

North Dakota Mathematics Content and Achievement Standards

Grades 11-12

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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
Grades 11-12				
NUMBERS, NUMBER RELATIONSHIPS, AND NUMBER SYSTEMS				
11-12.1.1. Translate between radical expressions and expressions involving rational exponents	Students translate between radical expressions and expressions involving rational exponents with no errors.	Students translate between radical expressions and expressions involving rational exponents with no significant errors.	Students translate between radical expressions and expressions involving rational exponents with a few significant errors.	Students translate between radical expressions and expressions involving rational exponents with many significant errors.
11-12.1.2. Describe the hierarchal relationships (e.g., explain why real numbers are complex) among subsets of the complex number system, i.e., complex, real, and imaginary	Students describe with great detail hierarchal relationships between subsets of the complex number system.	Students describe with adequate detail hierarchal relationships between subsets of the complex number system.	Students describe with some detail hierarchal relationships between subsets of the complex number system.	Students describe with minimal detail hierarchal relationships between subsets of the complex number system.
11-12.1.3. Use imaginary numbers to express square roots of negative numbers	Students use imaginary numbers to express square roots of negative numbers with no errors.	Students use imaginary numbers to express square roots of negative numbers with no significant errors.	Students use imaginary numbers to express square roots of negative numbers with a few significant errors.	Students use imaginary numbers to express square roots of negative numbers with many significant errors.
11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system; e.g., write an algebraic proof	Students justify the steps of an algebraic process in great detail, using the properties of the real number system.	Students justify the steps of an algebraic process in adequate detail, using the properties of the real number system.	Students justify the steps of an algebraic process in some detail, using the properties of the real number system.	Students justify the steps of an algebraic process in minimal detail, using the properties of the real number system.
OPERATIONS AND THEIR PROPERTIES				
11-12.1.5. Determine which properties of the real number system hold for matrices; e.g., matrix multiplication is not commutative	Students determine which properties of the real number system hold for matrices with no errors.	Students determine which properties of the real number system hold for matrices with no significant errors.	Students determine which properties of the real number system hold for matrices with a few significant errors.	Students determine which properties of the real number system hold for matrices with many significant errors.

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

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11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions; i.e., power of a product, power of a power, products and quotients of powers, zero and negative exponents, and log of a product, quotient, or power COMPUTATIONAL FLUENCY AND ESTIMATION	Students apply basic properties of exponents and logarithms to rewrite algebraic expressions with no errors.	Students apply basic properties of exponents and logarithms to rewrite algebraic expressions with no significant errors.	Students apply basic properties of exponents and logarithms to rewrite algebraic expressions with a few significant errors.	Students apply basic properties of exponents and logarithms with many significant errors.
11-12.1.7. Add, subtract, and multiply complex numbers	Students add, subtract, and multiply complex numbers with no errors.	Students add, subtract, and multiply complex numbers with no significant errors.	Students add, subtract, and multiply complex numbers with a few significant errors.	Students add, subtract, and multiply complex numbers with many significant errors.
11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology	Students multiply matrices with no errors.	Students multiply matrices with no significant errors.	Students multiply matrices with a few significant errors.	Students multiply 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.

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Grades 11-12 TWO- AND THREE-DIMENSIONAL SHAPES, GEOMETRIC PROPERTIES AND RELATIONSHIPS 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles; i.e., right triangle trigonometry, Law of Sines, and Law of Cosines COORDINATE GEOMETRY <i>No further expectations</i> TRANSFORMATION AND SYMMETRY <i>No further expectations</i> VISUALIZATION, SPATIAL REASONING, AND GEOMETRIC MODELING <i>No further expectations</i>	Students use trigonometric relationships to determine side lengths and angle measures in triangles with no errors.	Students use trigonometric relationships to determine side lengths and angle measures in triangles with no significant errors.	Students use trigonometric relationships to determine side lengths and angle measures in triangles with a few significant errors.	Students use trigonometric relationships to determine side lengths and angle measures in triangles 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.				
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Grades 11-12				
DATA COLLECTION, DISPLAY, AND INTERPRETATION				
11-12.3.1. Choose, construct, and interpret a display to represent a set of data	Students choose and construct a display for a set of data, and interpret the visual representation with no errors.	Students choose and construct a display for a set of data, and interpret the visual representation with no significant errors.	Students choose and construct a display for a set of data, and interpret the visual representation with a few significant errors.	Students choose and construct a display for a set of data, and interpret the visual representation with many significant errors.
PROBABILITY				
11-12.3.2. Make predictions based on theoretical probabilities and experimental results	Students make predictions based on theoretical probabilities and experimental results with ease.	Students make predictions based on theoretical probabilities and experimental results with minimal difficulty.	Students make predictions based on theoretical probabilities and experimental results with difficulty.	Students make predictions based on theoretical probabilities and experimental results with great difficulty.
STATISTICAL METHODS				
11-12.3.3. Select, calculate, and use appropriate measures of central tendency and spread (i.e., mean, median, mode, range, and quartiles) to draw meaningful conclusions about a set of data	Students select, calculate, and use measures of central tendency and spread with no errors.	Students select, calculate, and use measures of central tendency and spread with no significant errors.	Students select, calculate, and use measures of central tendency and spread with a few significant errors.	Students select, calculate, and use measures of central tendency and spread with many significant errors.
PREDICTIONS, DATA ANALYSIS, AND INFERENCES				
11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions	Students approximate an equation for the line of best fit and use the resulting model to make predictions with no errors.	Students approximate an equation for the line of best fit and use the resulting model to make predictions with no significant errors.	Students approximate an equation for the line of best fit and use the resulting model to make predictions with a few significant errors.	Students approximate an equation for the line of best fit and use the resulting model to make predictions 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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Grades 11-12				
MEASURABLE ATTRIBUTES, MEASUREMENT SYSTEMS AND UNITS <i>No further expectations</i>				
MEASUREMENT TOOLS, TECHNIQUES, AND FORMULAS <i>No further expectations</i>				

Standard 5: Algebra, Functions and Patterns

Standard 5: Students use algebraic concepts, functions, patterns, and relationships to solve problems.				
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Grades 11-12				
PATTERNS, RELATIONS, AND FUNCTIONS				
11-12.5.1. Perform advanced operations (i.e., composition and finding inverses) on algebraic functions	Students perform advanced operations on algebraic functions with no errors.	Students perform advanced operations on algebraic functions with no significant errors.	Students perform advanced operations on algebraic functions with a few significant errors.	Students perform advanced operations on algebraic functions with many significant errors.
11-12.5.2. Generate graphs of a variety of functions (i.e., linear, quadratic, polynomial, absolute value, and exponential), using technology when appropriate	Students generate graphs of a variety of functions with no errors.	Students generate graphs of a variety of functions with no significant errors.	Students generate graphs of a variety of functions with a few significant errors.	Students generate graphs of a variety of functions with many significant errors.
NUMERIC AND ALGEBRAIC REPRESENTATIONS				
11-12.5.3. Solve quadratic equations involving complex roots	Students solve quadratic equations involving complex roots with no errors.	Students solve quadratic equations involving complex roots with no significant errors.	Students solve quadratic equations involving complex roots with a few significant errors.	Students solve quadratic equations involving complex roots with many significant errors.
11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions	Students graph linear, quadratic, and absolute value functions using transformations with no errors.	Students graph linear, quadratic, and absolute value functions using transformations with no significant errors.	Students graph linear, quadratic, and absolute value functions using transformations with a few significant errors.	Students graph linear, quadratic, and absolute value functions using transformations with many significant errors.
11-12.5.5. Given the graph of a transformed linear, quadratic, or absolute value function, write its equation	Given a graph of a linear, quadratic, or absolute value function involving a single transformation, students write its equation with no errors.	Given a graph of a linear, quadratic, or absolute value function involving a single transformation, students write its equation with no significant errors.	Given a graph of a linear, quadratic, or absolute value function involving a single transformation, students write its equation with a few significant errors.	Given a graph of a linear, quadratic, or absolute value function involving a single transformation, students write its equation with many significant errors.

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

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<p>MATHEMATICAL MODELING</p> <p>11-12.5.6. Determine and write an equation for a function (i.e., linear, quadratic, polynomial, absolute value, and exponential) that models a mathematical relationship</p> <p>RATES OF CHANGE</p> <p><i>No further expectations</i></p>	<p>Students determine and write an equation for a function with ease and with no errors.</p>	<p>Students determine and write an equation for a function with minimal difficulty and with no significant errors.</p>	<p>Students determine and write an equation for a function with difficulty and with a few significant errors.</p>	<p>Students determine and write an equation for a function with great difficulty and with many significant errors.</p>