NORTH DAKOTA DEPARTMENT OF
PUBLIC INSTRUCTION

North Dakota
High School State Standards

Algebra I Pathway

July 2017

Overview

The North Dakota State Standards (NDSS) for Mathematics are organized by grade level in Grades K-8. At the high school level, the standards are organized by conceptual category (number and quantity, algebra, functions, geometry, modeling, and probability and statistics), showing the body of knowledge students should learn in each category to be college and career ready, and to be prepared to study more advanced mathematics. As North Dakota school districts consider how to implement the high school standards, an important consideration is how the high school NDSS might be organized into courses that provide a strong foundation for post-secondary success. To address this need, the NDSS writing committee has provided a possible pathway to implement the NDSS in the traditional courses of Algebra I, Geometry, Algebra II and Course IV.

In considering this document, it is important to note the following:

1. The pathway is a model, not a mandate. It illustrates a possible approach to organize the content of the NDSS into coherent and rigorous courses that lead to college and career readiness. Districts are not expected to adopt these courses as is; rather, they may use this pathway as a starting point for developing their own.

2. All college and career ready standards have been included in the pathway. Standards with a (+) are included to increase coherence but are not necessarily expected to be addressed on high stakes assessments.

While the focus of this document is on organizing the Standards for Mathematical Content into a pathway to college and career readiness, the content standards must also be connected to the Standards for Mathematical Practice to ensure that the skills needed for later success are developed. In particular, Modeling (defined by a * in the NDSS) is defined as both a *conceptual category* for high school mathematics and a *mathematical practice* and is an important avenue for motivating students to study mathematics, for building their understanding of mathematics, and for preparing them for future success. Development of the pathway into instructional programs will require careful attention to modeling and the mathematical practices. Assessments based on the pathway should reflect both the content and mathematical practices standards.

Strategic use of technology is expected in all work. This may include employing technological tools to assist students in forming and testing conjectures, creating graphs and data displays, as well as determining and assessing lines of fit for data. Geometric constructions may also be performed using geometric software, as well as classical tools and technology aiding in three-dimensional visualization.

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

Mathematical Practices

It should be noted that throughout each course, the following **mathematical practices** from the NDSS are to be emphasized:

1. Make sense of problems and persevere in solving them.

Mathematically proficient students:

- Explain to themselves the meaning of a problem and looking for entry points to its solution.
- Analyze givens, constraints, relationships, and goals.
- Make conjectures about the form and meaning of the solution attempt.
- Consider analogous problems, and try special cases and simpler forms of the original problem.
- Monitor and evaluate their progress and change course if necessary.
- Transform algebraic expressions or change the viewing window on their graphing calculator to get information.
- Explain correspondences between equations, verbal descriptions, tables, and graphs.
- Draw diagrams of important features and relationships, graph data, and search for regularity or trends.
- Use concrete objects or pictures to help conceptualize and solve a problem.
- Check their answers to problems using a different method.
- Ask themselves, “Does this make sense?”
- Understand the approaches of others to solving complex problems.

2. Reason abstractly and quantitatively.

Mathematically proficient students:

- Make sense of quantities and their relationships in problem situations.
  - ✓ *Decontextualize* (abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents) and
  - ✓ *Contextualize* (pause as needed during the manipulation process in order to probe into the referents for the symbols involved).
- Use quantitative reasoning that entails creating a coherent representation of quantities, not just how to compute them.
- Know and flexibly use different properties of operations and objects.

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3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students:

- Understand and use stated assumptions, definitions, and previously established results in constructing arguments.
- Make conjectures and build a logical progression of statements to explore the truth of their conjectures.
- Analyze situations by breaking them into cases.
- Recognize and use counterexamples.
- Justify their conclusions, communicate them to others, and respond to the arguments of others.
- Reason inductively about data, making plausible arguments that take into account the context.
- Compare the effectiveness of plausible arguments.
- Distinguish correct logic or reasoning from that which is flawed.
  - ✓ Elementary students construct arguments using objects, drawings, diagrams, and actions.
  - ✓ Later students learn to determine domains to which an argument applies.
- Listen or read the arguments of others, decide whether they make sense, and ask useful questions.

4. Model with mathematics.

Mathematically proficient students:

- Apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
  - ✓ In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community.
  - ✓ By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another.
- Simplify a complicated situation, realizing that these may need revision later.
- Identify important quantities in a practical situation.
- Map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas.
- Analyze those relationships mathematically to draw conclusions.
- Interpret their mathematical results in the context of the situation.
- Reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

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5. Use appropriate tools strategically.

Mathematically proficient students:

- Consider available tools when solving a mathematical problem.
- Are familiar with tools appropriate for their grade or course to make sound decisions about each of these tools.
- Detect possible errors by using estimations and other mathematical knowledge.
- Know that technology can enable them to visualize the results of varying assumptions, and explore consequences.
- Identify relevant mathematical resources and use them to pose or solve problems.
- Use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students:

- Try to communicate precisely to others.
- Use clear definitions in discussion with others and in their own reasoning.
- State the meaning of the symbols they choose, including using the equal sign consistently and appropriately.
- Specify units of measure and label axes to clarify the correspondence with quantities in a problem.
- Calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the context.
  - ✓ In the elementary grades, students give carefully formulated explanations to each other.
  - ✓ In high school, students have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students:

- Look closely to discern a pattern or structure.
  - ✓ Young students might notice that three and seven more is the same amount as seven and three more.
  - ✓ Later, students will see 7×8 equals the well-remembered $7 \times 5 + 7 \times 3$, in preparation for the distributive property.
  - ✓ In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$.
- Step back for an overview and can shift perspective.
- See complicated things, such as some algebraic expressions, as single objects or composed of several objects.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students:

- Notice if calculations are repeated.
- Look for both general methods and for shortcuts.
- Maintain oversight of the process, while attending to the details.
- Continually evaluate the reasonableness of intermediate results.

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category**: Number and Quantity**
Domain: **The Real Number System**
Cluster: **Extend the properties of exponents to rational numbers**

HS.N-RN

Standard HS.N-RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	**Students Can** • use exponential properties to explain how rational exponents follow from integer exponents	**Resources**
Vocabulary • rational number • exponent	**Annotations** Example: We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5	**Notes**

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Domain: **The Real Number System**
Cluster: **Extend the properties of exponents to rational numbers**

HS.N-RN

Standard HS.N-RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**Students Can** • understand that the denominator of a rational exponent is the root index and the numerator is the exponent of the radicand • convert an expression in radical form to rational exponents and vice-versa	**Resources**
Vocabulary • root index • radicand • radical	**Annotations** Example: $\sqrt{x^3} = x^{\frac{3}{2}}$ Example: $(\sqrt{4})^3 = ((4)^{\frac{1}{2}})^3 = 2^3 = 8$	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Number and Quantity**
Domain: **The Real Number System**
Cluster: **Use properties of rational and irrational numbers**

HS.N-RN

Standard	**Students Can**	**Resources**
HS.N-RN.3 Demonstrate that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational, and that the product of a nonzero rational number and an irrational number is irrational.	• use the closure property or show by example the sum or product of two rational numbers is rational • show by example the sum of a rational number and an irrational number is irrational • show by example the product of a nonzero rational number and an irrational number is irrational	Rational and Irrational Numbers 1 Rational and Irrational Numbers 2
Vocabulary • closure property • irrational number • rational number	**Annotations** Example: Evaluate $\sqrt{2} \cdot \sqrt{4}$ and identify which subset of the real number system the solution is in. Solution: $\sqrt{8} = 2\sqrt{2}$, which is irrational.	**Notes**

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HS.N-RN

Standard HS.N-RN.4 Perform basic operations on radicals and simplify radicals to write equivalent expressions.	**Students Can** • perform basic operations on radicals • simplify radicals to write equivalent expressions	**Resources**
Vocabulary • radicals • rationalizing the denominator	**Annotations** Basic operations include addition, subtraction, multiplication and division (e.g., rationalizing the denominator).	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Number and Quantity**
Domain: **Quantities* (Mathematical Practices 1, 4, and 6)**
Cluster: **Reason quantitatively and use units to solve problems**

HS.N-Q

Standard	**Students Can**	**Resources**
HS.N-Q.1* Use units as a way to understand problems and to guide the solution of multi-step problems (e.g., unit analysis). Choose and interpret units consistently in formulas. Choose and interpret the scale and the origin in graphs and data displays.	• interpret units in the context of the problem • use unit analysis to check the reasonability of your solution • choose and interpret an appropriate scale given data to be represented on a graph or display	Estimations and Approximations: The Money Munchers Leaky Faucet Yogurt
Vocabulary • unit analysis	**Annotations** Example: While driving in the United Kingdom (UK), a U.S. tourist puts 60 liters of gas in his car. The gas cost is £1.28 per liter. The exchange rate is £ 0.62978 for each US $1.00. The price for a gallon of a gasoline in the United States is US $3.05. The driver wants to compare costs for the same amount and the same type of gasoline in UK and in the United States if he pays in UK Pounds.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Number and Quantity**
Domain: **Quantities* (Mathematical Practices 1, 4, and 6)**
Cluster: **Reason quantitatively and use units to solve problems**

HS.N-Q

Standard	**Students Can**	**Resources**
HS.N-Q.2* Define appropriate quantities for the purpose of descriptive modeling.	• determine an appropriate quantity to model a situation	Estimations and Approximations: The Money Munchers Yogurt Leaky Faucet
Vocabulary • modeling	**Annotations** Example: When carpeting a room, students might consider whether it is best to use square feet or square yards. When considering a remodeling project, they might choose such units as cost per room, cost per month of the project, or cost per contractor.	**Notes**

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Domain: **Quantities* (Mathematical Practices 1, 4, and 6)**
Cluster: **Reason quantitatively and use units to solve problems**

HS.N-Q

Standard	**Students Can**	**Resources**
HS.N-Q.3* Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	• choose a level of accuracy appropriate to the measuring tool or situation	Estimations and Approximations: The Money Munchers Leaky Faucet Yogurt
Vocabulary • significant digits • precision: refers to how much information is conveyed by a number (in terms of the number of digits) • accuracy: the degree to which a measurement conforms to the correct value or a standard	**Annotations** Example: When using a ruler, students choose to report their measurements based on the precision of the ruler (e.g., to the nearest 1/16 or the nearest 1/32). Example: If you are playing soccer and you always hit the left goal post instead of scoring, then you are not accurate; you are precise. Example: When using a ruler, students are able to measure accurately. Example: When calculating the cost of a road trip, students are given the cost of gasoline to the thousandths place. When reporting the cost of the trip, students determine what level of precision—to the hundredths place or to the thousandths place—is appropriate and why.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Number and Quantity**
Domain: **Vector and Matrix Quantities**
Cluster: **Perform operations on matrices and use matrices in applications**

HS.N-VM

Standard	**Students Can**	**Resources**
HS.N-VM.6* Use matrices to represent and manipulate data.	• represent and manipulate data using matrices, e.g., to organize merchandise, keep total sales and total costs	
Vocabulary • matrix	**Annotations** Example: Represent the following situation using a matrix. The price for different sandwiches are presented below	**Notes**

	6in	9in
Roast beef	$3.95	$5.95
Turkey	$3.75	$5.60
Tuna	$3.50	$5.25

Solution: $p = \begin{bmatrix} 3.95 & 5.95 \\ 3.75 & 5.60 \\ 3.50 & 5.25 \end{bmatrix}$

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HS.N-VM

Standard HS.N-VM.7 Multiply matrices by scalars to produce new matrices.	**Students Can** • multiply matrices by a scalar	**Resources**
Vocabulary • scalar	**Annotations** Example: Given the following situation, find the cost of each type of sandwich in matrix form given a 10% discount. The price for different sandwiches are presented below Solution: $p = .90\begin{bmatrix} 3.95 & 5.95 \\ 3.75 & 5.60 \\ 3.50 & 5.25 \end{bmatrix} = \begin{bmatrix} 3.56 & 5.36 \\ 3.38 & 5.04 \\ 3.15 & 4.73 \end{bmatrix}$	**Notes**

	6in	9in
Roast beef	$3.95	$5.95
Turkey	$3.75	$5.60
Tuna	$3.50	$5.25

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Domain: **Vector and Matrix Quantities**
Cluster: **Perform operations on matrices and use matrices in applications**

HS.N-VM

Standard HS.N-VM.8 Add, subtract, and multiply matrices of appropriate dimensions.	**Students Can** • identify the dimensions of a matrix as the number or rows and columns • add, subtract, and multiply matrices of appropriate dimensions	**Resources**
Vocabulary • dimension of a matrix	**Annotations**	**Notes**

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Domain: **Vector and Matrix Quantities**
Cluster: **Perform operations on matrices and use matrices in applications**

HS.N-VM

Standard HS.N-VM.9 Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.	**Students Can** • understand that matrix multiplication is not commutative (AB ≠ BA); however, matrix multiplication is associative and satisfies the distributive properties	**Resources**
Vocabulary • commutative property • associative property • distributive property	**Annotations**	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Seeing Structure in Expressions**
Cluster: **Interpret the structure of expressions**

HS.A-SSE

Standard	**Students Can**	**Resources**
HS.A-SSE.1* Interpret expressions that represent a quantity in terms of its context a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity.	• interpret expressions that represent a quantity in terms of its context • identify the different parts of an expression and explain their meaning within the context of a problem • interpret expressions and make sense of the multiple factors and terms by explaining the meaning of the individual parts	
Vocabulary • expression • term • factor • coefficient	**Annotations** Focus on quadratic and exponential expressions. Example: Interpret $\frac{1}{2}h(b_1 + b_2)$ as the product of the height of a trapezoid and the average of its base lengths.	**Notes**

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Conceptual Category: **Algebra**
Domain: **Seeing Structure in Expressions**
Cluster: **Interpret the structure of expressions**

HS.A-SSE

Standard	**Students Can**	**Resources**
HS.A-SSE.2 Use the structure of an expression to identify ways to rewrite it.	• rewrite algebraic expressions in equivalent forms such as factoring or combining like terms • use factoring techniques such as common factors, grouping, the difference of two squares, the sum or difference of two cubes, or a combination of methods to factor an expression completely • simplify expressions by combining like terms, using the distributive property and using other operations with polynomials • recognize patterns and structures in expressions	Forming Quadratics Proving Patterns – Page 32
Vocabulary	**Annotations** Example: See $9a^2 - 4b^2$ as $(3a)^2 - (2b)^2$ and recognize it as a difference of squares that can be factored as $(3a - 2b)(3a + 2b)$. Example: See $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$, and further to $(x-y)(x+y)(x^2+y^2)$. Focus on quadratic and exponential expressions.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Seeing Structure in Expressions**
Cluster: **Write expressions in equivalent forms to solve problems**

Standard	**Students Can**	**Resources**
HS.A-SSE.3* Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to produce an equivalent expression. c. Use the properties of exponents to transform exponential expressions.	• choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression • write expressions in equivalent forms by factoring to find the zeros of a quadratic function and explain the meaning of the zeros • complete the square in a quadratic expression to convey the vertex form and determine the maximum or minimum value of the quadratic function, and to explain the meaning of the vertex • use properties of exponents (such as power of a power, product of powers, power of a product, power of a quotient) to write an equivalent form of an exponential function to reveal and explain specific information about its approximate rate of growth or decay	Forming Quadratics
Vocabulary • equivalent form • quadratic function • zero of a function • complete the square • maximum • minimum • vertex • exponent • exponential • rate of growth or decay	**Annotations** Example: Given a quadratic function explain the meaning of the zeros of the function. That is if $f(x) = x^2-7x+12 =(x – 4)(x – 3)$ then $f(4) = 0$ and $f(3) = 0$. Example: A toy rocket is shot up at 128 ft/sec from a height of 5 ft. What is the maximum height of the rocket and when does it reach that height? Solution: After 4 seconds the rocket is 261 ft high Example: $8^t = 2^{3t}$ Example: The expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Arithmetic with Polynomials and Rational Expressions**
Cluster: **Perform arithmetic operations on polynomials**

Standard	**Students Can**	**Resources**
HS.A-APR.1 Add, subtract, and multiply polynomials. Understand that polynomials form a system comparable to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication.	• identify polynomials • add, subtract, and multiply polynomials • recognize how closure applies under these operations • relate the addition, subtraction, and multiplication of polynomials to the same operations with integers	Proving Patterns – Page 32
Vocabulary • polynomial • closure	**Annotations** Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of *x.*	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Creating Equations and Inequalities***
Cluster: **Create equations that describe numbers or relationships**

HS.A-CED

Standard	**Students Can**	**Resources**
HS.A-CED.1* Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.	• create linear, quadratic, rational and exponential equations and inequalities in one variable and use them in a contextual situation to solve problems	Printing Tickets
Vocabulary • linear equations • quadratic equations • rational equations • exponential • equations • inequalities	**Annotations** Limit to linear and exponential equations. Limit to situations requiring evaluation of exponential functions at integer inputs.	**Notes**

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North Dakota *HIGH SCHOOL* Common Core: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Creating Equations and Inequalities***
Cluster: **Create equations that describe numbers or relationships**

HS.A-CED

Standard	**Students Can**	**Resources**
HS.A-CED.2* Create equations in two or more variables to represent relationships between quantities. Graph equations on coordinate axes with labels and scales.	• create equations in two or more variables to represent relationships between quantities • graph equations in two variables on a coordinate plane and label the axes and scales	Printing Tickets
Vocabulary • coordinate plane • scale	**Annotations** Example: The cost to rent a car is $50 plus $0.25 per mile driven. Write and graph an equation to represent the situation. Limit to linear and exponential equations. Limit to situations requiring evaluation of exponential functions at integer inputs.	**Notes**

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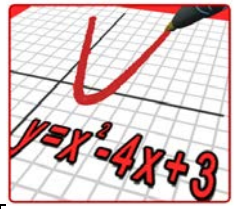
Conceptual Category: **Algebra**
Domain: **Creating Equations and Inequalities***
Cluster: **Create equations that describe numbers or relationships**



Standard	**Students Can**	**Resources**
HS.A-CED.3* Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.	• write and use a system of equations and/or inequalities to solve a real world problem • use equations and inequalities to represent problem constraints and objectives (linear programming) • interpret solutions to problems as viable or non-viable in a problem context	Printing Tickets
Vocabulary • linear programming • constraint • feasible region	**Annotations** Limit to linear equations and inequalities. Example: Willy Wonka's Chocolate Factory makes *Wonka Bars* and *The Everlasting Gobstopper*, among other amazing treats. Oompa Loompas and Fuzzy Fizzies work on each item. The Oompa Loompas spend 6 minutes making a *Wonka Bar* and 4 minutes mixing the ingredients for an *Everlasting Gobstopper*. There are enough Oompa Loompas for up to 6,000 worker-minutes per day. The Fuzzy Fizzies spend about 1 minute wrapping each Wonka Bar and 2 minutes wrapping each *Everlasting Gobstopper*. There are enough Fuzzy Fizzies for a maximum of 1,200 worker-minutes per day. Write the system of inequalities that represent the situation. Determine whether 500 Wonka Bars and 75 Everlasting Gobstoppers is a viable solution. Solution: Oompa Loompas: (6 min/bar)(x bars) + (4 min/gob) (y gob) ≤6,000 min. Fuzzy Fizzies: (1min/bar)(x bars) + (2 min/gob)(y gob) ≤1,200 min. Using substitution, y = 150, x = 900 if the maximum number of hours are worked. 500 Wonka Bars and 75 Everlasting Gobstoppers is a viable solution because it satisfies the constraints.	**Notes**

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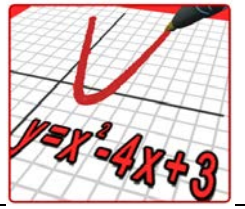
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Creating Equations and Inequalities***
Cluster: **Create equations that describe numbers or relationships**

HS.A-CED



Standard	**Students Can**	**Resources**
HS.A-CED.4* Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.	• solve multi-variable formulas or literal equations for a specific variable	Solving Linear Equations in Two Variables
Vocabulary • literal equation	**Annotations** Example: Rearrange Ohm's law $V = IR$ to isolate resistance R. Limit to formulas which are linear in the variable of interest.	**Notes**

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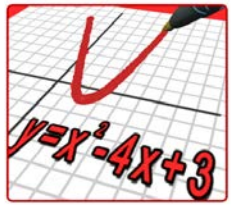
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Understand solving equations as a process of reasoning and explain the reasoning**

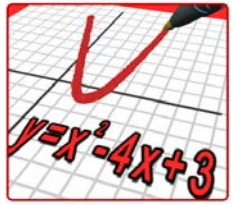
HS.A-REI



Standard HS.A-REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	**Students Can** • construct a convincing argument that justifies each step in the solution process assuming an equation has a solution	**Resources**
Vocabulary	**Annotations** Use justifiable comments such as “combine like terms,” “distributive property,” etc. within the explanation.	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Solve equations and inequalities in one variable**



Standard	**Students Can**	**Resources**
HS.A-REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	• solve linear equations in one variable, including equations with coefficients represented by letters • solve linear inequalities in one variable, including inequalities with coefficients represented by letters	
Vocabulary	**Annotations** Example: Solve for *x: 2mx+3mx+mx = 16* Example: Solve for y: $\frac{3}{4}$y + 7 > 10	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Solve equations and inequalities in one variable**

HS.A-REI

Standard	**Students Can**	**Resources**
HS.A-REI.4 Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. b. Solve quadratic equations by inspection (e.g., for $x^2=49$) taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a±bi for real numbers a and b.	• solve quadratic equations in one variable • transform a quadratic equation to an equation in the form $(x-p)^2=q$ by completing the square • solve quadratic equations in one variable by simple inspection, taking the square root, factoring, and completing the square • recognize which method of solving a quadratic equation is appropriate for a given equation • explain why taking the square root of both sides of an equation can yield two solutions • use the quadratic formula to solve any quadratic equation, recognizing the formula produces all complex solutions and write the solutions in the form a ± bi , where a and b are real numbers	
Vocabulary • completing the square • quadratic formula	**Annotations** This standard is related to HS.N-CN.7.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Solve systems of equations**

HS.A-REI

Standard HS.A-REI.6 Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables.	**Students Can** • solve systems of equations using substitution, linear combination, and graphing	**Resources** Solving Linear Equations in Two Variables
Vocabulary • linear combination • elimination method • substitution method	**Annotations** Methods for solution could include substitution, linear combination, graphing or matrices.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Represent and solve equations and inequalities graphically**

HS.A-REI

Standard HS.A-REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.	**Students Can** • find any solution to an equation in two variables from the graph of that equation • explain that the set of all solutions to an equation in two variables can often be represented in the coordinate plane as a curve	**Resources**
Vocabulary	**Annotations** Example: The equation of y=6x+5 represents the amount of money paid to a babysitter (i.e., $5 for gas to drive to the job and $6/hour to do the work), then every point on the line represents an amount of money paid, given the time worked.	**Notes**

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North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Represent and solve equations and inequalities graphically**

Standard	**Students Can**	**Resources**
HS.A-REI.11 Using graphs, technology, tables, or successive approximations, show that the solution(s) to the equation f(x) = g(x) are the x-value(s) that result in the y-values of f(x) and g(x) being the same.	• explain why the intersection of y = f(x) and y = g(x) is the solution of f(x) = g(x) for any combination of linear or exponential functions • use technology to graph the equations and find their points of intersection • use tables of values or successive approximations to find solutions	
Vocabulary • intersection	**Annotations** Example: Use a graphing calculator to find and justify the approximate solution(s) to the system below. $\begin{cases} f(x) = x + 4 \\ g(x) = 4 - x^2 \end{cases}$ Solutions*: x= 0 and x= -1.* *f(0) = 4, g (0) = 4; f(-1)=3, g(-1)=3* Focus on cases where f(x) and g(x) are linear or exponential.	**Notes**

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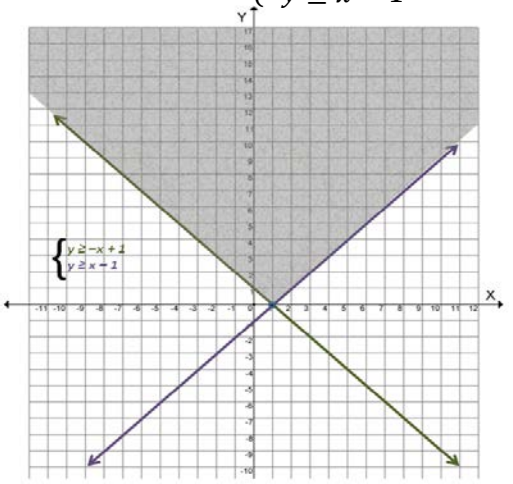
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Algebra**
Domain: **Reasoning with Equations and Inequalities**
Cluster: **Represent and solve equations and inequalities graphically**

Standard	**Students Can**	**Resources**
HS.A-REI.12 Graph the solutions to a linear inequality in two variables as a half-plane. Graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	• graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary for strict inequalities • graph the solution set to a system of linear inequalities in two variables as the intersection of their corresponding half-planes	
Vocabulary • half-plane	**Annotations** Example: Solve by graphing: $\begin{cases} y \geq -x+1 \\ y \geq x-1 \end{cases}$ Solution: 	**Notes**

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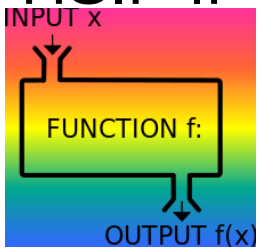
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Understand the concept of a function and use function notation**

HS.F-IF



Standard HS.F-IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y = f(x)*.	**Students Can** • use the definition of a function to determine whether a relationship is a function given a table, graph or words • identify x as an element of the domain and *f(x)* as an element in the range given the function *f* • identify that the graph of the function *f* is the graph of the function *y=f(x)*	**Resources**
Vocabulary • function • domain • range	**Annotations**	**Notes**

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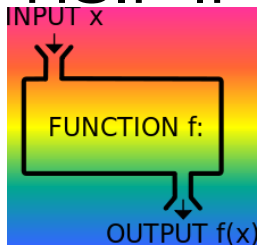
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Understand the concept of a function and use function notation**

HS.F-IF



Standard HS.F-IF.2* Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**Students Can** • use *f(x)* notation when a relation is determined to be a function • evaluate functions for inputs in their domains • interpret statements that use function notation in terms of a context in which they are used	**Resources**
Vocabulary • function notation	**Annotations** Example: Suppose *f(d) = 0.5d + 50* where *f(d)* represents the cost for renting a car driven *d* miles. Evaluate *f(200)* and interpret the result.	**Notes**

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Conceptual Category: **Functions**
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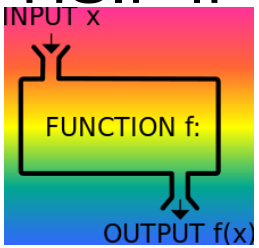
Cluster: **Understand the concept of a function and use function notation**

HS.F-IF



Standard HS.F-IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	**Students Can** • identify sequences as functions, sometimes defined recursively, whose domain is a subset of the integers	**Resources** Aussie Fir Tree
Vocabulary • recursive • integers	**Annotations** Example: The Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n > 1. Example: Write a recursive formula in function notation for the sequence generated by adding 5 to each successive term beginning with 2. Solution: $\begin{cases} f(1)=2 \\ f(n)=f(n-1)+5, n>1 \end{cases}$	**Notes**

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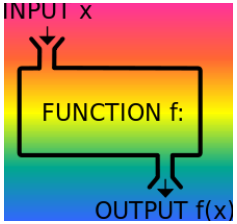
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Interpret functions that arise in applications in terms of the context**



Standard	**Students Can**	**Resources**
HS.F-IF.4* Use tables, graphs, verbal descriptions, and equations to interpret and sketch the key features of a function modeling the relationship between two quantities.	• identify key features in graphs and tables to include intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior for a given function • sketch the graph of a function given its key features	Interpreting Distance-Time Graphs Forming Quadratics
Vocabulary • intercepts • relative maximum • relative minimum • end behavior • symmetry	**Annotations** Students should be able to use appropriate notation to indicate where functions are increasing, decreasing, positive, and negative. Example: Given $f(x) = x^2 - 4$. Graph the function and identify the intercepts, intervals where the function is increasing, decreasing, positive, and negative, the relative maximum and minimum, and any symmetry. Solution: Intercepts: (-2,0), (2,0), (0,-4) Relative Minimum: (0,-4) ~~Increasing: x>0~~ Decreasing: x<0 Positive: x<-2 and x>2 Negative: -2<x<2 Symmetric to the y axis Focus on linear, quadratic and exponential functions.	**Notes**

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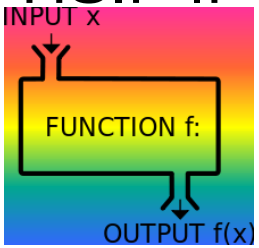
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Interpret functions that arise in applications in terms of the context**

HS.F-IF



Standard HS.F-IF.5* Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	**Students Can** • interpret a graph to determine the appropriate numerical domain being described	**Resources** Interpreting Distance-Time Graphs Forming Quadratics
Vocabulary • domain	**Annotations** Example: If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. Focus on linear and exponential functions.	**Notes**

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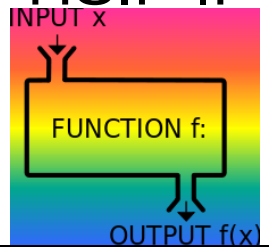
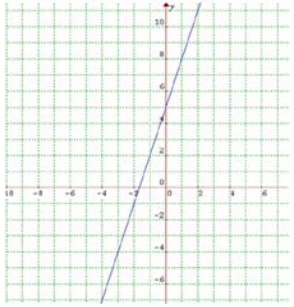
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Interpret functions that arise in applications in terms of the context**

HS.F-IF



Standard	**Students Can**	**Resources**
HS.F-IF.6* Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	• calculate and interpret the average rate of change of a function presented symbolically or as a table • estimate the average rate of change over a specified interval of a function from its graph	Interpreting Distance-Time Graphs
Vocabulary • rate of change • interval	**Annotations** Example: Estimate the rate of change given the graph below:  Solution: The average rate of change of a function $y = f(x)$ over an interval $[a, b]$ is $\frac{\Delta y}{\Delta x} = \frac{f(b)-(a)}{b-a}$. Therefore, the estimated average rate of change for the function graphed above is: $\frac{(5-0)}{(0-(-1.75)} \approx 2.86$ Focus on linear and exponential functions whose domains are a subset of the integers.	**Notes**

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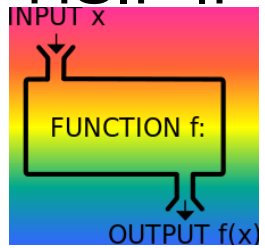
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Analyze functions using different representations**

HS.F-IF



Standard	**Students Can**	**Resources**
HS.F-IF.7* Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. e. Graph exponential functions, showing intercepts and end behavior.	• graph functions expressed symbolically and show key features of the graph (graph simple cases by hand and use technology to show more complicated cases) • graph linear functions showing intercepts • graph quadratic functions showing intercepts, a maximum or a minimum • graph exponential functions, showing intercepts and end behavior	Interpreting Distance-Time Graphs Forming Quadratics
Vocabulary • intercepts • maximum • minimum • end behavior	**Annotations** Focus on linear and exponential functions, include comparisons of two functions presented algebraically.	**Notes**

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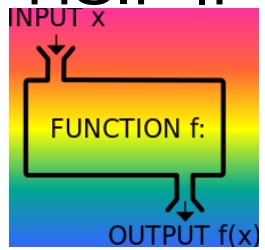
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Analyze functions using different representations**

HS.F-IF



Standard	**Students Can**	**Resources**
HS.F-IF.8* Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions.	• write a function in equivalent forms (e.g., factored vs. general form) to show different properties of the function • explain different properties of a function that are revealed by writing a function in equivalent forms • use the process of factoring and completing the square in a quadratic function to show zeros, a maximum or minimum, and symmetry of the graph, and interpret these in terms of a real-world situation • use the properties of exponents to interpret exponential functions as growth or decay	Interpreting Distance-Time Graphs Forming Quadratics
Vocabulary • exponential growth • exponential decay • extreme values	**Annotations** Example: Identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay. Focus on linear, quadratic and exponential functions.	**Notes**

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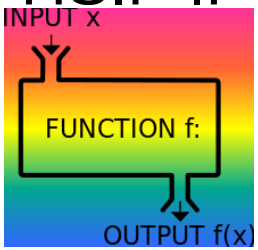
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Interpreting Functions**
Cluster: **Analyze functions using different representations**

HS.F-IF



Standard HS.F-IF.9* Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	**Students Can** • compare the key features of two functions that are represented in different ways	**Resources** Interpreting Distance-Time Graphs Forming Quadratics
Vocabulary	**Annotations** Example: Given a graph of one quadratic function and an algebraic representation for another function, say which has the larger maximum. Example: Compare the intercepts of two functions, one of which is represented graphically and the other is represented symbolically. Focus on linear, quadratic and exponential functions.	**Notes**

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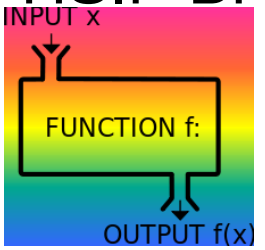
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Building Functions***
Cluster: **Build a function that models a relationship between two quantities**



Standard	**Students Can**	**Resources**
HS.F-BF.1* Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations.	• write a functions that describes a relationship between two quantities • write an explicit or recursive expression or describe the calculations needed to model a function given a situation • combine function types, such as linear, quadratic and exponential, using arithmetic operations	Generalizing Patterns: Table Tiles Printing Tickets
Vocabulary • explicit • recursive • linear • quadratic • exponential	**Annotations** Example: Given a table showing how far a car has driven after a given number of minutes, traveling at a uniform speed, students will examine the table by looking “down” the table to describe a recursive relationship, as well as “across” the table to determine an explicit formula to find the distance traveled in the number of minutes is known. Example: Build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. Limit to linear, quadratic and exponential functions.	**Notes**

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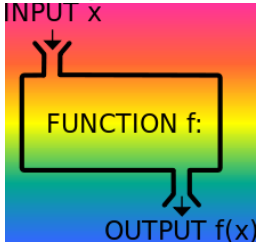
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Building Functions***
Cluster: **Build new functions from existing functions**

HS.F-BF



Standard	**Students Can**	**Resources**
HS.F-BF.3* Identify the effect on the graph of replacing *f(x)* by *f(x)* + *k*, *k f(x)*, *f(kx)*, and *f(x + k)* for specific values of *k* (both positive and negative); find the value of *k* given the graphs. Recognize even and odd functions from their graphs.	• experiment to identify, using technology, the transformational effects on the graph of a function *f(x)* when *f(x)* is replaced by *f(x)+k*, *k·f(x), f(kx),* and *f(x+k)* for specific values of k, both positive and negative • find the value of *k* given the graph of a transformed function • recognize even and odd functions from their graphs and equations	
Vocabulary • transformation • even functions • odd functions	**Annotations** Focus on vertical translations of graphs of linear and exponential functions; relate the vertical translation of a linear function to its y-intercept.	**Notes**

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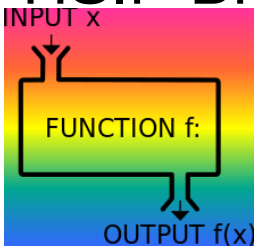
HS.F-BF



Standard	**Students Can**	**Resources**
HS.F-BF.4* Find inverse functions. a. Write an equation for the inverse given a function has an inverse.	• find the inverse of a given function • solve a function for the dependent variable and write the inverse of a function by interchanging the dependent and independent variables	
Vocabulary • inverse function • independent variable • dependent variable	**Annotations** Limit to linear functions.	**Notes**

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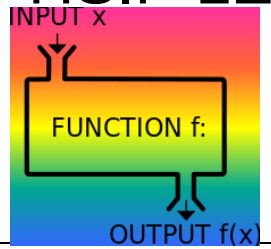
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Linear, Quadratic and Exponential Models***
Cluster: **Construct and compare linear, quadratic, and exponential models and solve problems**

HS.F-LE



Standard	**Students Can**	**Resources**
HS.F-LE.1* Identify situations that can be modeled with linear, quadratic, and exponential functions. Justify the most appropriate model for a situation based on the rate of change over equal intervals. Include situations in which a quantity grows or decays.	• determine a situation as linear or exponential by examining rates of change between data points • show there is a constant difference in a linear function over equal intervals • show there is a constant multiplier in an exponential function over equal intervals • describe situations where one quantity changes at a constant rate per unit interval relative to another • describe situations where one quantity grows or decays by a constant multiplier per unit interval relative to another	
Vocabulary • constant difference • constant multiplier	**Annotations** Example: a person earning $10 per hour experiences a constant rate of change in salary given the number of hours worked. Example: the number of bacteria on a dish doubles every hour will have equal factors over equal intervals.	**Notes**

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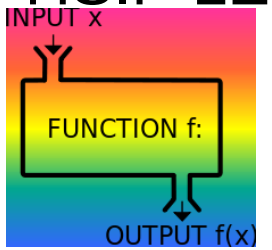
North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Linear, Quadratic and Exponential Models***
Cluster: **Construct and compare linear and exponential models and solve problems**

HS.F-LE

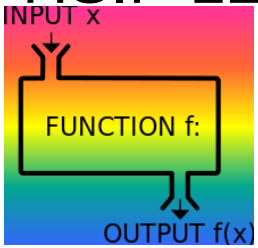


Standard	**Students Can**	**Resources**
HS.F-LE.2* Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a table, a description, or two input-output pairs given their relationship.	• write a linear or exponential function given an arithmetic or geometric sequence, a graph, a description of the relationship, or two points which can be read from a table	Comparing Investments Snail Invasion (exponential) Rumors (exponential) Sandia Aerial Tram (linear/exponential/quadratic) Basketball Rebounds (exponential /logarithms utilized) Two Points Determine an Exponential Function I Two Points Determine an Exponential Function II Algae Blooms
Vocabulary	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Linear, Quadratic and Exponential Models***
Cluster: **Construct and compare linear and exponential models and solve problems**

HS.F-LE

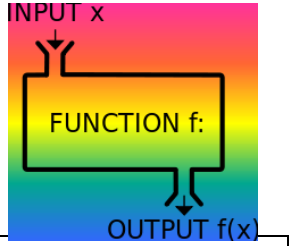


Standard	**Students Can**	**Resources**
HS.F-LE.3* Compare the end behavior of linear, quadratic, and exponential functions using graphs and/or tables to show that a quantity increasing exponentially eventually exceeds a quantity increasing as a linear or quadratic function.	• use graphs and tables to make the connection that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or any other polynomial function	
Vocabulary	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Functions**
Domain: **Linear, Quadratic and Exponential Models***
Cluster: **Interpret expressions for functions in terms of the situation they model**

HS.F-LE



Standard	**Students Can**	**Resources**
HS.F-LE.5* Interpret the parameters in a linear, quadratic, or exponential function in terms of a context.	• explain the meaning of the coefficients, constants, factors, exponents, and intercepts in a linear, quadratic or exponential function in terms of a context	
Vocabulary • coefficient • constant • parameter: A constant or a variable in a mathematical expression, which distinguishes various specific cases. For example, in the equation y = mx + b, m and b are parameters which specify the particular straight line represented by the equation. (From "Mathematics Dictionary, edited by Glenn James and Robert James, 1960, Princeton, New Jersey).	**Annotations** Example: in the equation y = mx + b, m and b are parameters which specify the particular straight line represented by the equation. Example: A cell phone plan includes $40 a month, plus 2 cents per minute of usage. Write a function that shows the monthly cost of using your cell phone, and interpret the parameters. Answer: C = 0.02m + 40 The monthly cost is 40 dollars plus two cents times the number of minutes used. The minimum cost per month is $40 (at m=0).	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Summarize, represent, and interpret data on a single count or measurement variable**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.1* Represent data with plots on the real number line (dot plots, histograms, and box plots).	• construct dot plots, histograms and box plots on a real number line	Evaluating Categorical and Quantitative Data Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • dot plot • histogram • box plot	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Summarize, represent, and interpret data on a single count or measurement variable**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.2* Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	• describe a distribution using center and spread • use the correct measure of center and spread to describe a distribution that is symmetric or skewed • compare two or more different data sets using the center and spread of each	Evaluating Categorical and Quantitative Data Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • skewed distribution • symmetric distribution • interquartile range • standard deviation	**Annotations** Students may use technology to find the standard deviation.	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Summarize, represent, and interpret data on a single count or measurement variable**

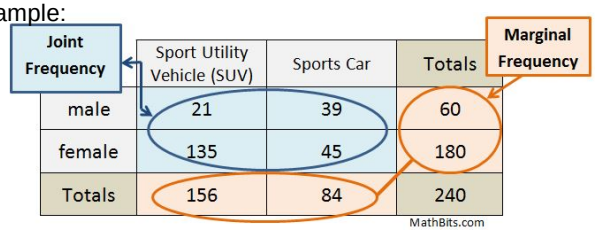
HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.3* Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	• identify outliers (extreme data points) and their effects on data sets • interpret differences in different data sets in context • interpret differences due to possible effects of outliers	Evaluating Categorical and Quantitative Data Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • outlier • spread • center	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Summarize, represent, and interpret data on two categorical and quantitative variables**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.5* Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	• create a two-way table from two categorical variables and read values from two-way table • interpret joint, marginal, and relative frequencies in context • recognize associations and trends in data from a two-way table	Musical Preferences Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • two-way frequency table • joint frequency • marginal frequency • relative frequency	**Annotations** Example:  The joint relative frequency of being male and owning an SUV is 21/240. The marginal relative frequency of owning an SUV is 156/240. The conditional relative frequency of owning a SUV given you are a male is 21/60.	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Summarize, represent, and interpret data on two categorical and quantitative variables**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.6* Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data (with or without technology). Use functions fitted to data to solve problems in the context of the data. b. (+) Informally assess the fit of a function by plotting and analyzing residuals.	• create a scatter plot from two quantitative variables • describe the form, strength and direction of the relationship • categorize data as linear, exponential, quadratic or neither • use algebraic methods or technology to fit the data to a linear, exponential or quadratic function and use the function to predict values • explain the meaning of slope and y-intercept (linear model) or the meaning of the growth rate and y-intercept (exponential model) or the meaning of the coefficients (quadratic model) in context • use the function to predict values • (+) calculate a residual • (+) create and analyze a residual plot	Interpreting Statistics: A Case of Muddying the Waters Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary	**Annotations**	**Notes**
• scatter plot • residual: The observed value minus the predicted value. It is the difference of the results obtained by observation, and by computation from a formula. • residual plot	Emphasize linear and exponential models.	

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Interpret linear models**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.7* Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. Interpolate and extrapolate the linear model to predict values.	• explain the meaning of the slope and y-intercept in context • recognize the difference between interpolation and extrapolation • interpolate and extrapolate a linear model to make predictions	Interpreting Statistics: A Case of Muddying the Waters Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • interpolate • extrapolate	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Interpret linear models**

HS.S-ID

Standard	**Students Can**	**Resources**
HS.S-ID.8* Compute (using technology) and interpret the correlation coefficient of a linear fit.	• use a calculator or computer to find the correlation coefficient for a linear association • interpret the meaning of the correlation coefficient in the context of the data	Interpreting Statistics: A Case of Muddying the Waters Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • correlation coefficient	**Annotations**	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*

North Dakota *HIGH SCHOOL* State Standards: *ALGEBRA I*
Conceptual Category: **Statistics and Probability**
Domain: **Interpreting Categorical and Quantitative Data***
Cluster: **Interpret linear models**

HS.S-ID

Standard HS.S-ID.9* Distinguish between correlation and causation.	**Students Can** • explain the difference between correlation and causation	**Resources** Interpreting Statistics: A Case of Muddying the Waters Resource: Progressions for the Common Core State Standards HS Statistics & Probability
Vocabulary • correlation**:** A mutual relationship between two or more things. • causation: The producer of an effect, result, or consequence.	**Annotations** Example: It is noted there is a high correlation between people who eat ice cream daily and their annual job salary. Does eating ice cream predict salary or vice-versa?	**Notes**

Note: (+) indicates additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics
** indicates modeling standards*