{1}{2} > 0.36$.
		6.1.1.3	Understand that percent represents parts out of 100 and ratios to 100. *For example*: 75% is equivalent to the ratio 75 to 100, which is equivalent to the ratio 3 to 4.
		6.1.1.4	Determine equivalences among fractions, decimals and percents; select among these representations to solve problems. *For example*: Since $\frac{1}{10}$ is equivalent to 10%, if a woman making $25 an hour gets a 10% raise, she will make an additional $2.50 an hour, because $2.50 is $\frac{1}{10}$ of $25.
		6.1.1.5	Factor whole numbers; express a whole number as a product of prime factors with exponents. *For example*: $24 = 2^3 \times 3$.

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		6.1.1.6	Determine greatest common factors and least common multiples. Use common factors and common multiples to do arithmetic with fractions and find equivalent fractions. *For example*: Factor the numerator and denominator of a fraction to determine an equivalent fraction.
		6.1.1.7	Convert between equivalent representations of positive rational numbers. *For example*: Express $\frac{10}{7}$ as $\frac{7+3}{7} = \frac{7}{7} + \frac{3}{7} = 1\frac{3}{7}$.
6 Number & Operation	Understand the concept of ratio and its relationship to fractions and to the multiplication and division of whole numbers. Use ratios to solve real-world and mathematical problems.	6.1.2.1	Identify and use ratios to compare quantities; understand that comparing quantities using ratios is not the same as comparing quantities using subtraction. *For example*: In a classroom with 15 boys and 10 girls, compare the numbers by subtracting (there are 5 more boys than girls) or by dividing (there are 1.5 times as many boys as girls). The comparison using division may be expressed as a ratio of boys to girls (3 to 2 or 3:2 or 1.5 to 1).
		6.1.2.2	Apply the relationship between ratios, equivalent fractions and percents to solve problems in various contexts, including those involving mixtures and concentrations. *For example*: If 5 cups of trail mix contains 2 cups of raisins, the ratio of raisins to trail mix is 2 to 5. This ratio corresponds to the fact that the raisins are $\frac{2}{5}$ of the total, or 40% of the total. And if one trail mix consists of 2 parts peanuts to 3 parts raisins, and another consists of 4 parts peanuts to 8 parts raisins, then the first mixture has a higher concentration of peanuts.
		6.1.2.3	Determine the rate for ratios of quantities with different units. *For example*: 60 miles in 3 hours is equivalent to 20 miles in one hour (20 mph).
		6.1.2.4	Use reasoning about multiplication and division to solve ratio and rate problems. *For example*: If 5 items cost $3.75, and all items are the same price, then 1 item costs 75 cents, so 12 items cost $9.00.

Strand	Standard	No.	Benchmark
	Multiply and divide decimals, fractions and mixed numbers; solve real-world and mathematical problems using arithmetic with positive rational numbers.	6.1.3.1	Multiply and divide decimals and fractions, using efficient and generalizable procedures, including standard algorithms.
		6.1.3.2	Use the meanings of fractions, multiplication, division and the inverse relationship between multiplication and division to make sense of procedures for multiplying and dividing fractions. *For example*: Just as $\frac{12}{4} = 3$ means $12 = 3 \times 4$, $\frac{2}{3} \div \frac{4}{5} = \frac{5}{6}$ means $\frac{5}{6} \times \frac{4}{5} = \frac{2}{3}$.
		6.1.3.3	Calculate the percent of a number and determine what percent one number is of another number to solve problems in various contexts. *For example*: If John has $45 and spends $15, what percent of his money did he keep?
		6.1.3.4	Solve real-world and mathematical problems requiring arithmetic with decimals, fractions and mixed numbers.
		6.1.3.5	Estimate solutions to problems with whole numbers, fractions and decimals and use the estimations to assess the reasonableness of computations and of results in the context of the problem. *For example*: The sum $\frac{1}{3} + 0.25$ can be estimated to be between $\frac{1}{2}$ and 1, and this estimate can be used as a check on the result of a more detailed calculation.
Algebra	Recognize and represent relationships between varying quantities; translate from one representation to another; use patterns, tables, graphs and rules to solve real-world and mathematical problems.	6.2.1.1	Understand that a variable can be used to represent a quantity that can change, often in relationship to another changing quantity. Use variables in various contexts. *For example*: If a student earns $7 an hour in a job, the amount of money earned can be represented by a variable and is related to the number of hours worked, which also can be represented by a variable.

Strand	Standard	No.	Benchmark
		6.2.1.2	Represent the relationship between two varying quantities with function rules, graphs and tables; translate between any two of these representations. *For example*: Describe the terms in the sequence of perfect squares $t = 1, 4, 9, 16, ...$ by using the rule $t = n^2$ for $n = 1, 2, 3, 4, ...$
	Use properties of arithmetic to generate equivalent numerical expressions and evaluate expressions involving positive rational numbers.	6.2.2.1	Apply the associative, commutative and distributive properties and order of operations to generate equivalent expressions and to solve problems involving positive rational numbers. *For example*: $\frac{32}{15} \times \frac{5}{6} = \frac{32 \times 5}{15 \times 6} = \frac{2 \times 16 \times 5}{3 \times 5 \times 3 \times 2} = \frac{16}{9} \times \frac{2}{2} \times \frac{5}{5} = \frac{16}{9}$. *Another example*: Use the distributive law to write: $\frac{1}{2} + \frac{1}{3} \cdot \frac{9}{2} - \frac{15}{8} = \frac{1}{2} + \frac{1}{3} \times \frac{9}{2} - \frac{1}{3} \times \frac{15}{8} = \frac{1}{2} + \frac{3}{2} - \frac{5}{8} = 2 - \frac{5}{8} = 1\frac{3}{8}$.
	Understand and interpret equations and inequalities involving variables and positive rational numbers. Use equations and inequalities to represent real-world and mathematical problems; use the idea of maintaining equality to solve equations. Interpret solutions in the original context.	6.2.3.1	Represent real-world or mathematical situations using equations and inequalities involving variables and positive rational numbers. *For example*: The number of miles *m* in a *k* kilometer race is represented by the equation *m* = 0.62 *k*.
		6.2.3.2	Solve equations involving positive rational numbers using number sense, properties of arithmetic and the idea of maintaining equality on both sides of the equation. Interpret a solution in the original context and assess the reasonableness of results. *For example*: A cellular phone company charges $0.12 per minute. If the bill was $11.40 in April, how many minutes were used?
		6.3.1.2	Calculate the area of quadrilaterals. Quadrilaterals include squares, rectangles, rhombuses, parallelograms, trapezoids and kites. When formulas are used, be able to explain why they are valid. *For example*: The area of a kite is one-half the product of the lengths of the diagonals, and this can be justified by decomposing the kite into two triangles.