

# North Dakota Mathematics Content and Achievement Standards

Grade 8

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North Dakota Department of Public Instruction

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## 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>Grade 8</b>				
<b>NUMBERS, NUMBER RELATIONSHIPS, AND NUMBER SYSTEMS</b>				
8.1.1. Identify subsets of the real number system; i.e., natural and whole numbers, integers, rational and irrational numbers	Students identify subsets of the real number system with no errors.	Students identify subsets of the real number system with no significant errors.	Students identify subsets of the real number system with a few significant errors.	Students identify subsets of the real number system with many significant errors.
8.1.2. Solve real-world problems involving ratio, proportion, and percent	Students solve real-world problems involving ratio, proportion, and percent with no errors.	Students solve real-world problems involving ratio, proportion, and percent with no significant errors.	Students solve real-world problems involving ratio, proportion, and percent with a few significant errors.	Students solve real-world problems involving ratio, proportion, and percent with many significant errors.
8.1.3. Identify perfect squares 1 to 144 and approximate square roots	Students identify perfect squares 1 to 144 and approximate square roots with no errors.	Students identify perfect squares 1 to 144 and approximate square roots with no significant errors.	Students identify perfect squares 1 to 144 and approximate square roots with a few significant errors.	Students identify perfect squares 1 to 144 and approximate square roots with many significant errors.
8.1.4. Represent large and small numbers using scientific notation	Students represent large and small numbers using scientific notation with no errors.	Students represent large and small numbers using scientific notation with no significant errors.	Students represent large and small numbers using scientific notation with a few significant errors.	Students represent large and small numbers using scientific notation with many significant errors.
<b>OPERATIONS AND THEIR PROPERTIES</b>				
8.1.5. Apply operation properties to simplify computations and solve problems; i.e., commutative, associative, and distributive	Students apply operation properties to simplify computations and solve problems with no errors.	Students apply operation properties to simplify computations and solve problems with no significant errors.	Students apply operation properties to simplify computations and solve problems with a few significant errors.	Students apply operation properties to simplify computations and solve problems with many significant errors.
8.1.6. Apply the order of operations to simplify numeric expressions and solve problems	Students apply the order of operations to simplify numeric expressions and solve problems with no errors.	Students apply the order of operations to simplify numeric expressions and solve problems with no significant errors.	Students apply the order of operations to simplify numeric expressions and solve problems with a few significant errors.	Students apply the order of operations to simplify numeric expressions and solve problems with many significant errors.

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

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COMPUTATIONAL FLUENCY AND ESTIMATION				
8.1.7. Add, subtract, multiply, and divide integers	Students add, subtract, multiply, and divide integers with no errors.	Students add, subtract, multiply, and divide integers with no significant errors.	Students add, subtract, multiply, and divide integers with a few significant errors.	Students add, subtract, multiply, and divide integers with many significant errors.
8.1.8. Select and use a computational technique (e.g., mental calculation, paper-and-pencil, technology) to solve problems	Students select and use a computational technique to solve problems with no errors.	Students select and use a computational technique to solve problems with no significant errors.	Students select and use a computational technique to solve problems with a few significant errors.	Students select and use a computational technique to solve problems with many significant errors.
8.1.9. Determine when an estimate is sufficient and an exact answer is needed in problem situations	Students determine when an estimate is sufficient and an exact answer is needed in problem situations with no errors.	Students determine when an estimate is sufficient and an exact answer is needed in problem situations with no significant errors.	Students determine when an estimate is sufficient and an exact answer is needed in problem situations with a few significant errors.	Students determine when an estimate is sufficient and an exact answer is needed in problem situations 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>Grade 8</b>				
<b>TWO- AND THREE-DIMENSIONAL SHAPES, GEOMETRIC PROPERTIES AND RELATIONSHIPS</b>				
8.2.1. Use nets to represent the relationships between two- and three-dimensional figures	Students use nets to represent relationships between two- and three-dimensional figures with no errors.	Students use nets to represent relationships between two- and three-dimensional figures with no significant errors.	Students use nets to represent relationships between two- and three-dimensional figures with a few significant errors.	Students use nets to represent relationships between two- and three-dimensional figures with many significant errors.
8.2.2. Classify quadrilaterals based on side lengths, angle measures, and sets of parallel sides	Students classify quadrilaterals based on side length, angle measures, and sets of parallel sides with no errors.	Students classify quadrilaterals based on side length, angle measures, and sets of parallel sides with no significant errors.	Students classify quadrilaterals based on side length, angle measures, and sets of parallel sides with a few significant errors.	Students classify quadrilaterals based on side length, angle measures, and sets of parallel sides with many significant errors.
8.2.3. Identify the angles formed and the relationships between the angles when parallel lines are intersected by a transversal	Students identify the angles formed, and the relationships between the angles, when parallel lines are intersected by a transversal with no errors.	Students identify the angles formed, and the relationships between the angles, when parallel lines are intersected by a transversal with no significant errors.	Students identify the angles formed, and the relationships between the angles, when parallel lines are intersected by a transversal with a few significant errors.	Students identify the angles formed, and the relationships between the angles, when parallel lines are intersected by a transversal with many significant errors.
8.2.4. Apply the Pythagorean Theorem to problems involving right triangles	Students apply the Pythagorean Theorem to problems involving right triangles with no errors.	Students apply the Pythagorean Theorem to problems involving right triangles with no significant errors.	Students apply the Pythagorean Theorem to problems involving right triangles with a few significant errors.	Students apply the Pythagorean Theorem to problems involving right triangles with many significant errors.
<b>COORDINATE GEOMETRY</b>				
8.2.5. Represent shapes using coordinate geometry	Students represent shapes using coordinate geometry with no errors.	Students represent shapes using coordinate geometry with no significant errors.	Students represent shapes using coordinate geometry with a few significant errors.	Students represent shapes using coordinate geometry with many significant errors.

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

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TRANSFORMATION AND SYMMETRY				
8.2.6. Draw the results of a combination of transformations in the coordinate plane; i.e., reflections, rotations, and translations	Students draw the results of a combination of transformations in the coordinate plane with no errors.	Students draw the results of a combination of transformations in the coordinate plane with no significant errors.	Students draw the results of a combination of transformations in the coordinate plane with a few significant errors.	Students draw the results of a combination of transformations in the coordinate plane with many significant errors.
8.2.7. Use scale, proportion, and congruency to solve problems involving similar figures	Students use scale, proportion, and congruency to solve problems involving similar figures with no errors.	Students use scale, proportion, and congruency to solve problems involving similar figures with no significant errors.	Students use scale, proportion, and congruency to solve problems involving similar figures with a few significant errors.	Students use scale, proportion, and congruency to solve problems involving similar figures with many significant errors.
VISUALIZATION, SPATIAL REASONING, AND GEOMETRIC MODELING				
8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems; e.g., those involving surface area and volume	Students use two-dimensional representations of three-dimensional objects to visualize and solve problems with no errors.	Students use two-dimensional representations of three-dimensional objects to visualize and solve problems with no significant errors.	Students use two-dimensional representations of three-dimensional objects to visualize and solve problems with a few significant errors.	Students use two-dimensional representations of three-dimensional objects to visualize and solve problems 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			
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<b>Grade 8</b>				
<b>DATA COLLECTION, DISPLAY, AND INTERPRETATION</b>				
8.3.1. Formulate a question and select a random or representative sample	Students formulate a question and select a random or representative sample with no errors.	Students formulate a question and select a random or representative sample with no significant errors.	Students formulate a question and select a random or representative sample with a few significant errors.	Students formulate a question and select a random or representative sample with many significant errors.
8.3.2. Collect, organize, and display data using scatter and stem-and-leaf plot	Students collect, organize, and display data using scatter and stem-and-leaf plots with no errors.	Students collect, organize, and display data using scatter and stem-and-leaf plots with no significant errors.	Students collect, organize, and display data using scatter and stem-and-leaf plots with a few significant errors.	Students collect, organize, and display data using scatter and stem-and-leaf plots with many significant errors.
<b>PROBABILITY</b>				
8.3.3. Determine possible outcomes using organized lists, tree diagrams, Venn diagrams, factorials, and the basic counting principle	Students determine possible outcomes, using organized lists, tree diagrams, Venn diagrams, factorials, and the basic counting principle, with no errors.	Students determine possible outcomes, using organized lists, tree diagrams, Venn diagrams, factorials, and the basic counting principle, with no significant errors.	Students determine possible outcomes, using organized lists, tree diagrams, Venn diagrams, factorials, and the basic counting principle, with a few significant errors.	Students determine possible outcomes, using organized lists, tree diagrams, Venn diagrams, factorials, and the basic counting principle, with many significant errors.
8.3.4. Distinguish between experimental and theoretical probability; i.e., the results of an experiment may not match the theoretical probability	Students distinguish between experimental and theoretical probability with great detail.	Students distinguish between experimental and theoretical probability with adequate detail.	Students distinguish between experimental and theoretical probability with some detail.	Students distinguish between experimental and theoretical probability with minimal detail.
<b>STATISTICAL METHODS</b>				
8.3.5. Calculate and compare the measures of central tendency (i.e., mean, median, mode) and spread (i.e., range)	Students calculate and compare the measures of central tendency and spread with no errors.	Students calculate and compare the measures of central tendency and spread with no significant errors.	Students calculate and compare the measures of central tendency and spread with a few significant errors.	Students calculate and compare the measures of central tendency and spread with many significant errors.

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

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8.3.6. Identify an outlier within a set of data and discuss its effects on the measures of central tendency and spread	Students identify an outlier within a set of data with no errors and explain with great detail its effects on the measures of central tendency and spread.	Students identify an outlier within a set of data with no significant errors and explain with adequate detail its effects on the measures of central tendency and spread.	Students identify an outlier within a set of data with a few significant errors and explain with some detail its effects on the measures of central tendency and spread.	Students identify an outlier within a set of data with many significant errors and explain with minimal detail its effects on the measures of central tendency and spread.
PREDICTIONS, DATA ANALYSIS, AND INFERENCES				
8.3.7. Make inferences based on analysis of data and interpretation of graphs	Students make inferences based on analysis of data and interpretations of graphs with no errors.	Students make inferences based on analysis of data and interpretations of graphs with no significant errors.	Students make inferences based on analysis of data and interpretations of graphs with a few significant errors.	Students make inferences based on analysis of data and interpretations of graphs with many significant errors.

## Standard 4: Measurement

Standard 4: Students use concepts and tools of measurement to describe and quantify the world..				
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<b>Grade 8</b>				
<b>MEASURABLE ATTRIBUTES, MEASUREMENT SYSTEMS AND UNITS</b>				
8.4.1. Select an appropriate degree of precision when using measurements for calculations	Students select, with no errors, an appropriate degree of precision when using measurements for calculations.	Students select, with no significant errors, an appropriate degree of precision when using measurements for calculations.	Students select, with a few significant errors, an appropriate degree of precision when using measurements for calculations.	Students select, with many significant errors, an appropriate degree of precision when using measurements for calculations.
8.4.2. Compare unit measurements between systems, e.g., a yard is almost a meter	Students make comparisons of unit measurements between systems with no errors.	Students make comparisons of unit measurements between systems with no significant errors.	Students make comparisons of unit measurements between systems with a few significant errors.	Students make comparisons of unit measurements between systems with many significant errors.
<b>MEASUREMENT TOOLS, TECHNIQUES, AND FORMULAS</b>				
8.4.3. Use formulas to determine the surface area and volume of right cones and spheres	Students use formulas to determine the surface area and volume of right cones and spheres with no errors.	Students use formulas to determine the surface area and volume of right cones and spheres with no significant errors.	Students use formulas to determine the surface area and volume of right cones and spheres with a few significant errors.	Students use formulas to determine the surface area and volume of right cones and spheres with many significant errors.

## Standard 5: Algebra, Functions and Patterns

Standard 5: Students use algebraic concepts, functions, patterns, and relationships to solve problems.				
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<b>Grade 8</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
8.5.1. Extend numerical patterns; e.g., Pascal's triangle and the Fibonacci sequence	Students extend numerical patterns with no errors.	Students extend numerical patterns with no significant errors.	Students extend numerical patterns with a few significant errors.	Students extend numerical patterns with many significant errors.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
8.5.2. Use variables, expressions and equations to represent problem situations	Students use variables, expressions, and equations to represent problem situations with no errors.	Students use variables, expressions, and equations to represent problem situations with no significant errors.	Students use variables, expressions, and equations to represent problem situations with a few significant errors.	Students use variables, expressions, and equations to represent problem situations with many significant errors.
8.5.3. Apply the order of operations and the commutative, associative, and distributive properties to simplify algebraic expressions	Students apply the order of operations and the commutative, associative, and distributive properties with no errors to simplify algebraic expressions.	Students apply the order of operations and the commutative, associative, and distributive properties with no significant errors to simplify algebraic expressions.	Students apply the order of operations and the commutative, associative, and distributive properties with a few significant errors to simplify algebraic expressions.	Students apply the order of operations and the commutative, associative, and distributive properties with many significant errors to simplify algebraic expressions.
8.5.4. Apply inverse operations and the properties of equality to solve multi-step equations and inequalities in one variable	Students apply inverse operations and the properties of equality to solve multi-step equations and inequalities in one variable with no errors.	Students apply inverse operations and the properties of equality to solve multi-step equations and inequalities in one variable with no significant errors.	Students apply inverse operations and the properties of equality to solve multi-step equations and inequalities in one variable with a few significant errors.	Students apply inverse operations and the properties of equality to solve multi-step equations and inequalities in one variable with many significant errors.
<b>MATHEMATICAL MODELING</b>				
8.5.5. Write multi-step equations and inequalities to represent problem situations	Students write multi-step equations and inequalities to represent problem situations with no errors.	Students write multi-step equations and inequalities to represent problem situations with no significant errors.	Students write multi-step equations and inequalities to represent problem situations with a few significant errors.	Students write multi-step equations and inequalities to represent problem situations with many significant errors.

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

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<p>RATES OF CHANGE</p> <p>8.5.6. Solve problems involving rates; i.e., speed equals distance divided by time (miles per hour)</p>	<p>Students solve problems involving rates with no errors.</p>	<p>Students solve problems involving rates with no significant errors.</p>	<p>Students solve problems involving rates with a few significant errors.</p>	<p>Students solve problems involving rates with many significant errors.</p>