

Math Achievement Indicators

Grade 8

Content Standard 1.0

Students will accurately calculate and use estimation techniques, number relationships, operation rules and algorithm; they will determine the reasonableness of answers and the accuracy of solutions to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.

Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
1.8.1. Represent numbers using scientific notation in mathematical and practical situations.	ability to represent numbers using positive powers to 10^6 . difficulty applying powers of negative exponents.	ability to represent numbers using scientific notation in mathematical situations. difficulty applying the rules for scientific notation, such as translating between scientific and standard notation.	ability to represent numbers using scientific notation in mathematical and practical situations. ability to translate between scientific and expanded notation.	use of mathematical operations including scientific notation, and apply to problem solving situations.
1.8.2 Translate among fractions, decimals, and percents, including percents greater than 100 and percents less than 1.	ability to translate among fractions, decimals, and percents using benchmark fractions ($\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$). difficulty using fractional percents.	ability to translate among fractions, decimals, and percents, with percents from one to 100.	ability to translate among fractions, decimals, and percents, including percents greater than 100 and percents less than 1.	understanding of equivalent representations of rational numbers.
Explain and use the relationship among equivalent representations of rational numbers in mathematical and practical situations.	inability to explain and use the relationship among equivalent representations of rational numbers in mathematical and practical situations.	ability to explain and use equivalent representations of benchmark fractions ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{2}{3}$, $\frac{3}{4}$...) in mathematical and practical situations.	ability to explain and use the relationship among equivalent representations of rational numbers in mathematical and practical situations.	ability to apply the appropriate transference of the rational numbers in a problem-solving situation for a reasonable answer.

Achievement Indicators for Math
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Content Standard 1.0 (continued)				
Students will accurately calculate and use estimation techniques, number relationships, operation rules and algorithm; they will determine the reasonableness of answers and the accuracy of solutions to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
1.8.3 Compare and order real numbers, including powers of whole numbers in mathematical and practical situations.	<p>inability to consistently in order rational numbers.</p> <p>inability to order irrational numbers, radicals and numbers with exponents.</p>	<p>ability to compare and order rational numbers</p> <p>difficulty with irrational numbers, radicals and numbers with exponents. (7, 2^3, $\frac{24}{5}$, 6.02)</p>	<p>ability to compare and order real numbers, including powers of whole numbers ($2^2=4$, $2^3=8$) in mathematical and practical situations.</p>	<p>ability to compare and order radicals and irrationals. (For example: π, $\sqrt{2}$, 3, 2.56)</p>
1.8.5 Identify perfect squares to 225 and their corresponding square roots.	<p>difficulty with the concept of exponents and square roots. e.g., the student simplifies 3^2 as 6, rather than 9.</p>	<p>ability to identify most perfect squares up to 100 and their corresponding square roots.</p>	<p>ability to identify perfect squares to 225 and their corresponding square roots.</p>	<p>ability to identify perfect squares higher than 225 and their corresponding square roots.</p>
1.8.6 Use estimation strategies to determine the reasonableness of an answer in mathematical and practical situations.	<p>ability to estimate by rounding.</p> <p>inability to use estimation to check for reasonableness of an answer.</p>	<p>difficulty using estimation strategies prior to calculation.</p> <p>difficulty determining the reasonableness of their estimation.</p>	<p>use of estimation strategies to determine the reasonableness of an answer in mathematical and practical situations.</p>	<p>application of estimation strategies to determine the reasonableness of an answer in multi-step/ advanced problems (radicals, irrationals, or negative exponents).</p>
1.8.7 Calculate with real numbers to solve mathematical and practical situations.	<p>difficulty with operational errors when calculating mathematical problems.</p>	<p>difficulty with operational errors when solving practical problems.</p>	<p>ability to calculate with real numbers to solve mathematical and practical situations.</p>	<p>ability to calculate multi-step mathematical and practical problems with real numbers.</p>
Use order of operations to solve equations in the real number system.	<p>inability to use order of operations to solve multi-step equations.</p>	<p>difficulty solving multi-step equations using order of operations.</p>	<p>use of order of operations to solve equations in the real number system.</p>	

Math Achievement Indicators

Grade 8

Content Standard 2.0

Students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.

Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
2.8.1 Find the missing term in a numerical sequence or a pictorial representation of a sequence.	<p>difficulty finding the missing term of a simple numerical sequence.</p> <p>inability to find the missing term in a pictorial representation.</p>	<p>ability to find the missing term in a simple numerical sequence.</p> <p>difficulty finding the missing term in a pictorial representation.</p>	<p>ability to find the missing term in a numerical sequence or a pictorial representation of a sequence.</p>	<p>ability to extend the pattern after finding the missing term.</p> <p>ability to explain the procedure to find the next term and write a rule for the numerical sequence.</p> <p>ability to express the change in the pictorial representation in written form.</p>
<p>2.8.2 Evaluate formulas and algebraic expressions using rational numbers (with and without technology).</p> <p>Solve and graphically represent equations and inequalities in one variable, including absolute value.</p>	<p>inability to evaluate formulas and algebraic expressions with rational numbers.</p> <p>difficulty solving and graphically representing equations and inequalities in one-variable with integer solutions.</p>	<p>evaluation of formulas and algebraic expressions using integers. They demonstrate difficulty evaluating rational numbers in an expression without the use of a calculator.</p> <p>ability to solve and graphically represent one variable equation.</p> <p>difficulty solving inequalities and absolute value equations.</p>	<p>evaluation of formulas and algebraic expressions using rational numbers (with and without technology).</p> <p>ability to solve and graphically represent equations and inequalities in one variable, including absolute value.</p>	<p>use of formulas and algebraic representations with any given values in the real number system and are able to estimate the value before evaluating.</p> <p>ability to solve and graphically represent equations and inequalities in practical situations.</p>

Achievement Indicators for Math
Grade 8

Content Standard 2.0 (continued)				
Students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
2.8.3 Add and subtract binomials.	difficulty combining like terms and therefore cannot add nor subtract binomials.	ability to add binomials containing the addition operation. difficulty distributing a negative sign through a binomial with either addition or subtraction.	ability to add and subtract binomials.	ability to add and subtract polynomials and are able to use the distributive property. e.g.: Simplify $3(x^2 + 2x - 7) + 5(2x^2 - 3x + 2)$
2.8.4 Identify, model, describe, and evaluate functions (with and without technology). Translate among verbal descriptions, graphic, tabular, and algebraic representations of mathematical situations (with and without technology).	ability to evaluate a function when given in a table. inability to identify the pattern. inability to describe the relationship between the function and its graph. inability to translate among the various representations of the function.	ability to evaluate and model a given function. difficulty identifying, and describing a function. ability to translate between tabular and graphic representations. difficulty applying an algebraic representation to a verbal description. difficulty translating when a graph is given and expression of the algebraic representation or list the coordinates in tabular form.	ability to identify, model, describe, and evaluate functions (with and without technology). ability translates among verbal descriptions, graphic, tabular, and algebraic representations of mathematical situations (with and without technology).	ability to translate from a verbal description and demonstrate using a model of the function using technology. use of the model or verbal description and write the algebraic rule for the function. ability to explain the solution set for the algebraic representation as all the ordered pairs that satisfy the rule for the function.

Achievement Indicators for Math
Grade 8

Content Standard 2.0 (continued)				
Students will use various algebraic methods to analyze, illustrate, extend, and create numerous representations (words, numbers, tables, and graphs) of patterns, functions, and algebraic relations as modeled in practical situations to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
2.8.5 Solve linear equations and represent the solution graphically.	ability to generate the solutions to a linear equation when given the x values and can graph the ordered pairs.	ability to graph ordered pairs. difficulty finding ordered pairs from an equation.	ability to graph a linear equation and identify at least 5 ordered pairs that are part of the solution set.	ability to generate solutions from linear equations in standard form and represent the solution graphically.
Solve inequalities and represent the solution on a number line.	difficulty solving inequalities with integers. difficulty graphing the solution on the number line.	difficulty solving inequalities with integers. ability to represent the answer on the number line.	ability to solve inequalities and represent the solution on a number line.	ability to solve multi-step and/or complex inequalities and represent the solution graphically.
2.8.6 Describe how changes in the value of one variable affect the values of the remaining variables in a relation.	inability to demonstrate the concept of how the change in one variable effects the relation.	difficulty evaluating the effect of variable change on outcome of the relation. Each change of a variable must be looked at to determine how the change will affect the outcome of the relation. difficulty generalizing the changes to the relation as one variable changes value.	ability to describe how changes in the value of one variable affect the values of the remaining variables in a relation.	understanding that change in one variable affects the other variable and is able to manipulate the relation to affect changes.

Math Achievement Indicators Grade 8

Content Standard 3.0

Students will use appropriate tools and techniques of measurement to determine estimate, record, and verify direct and indirect measurements to solve problems, communicate, reason and make connections within and beyond the field of mathematics.

Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
3.8.1 Estimate and convert units of measure for mass and capacity within the same measurement system (customary and metric).	difficulty converting within the metric system. ability to covert using the customary system of measurement.	ability to estimate and convert the most basic units of measurement for mass and capacity within the same measurement system (customary and metric).	ability to estimate and convert units of measure for mass and capacity within the same measurement system (customary and metric).	ability to convert unit of measure for mass and capacity (within the same measurement system) through the use of solving multi-step problems
3.8.2 Demonstrate an understanding of precision, error, and tolerance when using appropriate measurement tools.	inability to demonstrate the concepts of error and tolerance. ability to identify the most precise unit of measure involving different units.	difficultly identifying the greatest possible error and finding tolerance.	understanding of precision, error, and tolerance when using appropriate measurement tools.	ability to identify the most precise unit of measure involving different units. ability to identify a specific error when using appropriate measurement tools and can identify the tolerance, plus or minus, of a given measurement.
3.8.3 Identify how changes in a dimension of a figure effect changes in its perimeter, area and volume.	inability to describe the effect on a figure when a change in one dimension is changed.	ability to identify how changes in a dimension of a figure effects changes in its perimeter, area and volume when using quadrilateral figures or prisms	ability to identify how changes in a dimension of a figure effect changes in its perimeter, area and volume.	ability to solve problems in which changes in dimensions of figures effect changes in perimeter, area and volume, including circumference and area of circles.

Achievement Indicators for Math
Grade 8

Content Standard 3.0 (continued)				
Students will use appropriate tools and techniques of measurement to determine estimate, record, and verify direct and indirect measurements to solve problems, communicate, reason and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
3.8.4 Calculate percents in monetary problems.	inability to calculate percents in monetary problems.	ability to calculate the benchmark percents (10%, 20%, 25 %...) in monetary problems.	calculation of percents in monetary problems.	application of percent calculations to multi-step monetary problems.
3.8.5 Apply ratios and proportions to calculate rates and solve mathematical and practical problems using indirect measure.	difficulty setting up ratios to calculate rates. inability to apply proportions to solve indirect measurement problems.	ability to set up ratios to calculate rates. difficulty applying proportions to solve indirect measurement problems.	ability to apply ratios and proportions to calculate rates and solve mathematical and practical problems using indirect measure.	ability to write and solve equations involving indirect measure in both mathematical and practical situations. ability to determine whether the given information is enough to find specified measurements.

Math Achievement Indicators

Grade 8

Content Standard 4.0

Students will identify, represent, verify, and apply spatial relationships and geometric properties to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.

Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
4.8.1 Find and use the sum of the measures of interior angles of polygons.	difficulty finding the sum of the interior angles of polygons.	ability to find the sum of the interior angles of polygons. difficulty using the sum of the interior angles of polygons.	ability to find and use the sum of the measures of interior angles of polygons.	ability to write and solve algebraic equations involving the measure of interior angles.
4.8.2 Apply the properties of equality and proportionality to congruent or similar shapes.	inability to set up proportions for solving similarity problems. inability to determine the difference between congruent and similar.	difficulty setting up the proportions for similarity problems. difficulty with the concepts of equality, similarity and congruency.	ability to apply the properties of equality and proportionality to congruent or similar shapes.	ability to apply proportionality to solve practical problems (e.g., create similar three-dimensional shapes).
4.8.3 Demonstrate dilation using coordinate geometry and models. Describe the relationship between an original figure and its transformation or dilation.	ability to identify dilations. inability to draw dilations. ability to identify transformations and dilations. inability to describe the relationship between an original figure and its transformation or dilation.	difficulty processing the steps necessary to perform dilation. difficulty describing the relationship between an original figure and its transformation or dilation.	dilation using coordinate geometry and models. ability to describe the relationship between an original figure and its transformation or dilation.	ability to create a multi-step transformation and describe the changes that occur using coordinate rules [$(x,y) \Rightarrow (-x,y)$ is a reflection over the y axis].

Achievement Indicators for Math
Grade 8

Content Standard 4.0 (continued)				
Students will identify, represent, verify, and apply spatial relationships and geometric properties to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
<p>4.8.5 Calculate slope, midpoint, and distance using equations and formulas (with and without technology).</p> <p>Determine the x- and y-intercepts of a line.</p>	<p>difficulty identifying slope using “rise over run”</p> <p>inability to calculate slope, distance and midpoint; when formulas are given.</p> <p>inability to determine the x- and y-intercepts of a line.</p>	<p>identification of the slope using “rise over run” and demonstrate difficulty solving for distance and midpoint given the formulas.</p> <p>difficulty identifying the x- and y- intercepts of a line.</p>	<p>calculation of the slope, midpoint, and distance using equations and formulas (with and without technology).</p> <p>ability to determine the x- and y- intercepts of a line.</p>	<p>ability to solve practical problems involving slope (comparing the slopes of two different ramps used for wheelchair access, for example).</p> <p>ability to identify slope, x- and y- intercept of a line and graph the equation.</p>
<p>4.8.6 Form generalizations and validate conclusions about geometric figures and their properties.</p>	<p>inability to generalize or validate conclusions.</p>	<p>difficulty making generalizations or validating conclusions.</p>	<p>generalization and validation of conclusions about geometric figures and their properties.</p>	<p>validation of conclusions about geometric figures through the use of functions, write and solve word problems involving the geometric figures and their properties.</p>
<p>4.8.7 Verify and explain the Pythagorean Theorem using a variety of methods.</p> <p>Determine the measure of the missing side of a right triangle.</p>	<p>inability to apply the Pythagorean Theorem (Use of the Pythagorean theorem on non-right triangles).</p> <p>difficulty determining the measure of the hypotenuse.</p> <p>inability to find the measure of a leg of a right triangle.</p>	<p>ability to state the Pythagorean Theorem.</p> <p>difficulty verifying the Pythagorean Theorem.</p> <p>ability to find the length of the hypotenuse.</p> <p>difficulty finding the length of a leg in right triangles.</p>	<p>ability to verify and explain the Pythagorean Theorem using a variety of methods.</p> <p>ability to measure the missing side of a right triangle.</p>	<p>application and use of the Pythagorean Theorem</p> <p>conversion of the Pythagorean Theorem to practical problems involving all real numbers.</p>

Achievement Indicators for Math
Grade 8

Content Standard 4.0 (continued)				
Students will identify, represent, verify, and apply spatial relationships and geometric properties to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
4.8.8 Construct geometric figures using a variety of tools.	difficulty constructing geometric figures using tools.	ability to use a protractor or compass to construct geometric figures. difficulty with accurate measurement.	construction of geometric figures using a variety of tools.	ability to solve problems by constructing geometric figures and they can demonstrate geometric relationships.
4.8.9 Represent logical relationships using conditional statements.	inability to demonstrate conditional statements (cause and effect).	difficulty representing logical relationships using conditional statements.	representation of logical use of conditional statements.	ability to write syllogisms with three conditional statements and can explain the logical resulting conclusion.

Achievement Indicators for Math
Grade 8

Content Standard 5.0 (continued)				
Students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections to solve problems, communicate, reason and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
5.8.3 Evaluate statistical arguments that are based on data analysis for accuracy and validity.	inability to evaluate statistical arguments for accuracy and validity.	difficulty evaluating statistical arguments that are based on data analysis for accuracy and validity.	ability to evaluate statistical arguments that are based on data analysis for accuracy and validity.	ability to take data that has been represented in a misleading way and put it into displays that are no longer misleading. ability to identify bias and explain the bias to others- They develop a criterion for justifying the validity of the graphic representation.
5.8.4 Find the number of combinations possible in mathematical and practical situations. Distinguish between permutations and combinations.	ability to create a partial list of possible combinations in mathematical situations. inability to determine if all the combinations possible in mathematical situations are represented. inability to distinguish between permutation and combination problems.	ability to find the number of combinations by listing all combination. difficulty organizing problems that approach 24 combinations. ability to solve permutation and combination problems. difficulty distinguishing between permutation and combination when presented with mixed problems.	ability to find the number of combinations (up to 24) through either listing or calculating in mathematical and practical situations. ability to distinguish between permutations and combinations.	ability to find the number of combinations possible when more than 24 exist. ability to distinguish between permutations and combinations and can compare and contrast the two concepts.

Achievement Indicators for Math
Grade 8

Content Standard 5.0 (continued)				
Students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections to solve problems, communicate, reason and make connections within and beyond the field of mathematics.				
Content Standard Indicator	Work at the Emergent/Developing level may indicate...	Work at the Approaches level may indicate...	Work at the Meets level demonstrates...	Work at the Exceeds level demonstrates...
5.8.5 Differentiate between the probability of an event and the odds of an event.	difficulty calculating probability. inability to calculate odds. inability to differentiate between probability and odds.	ability to identify the probability of an event. difficulty identifying the odds of an event.	ability to differentiate between the probability and odds of an event.	ability to differentiate between the probability and odds of an event in practical situations and explain how a change in one will effect the other.
5.8.6 Formulate reasonable inferences and predictions through interpolation and extrapolation of data to solve practical problems.	difficulty formulating inferences and making predictions. inability to differentiate between interpolations and extrapolations.	ability to formulate reasonable inferences difficulty making predictions based on interpolations or extrapolations of the data.	ability to formulate reasonable inferences and predictions through interpolation and extrapolation of data to solve practical problems.	ability to design an experiment, effectively communicate the results. ability to write the linear equation to describe the trend of the data and use discrete points to explain the general behavior of the data in and outside the data set.