

# North Dakota Mathematics Content and Achievement Standards

## Standard 5

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### North Dakota Department of Public Instruction

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## 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
Kindergarten				
PATTERNS, RELATIONS, AND FUNCTIONS				
K.5.1. Identify, sort, and classify objects by one attribute	Students identify, sort, and classify objects by one attribute with no errors.	Students identify, sort, and classify objects by one attribute with no significant errors.	Students identify, sort, and classify objects by one attribute with a few significant errors.	Students identify, sort, and classify objects by one attribute with many significant errors.
K.5.2. Recognize, extend, and describe simple patterns	Students recognize and extend simple patterns with no errors, and describe them in great detail.	Students recognize and extend simple patterns with no significant errors, and describe them in adequate detail.	Students recognize and extend simple patterns with a few significant errors, and describe them in some detail.	Students recognize and extend patterns with many significant errors, and describe them in minimal detail.
NUMERIC AND ALGEBRAIC REPRESENTATIONS				
<i>No expectations at this level</i>				
MATHEMATICAL MODELING				
K.5.3. Use tools and strategies (e.g., manipulatives) to model problems	Students use tools and strategies to model and solve problems with no errors.	Students use tools and strategies to model problems with no significant errors.	Students use tools and strategies to model problems with a few significant errors.	Students use tools and strategies to model problems with many significant errors.
RATES OF CHANGE				
<i>No expectations at this level</i>				

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

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 1</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
1.5.1. Identify, sort, and classify objects by two or more attributes	Students identify, sort, and classify objects by two or more attributes with no errors.	Students identify, sort, and classify objects by two or more attributes with no significant errors.	Students identify, sort, and classify objects by two or more attributes with a few significant errors.	Students identify, sort, and classify objects by two or more attributes with many significant errors.
1.5.2. Recognize, extend, create, and describe patterns	Students recognize, extend, and create patterns with no errors and describe them in great detail.	Students recognize, extend, and create patterns with no significant errors and describe them in adequate detail.	Students recognize, extend, and create patterns with a few significant errors or describe them in some detail.	Students recognize, extend, and create patterns with many significant errors or describe them in minimal detail.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
1.5.3. Demonstrate the commutative property of addition; e.g., $3+5 = 5+3$	Students demonstrate the commutative property of addition with no errors.	Students demonstrate the commutative property of addition with no significant errors.	Students demonstrate the commutative property of addition with a few significant errors.	Students demonstrate the commutative property of addition with many significant errors.
<b>MATHEMATICAL MODELING</b>				
<i>No new expectations at this level</i>				
<b>RATES OF CHANGE</b>				
<i>No expectations at this level</i>				

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 2</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
2.5.1. Extend and create number patterns	Students extend and create number patterns with no errors.	Students extend and create number patterns with no significant errors.	Students extend and create number patterns with a few significant errors.	Students extend and create number patterns with many significant errors.
2.5.2. State the rule that describes a given repeating and growing pattern	Students state the rule that describes a given repeating or growing pattern with no errors.	Students state the rule that describes a given repeating or growing pattern with no significant errors.	Students state the rule that describes a given repeating or growing pattern with a few significant errors.	Students state the rule that describes a given repeating or growing pattern with many significant errors.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
2.5.3. Solve addition and subtraction equations with unknown numbers; e.g., $2 + \square = 5$	Students solve addition and subtraction equations with unknown numbers with no errors.	Students solve addition and subtraction equations with unknown numbers with no significant errors.	Students solve addition and subtraction equations with unknown numbers with a few significant errors.	Students solve addition and subtraction equations with unknown numbers with many significant errors.
<b>MATHEMATICAL MODELING</b>				
2.5.4. Use symbols (i.e., +, -, =, <, >) to write simple number sentences	Students use symbols to write number sentences with no errors.	Students use symbols to write simple number sentences with no significant errors.	Students use symbols to write simple number sentences with a few significant errors.	Students use symbols to write simple number sentences with many significant errors.
2.5.5. Use words, objects, and number sentences to represent addition and subtraction problems	Students use words, objects, and number sentences to represent addition and subtraction problems with no errors.	Students use words, objects, and number sentences to represent addition and subtraction problems with no significant errors.	Students use words, objects, and number sentences to represent addition and subtraction problems with a few significant errors.	Students use words, objects, and number sentences to represent addition and subtraction problems with many significant errors.
<b>RATES OF CHANGE</b>				
<i>No expectations at this level</i>				

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 3</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
3.5.1. Use patterns to solve problems	Students use patterns to solve problems with no errors.	Students use patterns to solve problems with no significant errors.	Students use patterns to solve problems with a few significant errors.	Students use patterns to solve problems with many significant errors.
3.5.2. Create patterns using multiplication	Students create patterns using multiplication with no errors.	Students create patterns using multiplication with no significant errors.	Students create patterns using multiplication with a few significant errors.	Students create patterns using multiplication with many significant errors.
3.5.3. Determine the missing elements of a pattern of multiples	Students determine the missing elements of a pattern of multiples with no errors.	Students determine the missing elements of a pattern of multiples with no significant errors.	Students determine the missing elements of a pattern of multiples with a few significant errors.	Students determine the missing elements of a pattern of multiples with many significant errors.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
3.5.4. Solve addition, subtraction, multiplication, and division equations with unknown numbers; e.g., $8x + 1 = 56$	Students solve addition, subtraction, multiplication, and division equations with unknown numbers with no errors.	Students solve addition, subtraction, multiplication, and division equations with unknown numbers with no significant errors.	Students solve addition, subtraction, multiplication, and division equations with unknown numbers with a few significant errors.	Students solve addition, subtraction, multiplication, and division equations with unknown numbers with many significant errors.
<b>MATHEMATICAL MODELING</b>				
3.5.5. Use symbols to write number sentences; i.e., +, -, >, <, =, x, and ÷	Students use symbols to write number sentences with no errors.	Students use symbols to write number sentences with no significant errors.	Students use symbols to write number sentences with a few significant errors.	Students use symbols to write number sentences with many significant errors.
<b>RATES OF CHANGE</b>				
<i>No expectations at this level</i>				

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 4</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
4.5.1. Determine the missing elements of complex repeating patterns	Students determine the missing elements of complex repeating patterns with no errors.	Students determine the missing elements of complex repeating patterns with no significant errors.	Students determine the missing elements of complex repeating patterns with a few significant errors.	Students determine the missing elements of complex repeating patterns with many significant errors.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
4.5.2. Explain that variables represent unknowns	Students explain, with great detail, that variables represent unknowns.	Students explain, with adequate detail, that variables represent unknowns.	Students explain, with some detail, that variables represent unknowns.	Students explain, with minimal detail, that variables represent unknowns.
<b>MATHEMATICAL MODELING</b>				
4.5.3. Solve problems with variables	Students solve problems with variables with no errors.	Students solve problems with variables with no significant errors.	Students solve problems with variables with a few significant errors.	Students solve problems with variables with many significant errors.
4.5.4. Use parentheses in solving simple equations	Students use parentheses in solving simple equations with no errors.	Students use parentheses in solving simple equations with no significant errors.	Students use parentheses in solving simple equations with a few significant errors.	Students use parentheses in solving simple equations with many significant errors.
<b>RATES OF CHANGE</b>				
<i>No expectations at this level</i>				

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	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 5</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
5.5.1. Analyze patterns represented by tables and graphs	Students analyze, in great detail, patterns represented by tables and graphs.	Students analyze, in adequate detail, patterns represented by tables and graphs.	Students analyze, in some detail, patterns represented by tables and graphs.	Students analyze, in minimal detail, patterns represented by tables and graphs.
5.5.2. Identify a rule for a pattern involving addition, subtraction, or multiplication	Students identify a rule for a pattern involving addition, subtraction, or multiplication with no errors.	Students identify a rule for a pattern involving addition, subtraction, or multiplication with no significant errors.	Students identify a rule for a pattern involving addition, subtraction, or multiplication with a few significant errors.	Students identify a rule for a pattern involving addition, subtraction, or multiplication with many significant errors.
5.5.3. Identify the rule for a pattern and then use the rule to solve a problem	Students identify and use a rule for a pattern to solve a problem with no errors.	Students identify and use a rule for a pattern to solve a problem with no significant errors.	Students identify and use a rule for a pattern to solve a problem with a few significant errors.	Students identify and use a rule for a pattern to solve a problem with many significant errors.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
5.5.4. Identify a variable in an expression	Students identify a variable in an expression with no errors.	Students identify a variable in an expression with no significant errors.	Students identify a variable in an expression with a few significant errors.	Students identify a variable in an expression with many significant errors.
<b>MATHEMATICAL MODELING</b>				
5.5.5. Use equations to solve problems; e.g., $28/x=7$	Students use equations to solve problems with no errors.	Students use equations to solve problems with no significant errors.	Students use equations to solve problems with a few significant errors.	Students use equations to solve problems with many significant errors.
<b>RATES OF CHANGE</b>				
<i>No expectations at this level</i>				

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	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 6</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
6.5.1. Identify and describe patterns represented by tables, graphs, and sequences	Students identify and describe in great detail the patterns represented by tables, graphs, and sequences.	Students identify and describe in adequate detail the patterns represented by tables, graphs, and sequences.	Students identify and describe in some detail the patterns represented by tables, graphs, and sequences.	Students identify and describe in minimal detail the patterns represented by tables, graphs, and sequences.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
6.5.2. Use a variable to represent an unknown quantity	Students use a variable to represent an unknown quantity with no errors.	Students use a variable to represent an unknown quantity with no significant errors.	Students use a variable to represent an unknown quantity with a few significant errors.	Students use a variable to represent an unknown quantity with many significant errors.
<b>MATHEMATICAL MODELING</b>				
6.5.3. Use representations to solve problems; i.e., tables and numerical sentences	Students use representations to solve problems with no errors.	Students use representations to solve problems with no significant errors.	Students use representations to solve problems with a few significant errors.	Students use representations to solve problems with many significant errors.
<b>RATES OF CHANGE</b>				
6.5.4. Recognize examples of change over time; e.g., growth of a sixth grader from September to May	Students recognize examples of change over time with no errors.	Students recognize examples of change over time with no significant errors.	Students recognize examples of change over time with a few significant errors.	Students recognize examples of change over time with many significant errors.

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	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>Grade 7</b>				
<b>PATTERNS, RELATIONS, AND FUNCTIONS</b>				
7.5.1. Create tables and graphs to analyze and describe patterns	Students create tables and graphs with no errors and use them to analyze and describe patterns in great detail.	Students create tables and graphs with no significant errors and use them to analyze and describe patterns in adequate detail.	Students create tables and graphs with a few significant errors and use them to analyze and describe patterns in some detail.	Students create tables and graphs with many significant errors and use them to analyze and describe patterns in minimal detail.
<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
7.5.2. Create algebraic expressions and equations to represent word phrases and sentences	Students create algebraic expressions and equations to represent word phrases and sentences with no errors.	Students create algebraic expressions and equations to represent word phrases and sentences with no significant errors.	Students create algebraic expressions and equations to represent word phrases and sentences with a few significant errors.	Students create algebraic expressions and equations to represent word phrases and sentences with many significant errors.
7.5.3. Apply the order of operations and the commutative, associative, and distributive properties to evaluate numeric expressions	Students apply the order of operations, and the commutative, associative, and distributive properties to evaluate numeric expressions with no errors.	Students apply the order of operations, and the commutative, associative, and distributive properties to evaluate numeric expressions with no significant errors.	Students use the order of operations, and the commutative, associative, and distributive properties to evaluate numeric expressions with a few significant errors.	Students use the order of operations, and the commutative, associative, and distributive properties to evaluate numeric expressions with many significant errors.
7.5.4. Use inverse operations and properties of equality to solve one-step equations and inequalities in one variable	Students use inverse operations and the properties of equality to solve one-step equations and inequalities in one variable with no errors.	Students use inverse operations and the properties of equality to solve one-step equations and inequalities in one variable with no significant errors.	Students use inverse operations and the properties of equality to solve one-step equations and inequalities in one variable with a few significant errors.	Students use inverse operations and/or properties of equality to solve one-step equations and inequalities in one variable with many significant errors.

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
<b>MATHEMATICAL MODELING</b>				
7.5.5. Write one-step equations and inequalities to represent problem situations	Students write one-step equations and inequalities to represent problem situations with no errors.	Students write one-step equations and inequalities to represent problem situations with no significant errors.	Students write one-step equations and inequalities to represent problem situations with a few significant errors.	Students write one-step equations and inequalities to represent problem situations with many significant errors.
<b>RATES OF CHANGE</b>				
7.5.6. Graph change over time; e.g., growth, distance, population	Students graph change over time with no errors.	Students graph change over time with no significant errors.	Students graph change over time with a few significant errors.	Students graph change over time with many significant errors.
<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.

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

Benchmark Expectations	PROFICIENCY DESCRIPTOR			
	ADVANCED PROFICIENT	PROFICIENT	PARTIALLY PROFICIENT	NOVICE
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.
<b>RATES OF CHANGE</b>				
8.5.6. Solve problems involving rates; i.e., speed equals distance divided by time (miles per hour)	Students solve problems involving rates with no errors.	Students solve problems involving rates with no significant errors.	Students solve problems involving rates with a few significant errors.	Students solve problems involving rates 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>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.
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	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.

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
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<b>NUMERIC AND ALGEBRAIC REPRESENTATIONS</b>				
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)	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.
9-10.5.8. Manipulate algebraic expressions and equations using properties of real numbers; e.g., simplify, factor	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.
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	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.
9-10.5.10. Solve a literal equation for a specified variable; e.g., solve $l = prt$ for $r$ , or solve $7n + p = t$ for $n$	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.
<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.

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
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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.
RATES OF CHANGE				
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.
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.

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Benchmark Expectations	PROFICIENCY DESCRIPTOR			
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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.
MATHEMATICAL MODELING				
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	Students determine and write an equation for a function with ease and with no errors.	Students determine and write an equation for a function with minimal difficulty and with no significant errors.	Students determine and write an equation for a function with difficulty and with a few significant errors.	Students determine and write an equation for a function with great difficulty and with many significant errors.
RATES OF CHANGE				
<i>No further expectations</i>				