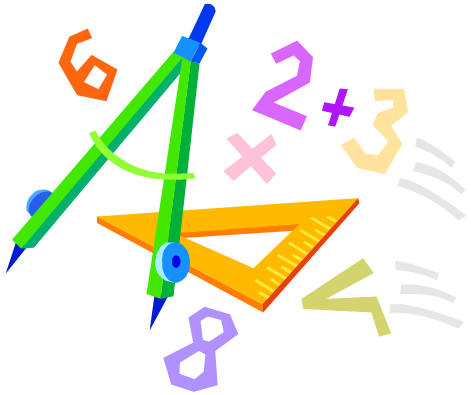
MATHEMATICS
ALIGNED STANDARDS OF LEARNING CURRICULUM FRAMEWORK
GRADE 5



5M-NSCE1 The student will

a) compare numbers to each other based on place value groups by composing and decomposing to 99;

b) recognize patterns in the number of zeros when multiplying a number by powers of 10;

c) round two-digit whole numbers to the nearest 10 from 0-90.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The structure of the Base-10 number system is based upon a simple pattern of tens in which each place is ten times the value of the place to its right. This is known as a ten-to-one place value relationship. • A decimal point separates the whole number places from the places less than one. Place values extend infinitely in two directions from a decimal point. A number containing a decimal point is called a *decimal number* or simply a *decimal*. • To read decimals, – read the whole number to the left of the decimal point, if there is one; – read the decimal point as "and"; – read the digits to the right of the decimal point just as you would read a whole number; and – say the name of the place value of the digit in the smallest place. • Decimals may be written in a variety of forms: – Standard: 23.456 – Written: Twenty-three and four hundred fifty-six thousandths – Expanded: $(2 \times 10) + (3 \times 1) + (4 \times 0.1) + (5 \times 0.01) + (6 \times 0.001)$ • To help students identify the ten-to-one place value relationship for decimals through thousandths, use Base-10 manipulatives, such	**All students should** • Understand that decimals are rounded in a way that is similar to the way whole numbers are rounded. • Understand that decimal numbers can be rounded to estimate when exact numbers are not needed for the situation at hand.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Round decimal numbers to the nearest whole number, tenth, or hundredth.

5M-NSCE1 The student will

a) compare numbers to each other based on place value groups by composing and decomposing to 99;

b) recognize patterns in the number of zeros when multiplying a number by powers of 10;

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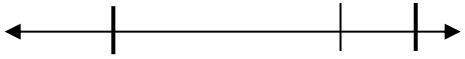
UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
as place value mats/charts, decimal squares, Base-10 blocks, and money. • Decimals can be rounded to the nearest whole number, tenth or hundredth in situations when exact numbers are not needed. • Strategies for rounding decimal numbers to the nearest whole number, tenth and hundredth are as follows: • Look one place to the right of the digit to which you wish to round. • If the digit is less than 5, leave the digit in the rounding place as it is, and change the digits to the right of the rounding place to zero. • If the digit is 5 or greater, add 1 to the digit in the rounding place and change the digits to the right of the rounding place to zero. • Create a number line that shows the decimal that is to be rounded. • The position of the decimal will help children conceptualize the number's placement relative for rounding. An example is to round 5.747 to the nearest hundredth:  5.74 5.747 5.75		

5M-NSCE2 The student will

a) multiply whole numbers up to 5;

b) apply the concept of fair share and equal shares to divide.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• An example of an approach to solving problems is Polya's four-step plan: – Understand: Retell the problem; read it twice; take notes; study the charts or diagrams; look up words and symbols that are new. – Plan: Decide what operation(s) to use and what sequence of steps to use to solve the problem. – Solve: Follow the plan and work accurately. If the first attempt doesn't work, try another plan. – Look back: Does the answer make sense? • Estimation gives a rough idea of an amount. Strategies such as front-end, rounding, and mental computation may be used to estimate addition, subtraction, multiplication, and division of whole numbers. • Examples of problems to be solved by using estimation strategies are encountered in shopping for groceries, buying school supplies, budgeting allowance, and sharing the cost of a pizza or the prize money from a contest. • Estimation can be used to check the reasonableness of the results.	**All students should** • Understand the meaning of mathematical operations and how these operations relate to one another when creating and solving single-step and multistep word problems.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Select appropriate methods and tools from among paper and pencil, estimation, mental computation, and calculators according to the context and nature of the computation in order to compute with whole numbers. • Create single-step and multistep problems involving the operations of addition, subtraction, multiplication, and division with and without remainders of whole numbers, using practical situations. • Estimate the sum, difference, product, and quotient of whole number computations. • Solve single-step and multistep problems involving addition, subtraction, multiplication, and division with and without remainders of whole numbers, using paper and pencil, mental computation, and calculators in which – sums, differences, and products will not exceed five digits; – multipliers will not exceed two digits; – divisors will not exceed two digits; or – dividends will not exceed four digits. • Use two or more operational steps to solve a multistep problem. Operations can be the same or different.

5M-NSCE3 The student will

a) illustrate the concept of division using fair and equal shares.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Addition and subtraction of decimals may be investigated using a variety of models (e.g., 10-by-10 grids, number lines, money). • Decimal computation uses similar procedures as those developed for whole number computation and applies them to decimal place values, giving careful attention to the placement of the decimal point in the solution. • Multiplication of decimals follows the same procedure as multiplication of whole numbers. The only difference is that a decimal point must be correctly placed in the product giving careful attention to the placement of the decimal point in the solution. • The product of decimals is dependent upon the two factors being multiplied. • In cases where an exact product is not required, the product of decimals can be estimated using strategies for multiplying whole numbers, such as front-end and compatible numbers, or rounding. In each case, the student needs to determine where to place the decimal point to ensure that the product is reasonable. • Division is the operation of making equal groups or shares. When the original amount and the number of shares are known, divide to find the size of each share. When the original amount and the size of each share are known, divide to find the number of shares. Both situations may be modeled with Base-10 manipulatives.	**All students should** • Use similar procedures as those developed for whole number computation and apply them to decimal place values, giving careful attention to the placement of the decimal point in the solution. • Select appropriate methods and tools from among paper and pencil, estimation, mental computation, and calculators according to the context and nature of the computation in order to compute with decimal numbers. • Understand the various meanings of *division* and its effect on whole numbers. • Understand various representations of division, i.e., $dividend \div divisor = quotient$ $divisor \overline{)\,dividend}$ $quotient$ $\frac{dividend}{divisor} = quotient.$	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Determine an appropriate method of calculation to find the sum, difference, product, and quotient of two numbers expressed as decimals through thousandths, selecting from among paper and pencil, estimation, mental computation, and calculators. • Estimate to find the number that is closest to the sum, difference, and product of two numbers expressed as decimals through thousandths. • Find the sum, difference, and product of two numbers expressed as decimals through thousandths, using paper and pencil, estimation, mental computation, and calculators. • Determine the quotient, given a dividend expressed as a decimal through thousandths and a single-digit divisor. For example, 5.4 divided by 2 and 2.4 divided by 5. • Use estimation to check the reasonableness of a sum, difference, product, and quotient. • Create and solve single-step and multistep problems. • A multistep problem needs to incorporate two or more operational steps (operations can be the same or different).

5M-NSCE3 The student will

a) illustrate the concept of division using fair and equal shares.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• The fair-share concept of decimal division can be modeled, using manipulatives (e.g., Base-10 blocks). • Division with decimals is performed the same way as division of whole numbers. The only difference is the placement of the decimal point in the quotient. • The quotient can be estimated, given a dividend expressed as a decimal through thousandths (and no adding of zeros to the dividend during the division process) and a single-digit divisor. • Estimation can be used to check the reasonableness of a quotient. • Division is the inverse of multiplication; therefore, multiplication and division are inverse operations. • Terms used in division are *dividend*, *divisor*, and *quotient.* $dividend \div divisor = quotient$ $divisor \overline{)dividend}\ quotient$ • There are a variety of algorithms for division such as repeated multiplication and subtraction. Experience with these algorithms may enhance understanding of the traditional long division algorithm. • A multistep problem needs to incorporate no more than two operational steps (operations can be the same or different).		

5M-NSCE4 The student will

a) differentiate between halves, fourths, and eighths;

b) solve two-step word problems using addition and subtraction of whole numbers;

c) represent and interpret data on a picture, line plot or bar graph given a model and a graph to complete.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• A fraction can be expressed in simplest form (simplest equivalent fraction) by dividing the numerator and denominator by their greatest common factor. • When the numerator and denominator have no common factors other than 1, then the fraction is in simplest form. • Fractions having like denominators means the same as fractions having common denominators. • Equivalent fractions name the same amount. To find equivalent fractions, multiply or divide the numerator and denominator by the same nonzero number. • Addition and subtraction with fractions and mixed numbers can be modeled using a variety of concrete materials and pictorial representations as well as paper and pencil. • To add, subtract, and compare fractions and mixed numbers, it often helps to find the least common denominator. The least common denominator (LCD) of two or more fractions is the least common multiple (LCM) of the denominators. • To add or subtract with fractions having the same or like denominators, add or subtract the numerators and write in simplest form.	**All students should** • Develop and use strategies to estimate and compute addition and subtraction of fractions. • Understand the concept of least common multiple and least common denominator as they are important when adding and subtracting fractions. • Understand that a fraction is in simplest form when its numerator and denominator have no common factors other than 1. The numerator can be greater than the denominator.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Solve single-step and multistep practical problems involving addition and subtraction with fractions having like and unlike denominators. Denominators in the problems should be limited to 12 or less (e.g., $\frac{1}{5}+\frac{1}{4}$) and answers should be expressed in simplest form. • Solve single-step and multistep practical problems involving addition and subtraction with mixed numbers having like and unlike denominators, with and without regrouping. Denominators in the problems should be limited to 12 or less, and answers should be expressed in simplest form. • Use estimation to check the reasonableness of a sum or difference.

5M-NSCE4 The student will

a) differentiate between halves, fourths, and eighths;

b) solve two-step word problems using addition and subtraction of whole numbers;

c) represent and interpret data on a picture, line plot or bar graph given a model and a graph to complete.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• To add or subtract with fractions that do not have the same denominator, first find equivalent fractions with the least common denominator. Then add or subtract and write the answer in simplest form. • A mixed number has two parts: a whole number and a fraction. The value of a mixed number is the sum of its two parts. • To add or subtract with mixed numbers, students may use a number line, draw a picture, rewrite fractions with like denominators, or rewrite mixed numbers as fractions.		

5M-MG1 The student will

a) use customary units to measure weight and length of objects;

b) determine volume of a cube by counting units of measure.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Perimeter is the distance around an object. It is a measure of length. Area is the number of square units needed to cover a surface. Volume is a measure of capacity and is measured in cubic units. • To find the perimeter of any polygon, add the lengths of the sides. • Students should label the perimeter, area, and volume with the appropriate unit of linear, square, or cubic measure. • Area is the number of square units needed to cover a surface or figure. • Students should investigate, using manipulatives, to discover the formulas for the area of a square, rectangle, and right triangle; and volume of a rectangular solid. – Area of a rectangle = Length × Width – Area of a square = Side × Side – Area of a right triangle = $\frac{1}{2}$ Base × Height – Volume of a rectangular solid = Length x Width x Height • Length is the distance along a line or figure from one point to another. • U.S. Customary units for measurement of length include inches, feet, yards, and miles. Appropriate measuring devices include rulers, yardsticks, and tape measures. Metric units	**All students should** • Understand the concepts of perimeter, area, and volume. • Understand and use appropriate units of measure for perimeter, area, and volume. • Understand the difference between using perimeter, area, and volume in a given situation. • Understand how to select a measuring device and unit of measure to solve problems involving measurement.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Determine the perimeter of a polygon, with or without diagrams, when – the lengths of all sides of a polygon that is not a rectangle or a square are given; – the length and width of a rectangle are given; or – the length of a side of a square is given. • Estimate and determine the perimeter of a polygon, and area of a square, rectangle, and right triangle following the parameters listed above, using only whole number measurements given in metric or U.S. Customary units, and record the solution with the appropriate unit of measure (e.g., 24 square inches). • Estimate and determine the area of a square, with or without diagrams, when the length of a side is given. • Estimate and determine the area of a rectangle, with or without diagrams, when the length and width are given. • Estimate and determine the area of a right triangle, with or without diagrams, when the base and the height are given. • Differentiate among the concepts of area, perimeter, and volume. • Develop a procedure for finding volume using manipulatives (e.g., cubes). • Determine volume in standard units. • Describe practical situations where area, perimeter, and volume are appropriate measures to use, and justify their choices orally or in writing. • Identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation.

5M-MG1 The student will

a) use customary units to measure weight and length of objects;

b) determine volume of a cube by counting units of measure.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
for measurement of length include millimeters, centimeters, meters, and kilometers. Appropriate measuring devices include centimeter ruler, meter stick, and tape measure. • When measuring with U.S. Customary units, students should be able to measure to the nearest part of an inch ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$), foot, or yard. • Weight and mass are different. Mass is the amount of matter in an object. Weight is determined by the pull of gravity on the mass of an object. The mass of an object remains the same regardless of its location. The weight that an object changes is dependent on the gravitational pull at its location. In everyday life, most people are actually interested in determining an object's mass, although they use the term *weight* (e.g., "How much does it weigh?" versus "What is its mass?"). • Appropriate measuring devices to measure mass in U.S. Customary units (ounces, pounds) and metric units (grams, kilograms) are balances. • U.S. Customary units to measure liquid volume (capacity) include cups, pints, quarts, and gallons. Metric units to measure liquid volume (capacity) include milliliters and liters.		• Identify equivalent measurements within the metric system for the following: – length: millimeters, centimeters, meters, and kilometers; – mass: grams and kilograms; – liquid volume: milliliters, and liters. • Solve problems involving measurement by selecting an appropriate measuring device and a U.S. Customary or metric unit of measure for the following: – length: part of an inch ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$), inches, feet, yards, millimeters, centimeters, meters, and kilometers; – weight: ounces, pounds, and tons; – mass: grams and kilograms; – liquid volume: cups, pints, quarts, gallons, milliliters, and liters; – area: square units; and – temperature: Celsius and Fahrenheit units. – Water freezes at 0°C and 32°F. – Water boils at 100°C and 212°F. – Normal body temperature is about 37°C and 98.6°F.

STANDARD 5M-MG1 REPORTING CATEGORY: MEASUREMENT CONTENT: MATHEMATICS

5M-MG1 The student will

a) use customary units to measure weight and length of objects;

b) determine volume of a cube by counting units of measure.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Temperature is measured using a thermometer. The U.S. Customary unit of measure is degrees Fahrenheit; the metric unit of measure is degrees Celsius. • Practical experience measuring familiar objects helps students establish benchmarks and facilitates students' ability to use the units of measure to make estimates.		

5M-PSPFA1 The student will

a) compare two sets of data within a single data display such as a picture graph, line plot, or bar graph.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Statistics is the science of conducting studies to collect, organize, summarize, analyze, and draw conclusions from data. • A measure of center is a value at the center or middle of a data set. Mean, median, and mode are measures of center. • The mean, median, and mode are three of the various ways that data can be analyzed. • Mean represents a fair share concept of the data. Dividing the data constitutes a fair share. This is done by equally dividing the data points. This should be demonstrated visually and with manipulatives. The arithmetic way is to add all of the data points then divide by the number of data points to determine the average or mean. • The median is the piece of data that lies in the middle of the set of data arranged in order. • The mode is the piece of data that occurs most frequently in the data set. There may be one, more than one, or no mode in a data set. Students should order the data from least to greatest so they can better find the mode. • The range is the spread of a set of data. The range of a set of data is the difference between the greatest and least values in the data set. It is determined by subtracting the least number in the data set from the greatest number in the data set. An example is ordering test scores from least to greatest: 73, 77, 84, 87, 89, 91, 94. The	**All students should** • Understand that mean, median, and mode are described as measures of center. • Understand that mean, median, and mode are three of the various ways that data can be described or summarized. • Understand that mean as fair share is described as equally dividing the data set or the data set has already been divided equally. • Understand how to find the mean, median, and mode of a set of data as measures of center. • Understand values in the context of other characteristics of the data in order to best describe the results.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Describe and find the mean of a group of numbers representing data from a given context as a measure of center. • Describe and find the median of a group of numbers representing data from a given context as a measure of center. • Describe and find the mode of a group of numbers representing data from a given context as a measure of center. • Describe mean as fair share. • Describe and find the range of a group of numbers representing data from a given context as a measure of variation. • Describe the impact on measures of center when a single value of a data set is added, removed, or changed.

5M-PSPFA1 The student will

a) compare two sets of data within a single data display such as a picture graph, line plot, or bar graph.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
greatest score in the data set is 94 and the least score is 73, so the least score is subtracted from the greatest score or 94 - 73 = 21. The range of these test scores is 21. • Students need to learn more than how to identify the mean, median, mode, and range of a set of data. They need to build an understanding of what the number tells them about the data, and they need to see those values in the context of other characteristics of the data in order to best describe the results.		

5M-PSPFA2 The student will

a) identify and extend numerical patterns.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• There are an infinite number of patterns. • The simplest types of patterns are repeating patterns. In such patterns, students need to identify the basic unit of the pattern and repeat it. • Growing patterns are more difficult for students to understand than repeating patterns because not only must they determine what comes next, they must also begin the process of generalization. Students need experiences with growing patterns. • Sample numerical patterns are 6, 9, 12, 15, 18, …; 5, 7, 9, 11, 13, …; 1, 2, 4, 7, 11, 16, …; 2, 4, 8, 16, 32, …; 32, 30, 28, 26, 24…; and 1, 5, 25, 125, 625,…. • An expression, like a phrase, has no equal sign. • When the pattern data are expressed in a T-table, an expression can represent that data. An example is: X Y 6 9 7 10 11 14 15 18 This example defines the relationship as $x + 3$.	**All students should** • Understand that patterns and functions can be represented in many ways and described using words, tables, and symbols. • Understand the structure of a pattern and how it grows or changes using concrete materials and calculators. • Understand that mathematical relationships exist in patterns. • Understand that an expression uses symbols to define a relationship and shows how each number in the list, after the first number, is related to the preceding number. • Understand that expressions can be numerical or variable or a combination of numbers and variables.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Describe numerical and geometric patterns formed by using concrete materials and calculators. • Describe the relationship found in patterns, using words, tables, and symbols to express the relationship.

5M-PSPFA2 The student will

a) identify and extend numerical patterns.

UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
• Expressions are simplified by using the order of operations. • A verbal quantitative expression involving one operation can be represented by a variable expression that describes what is going on. Numbers are used when they are known; variables are used when the numbers are unknown. For example, "a full box of cookies and four extra" can be represented by $b + 4$; "three full boxes of cookies" by $3b$; "a full box of cookies shared among four" by $\frac{b}{4}$. • A mathematical expression contains a variable or a combination of variables, numbers, and/or operation symbols and represents a mathematical relationship. An expression cannot be solved.		