

# North Dakota Mathematics Content and Achievement Standards

Grades 9-10

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North Dakota Department of Public Instruction

Dr. Wayne G. Sanstead, State Superintendent

600 E Boulevard Avenue, Dept. 201

Bismarck, North Dakota 58505-0440

[www.dpi.state.nd.us](http://www.dpi.state.nd.us)



## Standard 1: Number and Operation

Standard 1: Students understand and use basic and advanced concepts of number and number systems..				
Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grades 9-10</b>				
<b>NUMBERS, NUMBER RELATIONSHIPS, AND NUMBER SYSTEMS</b>				
9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation	Students express numbers between one-billionth and one billion in fraction, decimal, and verbal form with no errors.  Students express numbers of all magnitudes in scientific notation with no errors.	Students express numbers between one-billionth and one billion in fraction, decimal, and verbal form with no significant errors.  Students express numbers of all magnitudes in scientific notation with no significant errors.	Students express numbers between one-billionth and one billion in fraction, decimal, and verbal form with a few significant errors.  Students express numbers of all magnitudes in scientific notation with a few significant errors.	Students express numbers between one-billionth and one billion in fraction, decimal, and verbal form with many significant errors.  Students express numbers of all magnitudes in scientific notation with many significant errors.
9-10.1.2. Describe the hierarchical relationships (e.g., integers are rationals) among subsets of the real number system; i.e., reals, rationals, irrationals, integers, wholes, and naturals	Students describe with great detail the relationships between subsets of the real number system.	Students describe with adequate detail the relationships between subsets of the real number system.	Students describe with some detail the relationships between subsets of the real number system.	Students describe with minimal detail the relationships between subsets of the real number system.
9-10.1.3. Identify the properties of the real number system; i.e., commutative, associative, distributive, closure, inverse, and identity properties	Students identify the properties of the real number system with no errors.	Students identify the properties of the real number system with no significant errors.	Students identify the properties of the real number system with a few significant errors.	Students identify the properties of the real number system with many significant errors.
9-10.1.4. Represent a set of data in a matrix	Students represent a set of data in a matrix with no errors.	Students represent a set of data in a matrix with no significant errors.	Students represent a set of data in a matrix with a few significant errors.	Students represent a set of data in a matrix with many significant errors.
<b>OPERATIONS AND THEIR PROPERTIES</b>				
9-10.1.5. Use the order of operations and properties of exponents to simplify an algebraic expression	Students use the order of operations and properties of exponents to simplify an algebraic expression with no errors.	Students use the order of operations and properties of exponents to simplify an algebraic expression with no significant errors.	Students use the order of operations and properties of exponents to simplify an algebraic expression with a few significant errors.	Students use the order of operations and properties of exponents to simplify an algebraic expression with many significant errors.

**Standard 1: Students understand and use basic and advanced concepts of number and number systems..**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities; e.g., when will the square root of a number be greater than the number itself, or what will happen to the magnitude of a number when you multiply it by a negative number?	Students analyze in great detail the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities.	Students analyze with adequate detail the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities.	Students analyze with some detail the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities.	Students analyze with minimal detail the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities.
9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions; i.e., power of a product, power of a power, products and quotients of powers, zero and negative exponents	Students apply basic properties of exponents to simplify algebraic expressions with no errors.	Students apply basic properties of exponents to simplify algebraic expressions with no significant errors.	Students apply basic properties of exponents to simplify algebraic expressions with a few significant errors.	Students apply basic properties of exponents to simplify algebraic expressions with many significant errors.
<b>COMPUTATIONAL FLUENCY AND ESTIMATION</b>				
9-10.1.8. Apply estimation skills to predict realistic solutions to problems	Students apply estimation skills with ease to predict a realistic solution to a problem.	Students apply estimation skills with minimal difficulty to predict a realistic solution to a problem.	Students apply estimation skills with difficulty to predict a realistic solution to a problem.	Students apply estimation skills with great difficulty to predict a realistic solution to a problem.
9-10.1.9. Select and use a computational technique (i.e., mental calculation, paper-and-pencil, or technology) to solve problems involving real numbers	Students select and use a computational technique with ease.	Students select and use a computational technique with minimal difficulty.	Students select and use a computational technique with difficulty.	Students select and use a computational technique with great difficulty.
9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it	Students explain in great detail the reasonableness of a problem's solution along with the process used to obtain it.	Students explain with adequate detail the reasonableness of a problem's solution along with the process used to obtain it.	Students explain with some detail the reasonableness of a problem's solution along with the process used to obtain it.	Students explain with minimal detail the reasonableness of a problem's solution along with the process used to obtain it.
9-10.1.11. Add, subtract, and perform scalar multiplication on matrices	Students add, subtract, and perform scalar multiplication on matrices with no errors.	Students add, subtract, and perform scalar multiplication on matrices with no significant errors.	Students add, subtract, and perform scalar multiplication on matrices with a few significant errors.	Students add, subtract, and perform scalar multiplication on matrices with many significant errors.

## Standard 2: Geometry and Spatial Sense

Standard 2: Student understands and applies geometric concepts and spatial relationships to represent and solve problems in mathematical and nonmathematical situations.				
Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grades 9-10</b>				
<b>TWO- AND THREE-DIMENSIONAL SHAPES, GEOMETRIC PROPERTIES AND RELATIONSHIPS</b>				
9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another; e.g., a cylinder has two parallel circular bases	Students identify the properties and attributes of two- and three-dimensional objects that distinguish one from another with no errors.	Students identify the properties and attributes of two- and three-dimensional objects that distinguish one from another with no significant errors.	Students identify the properties and attributes of two- and three-dimensional objects that distinguish one from another with a few significant errors.	Students identify the properties and attributes of two- and three-dimensional objects that distinguish one from another with many significant errors.
9-10.2.2. Determine congruence and similarity among geometric objects	Students determine congruence and similarity among geometric objects with no errors.	Students determine congruence and similarity among geometric objects with no significant errors.	Students determine congruence and similarity among geometric objects with a few significant errors.	Students determine congruence and similarity among geometric objects with many significant errors.
9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles	Students use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles with no errors.	Students use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles with no significant errors.	Students use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles with a few significant errors.	Students use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles with many significant errors.
9-10.2.4. Using given information, establish the validity of a conjecture using a two-column or paragraph proof	Students use given information in great detail and make no errors in using it to establish the validity of a conjecture.	Students use given information in adequate detail and make no significant errors in using it to establish the validity of a conjecture.	Students use given information in some detail and make a few significant errors in using it to establish the validity of a conjecture.	Students use given information in minimal detail and make many significant errors in using it to establish the validity of a conjecture.

**Standard 2: Student understands and applies geometric concepts and spatial relationships to represent and solve problems in mathematical and nonmathematical situations.**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>COORDINATE GEOMETRY</b>				
9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope	Students use Cartesian coordinates to determine distance, midpoint, and slope with no errors.	Students use Cartesian coordinates to determine distance, midpoint, and slope with no significant errors.	Students use Cartesian coordinates to determine distance, midpoint, and slope with a few significant errors.	Students use Cartesian coordinates to determine distance, midpoint, and slope with many significant errors.
9-10.2.6. Use distance, midpoint, and slope to determine relationships between points, lines, and plane figures in the Cartesian coordinate system; e.g., determine whether a triangle is scalene, isosceles, or equilateral given the coordinates of its vertices	Students use distance, midpoint, and slope to determine the relationships between points, lines, and plane figures in the Cartesian coordinate system with no errors.	Students use distance, midpoint, and slope to determine the relationships between points, lines, and plane figures in the Cartesian coordinate system with no significant errors.	Students use distance, midpoint, and slope to determine the relationships between points, lines, and plane figures in the Cartesian coordinate system with a few significant errors.	Students use distance, midpoint, and slope to determine the relationships between points, lines, and plane figures in the Cartesian coordinate system with many significant errors.
<b>TRANSFORMATION AND SYMMETRY</b>				
9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)	Students identify and perform transformations of objects in the plane with no errors.	Students identify and perform transformations of objects in the plane with no significant errors.	Students identify and perform transformations of objects in the plane with a few significant errors.	Students identify and perform transformations of objects in the plane with many significant errors.
9-10.2.8. Describe the effects of combining basic transformations in a plane; e.g., two reflections over parallel lines results in a translation	Students describe, in great detail, the results of combining basic transformations in a plane.	Students describe, in adequate detail, the results of combining basic transformations in a plane.	Students describe, in some detail, the results of combining basic transformations in a plane.	Students describe, with minimal detail, the results of combining basic transformations in a plane.
<b>VISUALIZATION, SPATIAL REASONING, AND GEOMETRIC MODELING</b>				
9-10.2.9. Construct plane figures using traditional and/or technological tools; i.e., congruent segments, congruent angles, angle and segment bisectors, perpendicular and parallel lines	Students construct plane figures with no errors using traditional and/or technological tools.	Students construct plane figures with no significant errors using traditional and/or technological tools.	Students construct plane figures with a few significant errors using traditional and/or technological tools.	Students construct plane figures with many significant errors using traditional and/or technological tools.

**Standard 2: Student understands and applies geometric concepts and spatial relationships to represent and solve problems in mathematical and nonmathematical situations.**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	<b>ADVANCED PROFICIENT</b>	<b>PROFICIENT</b>	<b>PARTIALLY PROFICIENT</b>	<b>NOVICE</b>
9-10.2.10. Recognize images of the same object shown from different perspectives; i.e., a two-dimensional image of a three-dimensional object	Students recognize images of the same object shown from different perspectives with no errors.	Students recognize images of the same object shown from different perspectives with no significant errors.	Students recognize images of the same object shown from different perspectives with a few significant errors.	Students recognize images of the same object shown from different perspectives with many significant errors.
9-10.2.11. Use geometric models to find solutions to problems in mathematics and other disciplines; e.g., art and architecture	Students use geometric models to find solutions to problems in mathematics and other disciplines with no errors.	Students use geometric models to find solutions to problems in mathematics and other disciplines with no significant errors.	Students use geometric models to find solutions to problems in mathematics and other disciplines with a few significant errors.	Students use geometric models to find solutions to problems in mathematics and other disciplines with many significant errors.

## Standard 3: Data Analysis, Statistics, and Probability

Standard 3: Students use data collection and analysis techniques, statistical methods, and probability to solve problems.				
Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grades 9-10</b>				
<b>DATA COLLECTION, DISPLAY, AND INTERPRETATION</b>				
9-10.3.1. Construct appropriate displays of given data; i.e., circle graphs, bar graphs, histograms, stem-and-leaf plots, box-and-whisker plots, and scatter plots	Students construct a display for a given set of data with no errors.	Students construct a display for a given set of data with no significant errors.	Students construct a display for a given set of data with a few significant errors.	Students construct a display for a given set of data with many significant errors.
9-10.3.2. Interpret a given visual representation (i.e., circle graphs, bar graphs, histograms, stem-and-leaf plots, box-and-whisker plots, and scatter plots) of a set of data	Students interpret, with great detail, a given visual representation of a data set.	Students interpret, with adequate detail, a given visual representation of a data set.	Students interpret, with some detail, a given visual representation of a data set.	Students interpret, with minimal detail, a given visual representation of a data set.
9-10.3.3. Identify the variable, sample, and population in a well-designed study; e.g., in an exit poll for a tax increase, the variable is the outcome of the vote, the sample is the set of people surveyed, the population is the set of all voters	Students identify the variable, sample, and population in a well-designed study with no errors.	Students identify the variable, sample, and population in a well-designed study with no significant errors.	Students identify the variable, sample, and population in a well-designed study with a few significant errors.	Students identify the variable, sample, and population in a well-designed study with many significant errors.
<b>PROBABILITY</b>				
9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques; e.g., fundamental counting principle, factorials, combinations, permutations	Students determine the number of possible outcomes for an event with no errors.	Students determine the number of possible outcomes for an event with no significant errors.	Students determine the number of possible outcomes for an event with a few significant errors.	Students determine the number of possible outcomes for an event with many significant errors.
9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement	Students calculate experimental and theoretical probabilities with and without replacement with no errors.	Students calculate experimental and theoretical probabilities with and without replacement with no significant arithmetic errors.	Students calculate experimental or theoretical probabilities with and without replacement with a few significant errors.	Students calculate experimental and theoretical probabilities with and without replacement with many significant errors.

**Standard 3: Students use data collection and analysis techniques, statistical methods, and probability to solve problems.**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<p>9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules</p> <p>STATISTICAL METHODS</p>	Students use addition and multiplication rules to calculate probabilities of compound events with no errors.	Students use addition and multiplication rules to calculate probabilities of compound events with no significant errors.	Students use addition and multiplication rules to calculate probabilities of compound events with a few significant errors.	Students use addition and multiplication rules to calculate probabilities of compound events with many significant errors.
<p>9-10.3.7. Calculate measures of central tendency and spread; i.e., mean, median, mode, range, and quartiles</p>	Students calculate measures of central tendency and spread with no errors.	Students calculate measures of central tendency and spread with no significant errors.	Students calculate measures of central tendency and spread with a few significant errors.	Students calculate measures of central tendency and spread with many significant errors.
<p>9-10.3.8. Discuss relationships among measures of central tendency and spread; i.e., mean, median, mode, range, and quartiles</p> <p>PREDICTIONS, DATA ANALYSIS, AND INFERENCES</p>	Students discuss, in great detail, the relationships among measures of central tendency and spread.	Students discuss, in adequate detail, the relationships among measures of central tendency and spread.	Students discuss, in some detail, the relationships among measures of central tendency and spread.	Students discuss, in minimal detail, the relationships among measures of central tendency and spread.
<p>9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data</p>	Students select two points, and determine an equation that approximates the line of best fit with no errors.	Students select two points, and determine an equation that approximates the line of best fit with no significant errors.	Students select two points, and determine an equation that approximates the line of best fit with a few significant errors.	Students select two points, and determine an equation that approximates the line of best fit with many significant errors.
<p>9-10.3.10. Identify the trend of a set of data and estimate the strength of the correlation between two variables; e.g., strong vs. weak, positive vs. negative</p>	Students identify the trend of a set of data and provide an estimate of the strength of the correlation between two variables with no errors.	Students identify the trend of a set of data and provide an estimate of the strength of the correlation between two variables with no significant errors.	Students identify the trend of a set of data and provide an estimate of the strength of the correlation between two variables with a few significant errors.	Students identify the trend of a set of data and provide an estimate of the strength of the correlation between two variables with many significant errors.

## Standard 4: Measurement

Standard 4: Students use concepts and tools of measurement to describe and quantify the world..				
Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grades 9-10</b>				
<b>MEASURABLE ATTRIBUTES, MEASUREMENT SYSTEMS AND UNITS</b>				
9-10.4.1. Select appropriate units and scales for problem situations involving measurement	Students select appropriate units and scales for problem situations involving measurement with ease.	Students select appropriate units and scales for problem situations involving measurement with minimal difficulty.	Students select appropriate units and scales for problem situations involving measurement with difficulty.	Students select appropriate units and scales for problem situations involving measurement with great difficulty.
9-10.4.2. Describe the effects of scalar change on the area and volume of a figure; e.g., the effect of doubling one or more edges of a solid on its surface area and volume	Students describe with great detail the effects of scalar change on area and volume.	Students describe with adequate detail the effects of scalar change on area and volume.	Students describe with some detail the effects of scalar change on area and volume.	Students describe with minimal detail the effects of scalar change on area and volume.
9-10.4.3. Use approximations to compare the standard and metric systems of measurement; e.g., a five-kilometer race is about three miles long	Students use approximations to compare the standard and metric systems of measurement with ease.	Students use approximations to compare the standard and metric systems of measurement with minimal difficulty.	Students use approximations to compare the standard and metric systems of measurement with difficulty.	Students use approximations to compare the standard and metric systems of measurement with great difficulty.
9-10.4.4. Given a conversion factor, convert between standard and metric measurements	Students convert between standard and metric measurements with no errors.	Students convert between standard and metric measurements with no significant errors.	Students convert between standard and metric measurements with a few significant errors.	Students convert between standard and metric measurements with many significant errors.
<b>MEASUREMENT TOOLS, TECHNIQUES, AND FORMULAS</b>				
9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy (i.e., appropriate number of significant digits) in measurement situations	Students use methods necessary to achieve a specified degree of precision and accuracy in a measurement situation with no errors.	Students use methods necessary to achieve a specified degree of precision and accuracy in a measurement situation with no significant errors.	Students use methods necessary to achieve a specified degree of precision and accuracy in a measurement situation with a few significant errors.	Students use methods necessary to achieve a specified degree of precision and accuracy in a measurement situation with many significant errors.

**Standard 4: Students use concepts and tools of measurement to describe and quantify the world..**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations	Students employ estimation techniques to evaluate the reasonableness of results in measurement situations with ease.	Students employ estimation techniques to evaluate the reasonableness of results in measurement situations with minimal difficulty.	Students employ estimation techniques to evaluate the reasonableness of results in measurement situations with difficulty.	Students employ estimation techniques to evaluate the reasonableness of results in measurement situations with great difficulty.
9-10.4.7. Use unit analysis to track units during computations	Students use unit analysis to track units during computations with no errors.	Students use unit analysis to track units during computations with no significant errors.	Students use unit analysis to track units during computations with a few significant errors.	Students use unit analysis to track units during computations with many significant errors.
9-10.4.8. Given a formula list, compute the area of a regular polygon	Students compute the area of a regular polygon with no errors.	Students compute the area of a regular polygon with no significant errors.	Students compute the area of a regular polygon with a few significant errors.	Students compute the area of a regular polygon, with many significant errors.
9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere	Students compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere with no errors.	Students compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere with no significant errors.	Students compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere with a few significant errors.	Students compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere with many significant errors.
9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects; e.g., calculate the distance across a lake, triangulate an irregular region to find its approximate area	Students apply indirect measurement techniques with ease to solve problems involving irregular shapes or inaccessible objects.	Students apply indirect measurement techniques with minimal difficulty to solve problems involving irregular shapes or inaccessible objects.	Students apply indirect measurement techniques with difficulty to solve problems involving irregular shapes or inaccessible objects.	Students apply indirect measurement techniques with great difficulty to solve problems involving irregular shapes or inaccessible objects.

## Standard 5: Algebra, Functions and Patterns

Standard 5: Students use algebraic concepts, functions, patterns, and relationships to solve problems.				
Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grades 9-10</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
9-10.5.1. Given the explicit and/or the recursive definition of a sequence, generate a specific term (explicit formula only) or a specified number of terms	Given an explicit and/or a recursive definition of a sequence, students generate the specified number of terms with no errors.	Given an explicit and/or a recursive definition of a sequence, students generate the specified number of terms with no significant errors.	Given an explicit and/or a recursive definition of a sequence, students generate the specified number of terms with a few significant errors.	Given an explicit and/or a recursive definition of a sequence, students generate the specified number of terms with many significant errors.
9-10.5.2. Express relations and functions using a variety of representations; i.e., numeric, graphic, symbolic, and verbal	Students express relations and functions using a variety of representations with no errors.	Students express relations and functions using a variety of representations with no significant errors.	Students express relations and functions using a variety of representations with a few significant errors.	Students express relations and functions using a variety of representations with many significant errors.
9-10.5.3. Determine whether a relation is a function by examining various representations of the relation; e.g., table, graph, equation, set of ordered pairs	Students determine whether a relation is a function with ease.	Students determine whether a relation is a function with minimal difficulty.	Students determine whether a relation is a function with difficulty.	Students determine whether a relation is a function with great difficulty.
9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions; e.g., given $f(x) = 2x$ and $g(x) = 5x - 7$ , find $f(x) + g(x)$	Students perform the four basic operations on algebraic functions with no errors.	Students perform the four basic operations on algebraic functions with no significant errors.	Students perform the four basic operations on algebraic functions with a few significant errors.	Students perform the four basic operations on algebraic functions with many significant errors.
9-10.5.5. Identify the independent variable, dependent variable, domain, and range of a function	Students identify the independent variable, dependent variable, domain, and range of a function with ease.	Students identify the independent variable, dependent variable, domain, and range of a function with minimal difficulty.	Students identify the independent variable, dependent variable, domain, and range of a function with difficulty.	Students identify the independent variable, dependent variable, domain, and range of a function with great difficulty.

**Standard 5: Students use algebraic concepts, functions, patterns, and relationships to solve problems.**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<p>9-10.5.6. Draw graphs of linear and quadratic functions using paper and pencil, labeling key features; e.g., graph a line and label its x-intercept and y-intercept, graph a parabola and label its vertex and one point on each side of the vertex</p> <p>NUMERIC AND ALGEBRAIC REPRESENTATIONS</p>	Students graph linear and quadratic functions with no errors, labeling all key features.	Students graph linear and quadratic functions with no significant errors, labeling most key features.	Students graph linear and quadratic functions with a few significant errors, labeling some key features.	Students graph linear and quadratic functions with many significant errors, labeling very few key features.
<p>9-10.5.7. Use algebraic expressions, equations, or inequalities involving one or two variables to represent relationships (e.g., given a verbal statement, write an equivalent algebraic expression or equation) found in various contexts (e.g., time and distance problems, mixture problems)</p>	Students use algebraic expressions, equations, or inequalities involving one or two variables to represent relationships with no errors.	Students use algebraic expressions, equations, or inequalities involving one or two variables to represent relationships with no significant errors.	Students use algebraic expressions, equations, or inequalities involving one or two variables to represent relationships with a few significant errors.	Students use algebraic expressions, equations, or inequalities involving one or two variables to represent relationships with many significant errors.
<p>9-10.5.8. Manipulate algebraic expressions and equations using properties of real numbers; e.g., simplify, factor</p>	Students manipulate algebraic expressions and equations using properties of real numbers with no errors.	Students manipulate algebraic expressions and equations using properties of real numbers with no significant errors.	Students manipulate algebraic expressions and equations using properties of real numbers with a few significant errors.	Students manipulate algebraic expressions and equations using properties of real numbers with many significant errors.
<p>9-10.5.9. Solve linear equations and inequalities, systems of two linear equations or inequalities, and quadratic equations having rational solutions; e.g., factoring, quadratic formula</p>	Students solve linear equations and inequalities, systems of linear equations and inequalities, and quadratic equations with no errors.	Students solve linear equations and inequalities, systems of linear equations and inequalities, and quadratic equations with no significant errors.	Students solve linear equations and inequalities, systems of linear equations and inequalities, and quadratic equations with a few significant errors.	Students solve linear equations and inequalities, systems of linear equations and inequalities, and quadratic equations with many significant errors.
<p>9-10.5.10. Solve a literal equation for a specified variable; e.g., solve <math>I = prt</math> for <math>r</math>, or solve <math>7n + p = t</math> for <math>n</math></p>	Students solve a literal equation for a specified variable with no errors.	Students solve a literal equation for a specified variable with no significant errors.	Students solve a literal equation for a specified variable with a few significant errors.	Students solve a literal equation for a specified variable with many significant errors.

**Standard 5: Students use algebraic concepts, functions, patterns, and relationships to solve problems.**

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>MATHEMATICAL MODELING</b>				
9-10.5.11. Use essential quantitative relationships in a situation to determine whether the relationship can be modeled by a linear function; e.g., simple interest is linear, compound interest is not linear	Students determine with ease whether a quantitative relationship can be modeled by a linear function.	Students determine with minimal difficulty whether a quantitative relationship can be modeled by a linear function.	Students determine with difficulty whether a quantitative relationship can be modeled by a linear function.	Students determine with great difficulty whether a quantitative relationship can be modeled by a linear function.
9-10.5.12. Graphically represent the solution or solutions to an equation, inequality, or system	Students graphically represent the solution or solutions to an equation, inequality, or system with no errors.	Students graphically represent the solution or solutions to an equation, inequality, or system with no significant errors.	Students graphically represent the solution or solutions to an equation, inequality, or system with a few significant errors.	Students graphically represent the solution or solutions to an equation, inequality, or system with many significant errors.
9-10.5.13. Interpret a graphical representation of a real-world situation	Students interpret a graphical representation of a real-world situation with no errors.	Students interpret a graphical representation of a real-world situation with no significant errors.	Students interpret a graphical representation of a real-world situation with a few significant errors.	Students interpret a graphical representation of a real-world situation with many significant errors.
9-10.5.14. Draw conclusions about a situation being modeled	Students draw conclusions about a modeled situation with no errors.	Students draw conclusions about a modeled situation with no significant errors.	Students draw conclusion about a modeled situation with a few significant errors.	Students draw conclusions about a modeled situation with many significant errors.
<b>RATES OF CHANGE</b>				
9-10.5.15. Approximate and interpret rates of change from graphical and numerical data	Students approximate and interpret rates of change from graphical and numerical data with no errors.	Students approximate and interpret rates of change from graphical and numerical data with no significant errors.	Students approximate and interpret rates of change from graphical and numerical data with a few significant errors.	Students approximate and interpret rates of change from graphical and numerical data with many significant errors.