**NACA Yearlong UbD Algebra I**

**UbD Curriculum Algebra
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|  **Stage 1 Desired Results**  |
| **Algebra I Common Core State Standards**Interpreting Functions* Understand the concept of a function and use function notation
* Interpret functions that arise in applications in terms of the context
* Analyze functions using different representations

Building Functions* Build a function that models a relationship between two quantities
* Build new functions from existing functions

Linear, Quadratic, and Exponential Models* Construct and compare linear and exponential models and solve problems
* Interpret expressions for functions in terms of the situation they model

Seeing Structure in ExpressionsInterpret the structure of expressionsWrite expressions in equivalent forms to solve problemsReasoning with Equations and Inequalities* **Understand solving equations as a process of reasoning and explain the reasoning**
* **Solve equations and inequalities in one variable**
* **Solve systems of equations**
* **Represent and solve equations and inequalities graphically**

Creating Equations* **Create equations that describe numbers or relationships**

Arithmetic with Polynomials and Rational Functions* **Perform arithmetic operations on polynomials**
* **Understand the relationship between zeros and factors of polynomials**
* **Use polynomial identities to solve problems**
* **Rewrite rational functions**

Mathematical Practices1. **Make sense of problems and persevere in solving them.**
2. **Reason abstractly and quantitatively.**
3. **Construct viable arguments and critique the reasoning of others.**
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. **Attend to precision.**
7. **Look for and make use of structure.**
8. **Look for and express regularity in .repeated reasoning**
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| Other than the big ideas explicitly in the standards you chose, what big ideas might frame this yearlong curriculum?1. Mathematical Models in Algebra help to analyze and understand real life situations so that predictions can be made, which facilitates decision making.
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| CHOSEN BIG IDEAS(S):FunctionsLinearExponentialArithmeticGeometricSystems of EquationsGraphTableSituationRepresentationsQuadraticParabolaVariablePolynomialInequality | ***Transfer*** |
| *I want my students to master collecting evidence to problem solve, so that in the long-run, on their own, they will be able to evaluate information in a real world context and present good arguments. This will allow them to become good consumers of information in an era of misinformation overload.*  |
| ***Meaning*** |
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| UNDERSTANDINGS *Students will understand that…** It is important to persevere in problem-solving.
* How to find multiple strategies and choose the most efficient strategy for them to use
* There are a variety of functions that are used to model real world issues in order to make predictions.
* Math is a universal language that transcends borders and is the language of science. It allows individuals to communicate in a global community in an efficient way.
 | ESSENTIAL QUESTIONS * How do we use math to model real life situations?
* Why is stick-to-it-ness (perseverance) more important than “book-smarts”?
* What strategy will work best for you to solve the problem?
* When faced with an algebraic equation you don’t recognize, where do you start?
* Where did you use math in your life today?
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| ***Acquisition*** |
| *Students will know…* * Unit 1: (How to graph any funky function/Linear Equations)

 Order of Operations The application of linear equations What is a Function What is “X” What is “Y” What are the Four Ways to present these numbers Slope as Growth or Change Y-intercept as starting value or zero (Project One: What do you Want to Buy)* Unit 2: (Exponential Growth and Sequences (Ch. 3, 5, 7)

 Project Two : So you want to be a Millionaire* Unit 3: Story Problems and Systems of Equations (Chapter 4 and 6)

 Project Three: Unique Science design- Science is messy* Unit 4: Quadratics and Complex Equations

 Project Four: Parabola Video Game Screen Shot | *Students will be skilled at…* * Unit 1:
	+ Applying Order of Operation to solving two variable equations
	+ How to plot points on a Cartesian graph system
	+ Pick an input (X) and find the answer (Y)
	+ Be able to move between the four representations

 * Unit 2:
	+ Solve an exponential expression
	+ graph an exponential equations
	+ build a table of data using exponents
	+ simplify exponential expressions
	+ recognize repeating patterns and label them as arithmetic or geometric
	+ Differentiate between discrete and continuous graphs and when it is appropriate in real world settings.
* Unit 3:
	+ creating scatterplots
	+ interpreting scatterplots
	+ identify errors in data and errors in reasoning
	+ Distinguish between causation and correlation
* Unit 4:
	+ graphing one variable quadratics
	+ factoring quadratics
	+ recognizing the uses of quadratics to model area, perimeter and parabolic projectiles
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| **Stage 2 - Evidence** |
| **Evaluative Criteria** | **Assessment Evidence** |
| Standards-based A+ Rubric in Student-friendly Language

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| Performance Assessment Criteria and Standard Alignment | Complete | Needs Revision |
| Construct and compare linear, quadratic, and exponential models and solve problems. |  |  |
| Interpret the parameters in a linear or exponential function in terms of a context. |  |  |
| Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. |  |  |
| Graph linear and quadratic functions and show intercepts, maxima, and minima. |  |  |
| Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions |  |  |
| Model with mathematics. |  |  |
| Look for and make use of structure. |  |  |

 | PERFORMANCE TASK(S):  What (cognitive verb + big idea): Comparing and Contrasting different algebraic Functions  Why (copied and pasted EUs from Stage 1): There are a variety of functions that are used to model real world issues in order to make predictions. How (GRASPS, written to and for students): **Goal: Video Game Design** **Role: Video Game Designer** **Audience: Teacher, other students** **Situation: Student will create a video game screenshot. They will create an avatar, target and projectile. They need to use mathematical equations to “guide” the projectile to the target from the avatar. The students must use a linear projectile and a quadratic projectile, and one other function (such as absolute value, cube root, square root, exponential).** **Product, Performance, and Purpose:** **Standards and Criteria for Success:** |
|  | OTHER EVIDENCE: Students will take an end of course final (or district based summative assessment based on the common core standards. Note: Students who pass the summative assessment and the project will receive a passing grade for the class. |
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| **Stage 3 – Learning Plan** *What units will you teach, and what skills will students master, as a result of this yearlong curriculum?* |

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| --- | --- | --- | --- | --- |
| Unit Big Idea (Title) | Unit Essential Question(s) | Unit Standard(s) | Assessment(s) | Time Frame |
| What big idea anchors this unit? | What EQ will anchor conceptual, critical thinking related to the big idea? | What core standard(s) anchors this unit, and therefore what observable skills will you evaluate ? | What summative assessment will provide you evidence of skills and understanding? | What is the approximate time frame for the teaching and learning in this unit? |
| 1. Functions Linear Systems of Equations
 | 1. How do teams work together to solve a complex problems?
2. **What are some examples of linear growth (or decay) in your life?**
3. How does a graph show the answer to a system of equations?
4. How do you describe a pattern you haven’t seen before?
5. How can you tell if a graph is a function?
 | 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.Interpret functions that arise in applications in terms of the context.Create equations and inequalities in one variable and use them to solve problems.Solve systems of equations | 1. What do you want to buy? Project. Students will complete a Situation, table, equation and graph that shows how they will save money to buy something they want
2. Written Exam covering CCSS from Chapters 1, 2, and 4
 | 9 weeks (45 days) |
| 1. Exponential Relationships

 **Arithmetic &** **Geometric** **Sequences** | 1. Like Linear functions, can you switch between graph, equation, table and situation?
2. Can you use the information in this section to make wise decisions in the future?
3. What clues on the graph can you use to create an equation?
4. What is Zero Population Growth? Is it Ethical?
5. What is depreciation? How is it important to your life?
6. Why should you stay out of credit card debt?
 | Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.Use the properties of exponents to transform expressions for exponential functions. | 1. So you want to be a millionaire? Project. Students will use the concepts to understand how to save using simple and compound interest, and why to avoid debt by understanding credit card interest and high interest rate loans.
2. Written Exam covering CCSS from Chapters 3, 5 and 7
 | 9 weeks (45 days) |
| 1. Scientific connections to Math (modelling two variable data)
 | 1. Why is Math called the Language of Science?
2. Why is it important to be able to graph data and make predictions?
 | Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.  | 1. The Scientific Method. Project. The class will generate a testable hypothesis, gather data, create a scatterplot and reach a conclusion regarding their original hypothesis. (Note : this has been the effect of absences on grades in the past, but this might become a part of a shared cross curricular project.)
2. Written Exam covering Chapter 6
 | 9 weeks (45 days) |
| 1. Quadratics and Parabolas
 | 1. Are there patterns we can use to make factoring easier?
2. Can you use any of the four representations to find the other three with Quadratic Equations?
3. What is Zero, and how does it help us solve Quadratics.
 | Factor a quadratic expression to reveal the zeros of the function it defines.Solve quadratic equations in one variable. | 1. Video Game Screenshot (see above for description).
2. Written examination covering Chapter 8 and 9
 | 9 weeks (45 days) |

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