**NACA Yearlong UbD Template**

**UbD Curriculum Template 2.0  
Designer: Paula Maxmin  
Date: May 2015**

|  |
| --- |
| **Stage 1 Desired Results** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Directions:** Choose multiple CCSS (or other standards), copy and paste them here, and unpack them for big ideas and assessment verbs by highlighting.  **The Number System 8.NS**  **Know that there are numbers that are not rational, and approximate**  **them by rational numbers.**  **1. Know that numbers that are not rational are called irrational.**  **Understand informally that every number has a decimal expansion; for**  **rational numbers show that the decimal expansion repeats eventually,**  **and convert a decimal expansion which repeats eventually into a**  **rational number.**  **2. Use rational approximations of irrational numbers to compare the size**  **of irrational numbers, locate them approximately on a number line**  **diagram, and estimate the value of expressions (e.g., π2). For example,**  **by truncating the decimal expansion of √2, show that √2 is between 1 and**  **2, then between 1.4 and 1.5, and explain how to continue on to get better**  **approximations.**  **Expressions and Equations 8.EE**  **Work with radicals and integer exponents.**  **1. Know and apply the properties of integer exponents to generate**  **equivalent numerical expressions. For example, 32 × 3–5 = 3–3 = 1/33 = 1/27.**  **2. Use square root and cube root symbols to represent solutions to**  **equations of the form x2 = p and x3 = p, where p is a positive rational**  **number. Evaluate square roots of small perfect squares and cube roots**  **of small perfect cubes. Know that √2 is irrational.**  **3. Use numbers expressed in the form of a single digit times an integer**  **power of 10 to estimate very large or very small quantities, and to**  **express how many times as much one is than the other. For example,**  **estimate the population of the United States as 3 × 108 and the population**  **of the world as 7 × 109, and determine that the world population is more**  **than 20 times larger.**  **4. Perform operations with numbers expressed in scientific notation,**  **including problems where both decimal and scientific notation are**  **used. Use scientific notation and choose units of appropriate size**  **for measurements of very large or very small quantities (e.g., use**  **millimeters per year for seafloor spreading). Interpret scientific**  **notation that has been generated by technology.**  **Understand the connections between proportional relationships,**  **lines, and linear equations.**  **5. Graph proportional relationships, interpreting the unit rate as the**  **slope of the graph. Compare two different proportional relationships**  **represented in different ways. For example, compare a distance-time**  **graph to a distance-time equation to determine which of two moving**  **objects has greater speed.**  **6. Use similar triangles to explain why the slope m is the same between**  **any two distinct points on a non-vertical line in the coordinate plane;**  **derive the equation y = mx for a line through the origin and the**  **equation y = mx + b for a line intercepting the vertical axis at b.**  **Analyze and solve linear equations and pairs of simultaneous linear**  **equations.**  **7. Solve linear equations in one variable.**  **a. Give examples of linear equations in one variable with one**  **solution, infinitely many solutions, or no solutions. Show which**  **of these possibilities is the case by successively transforming the**  **given equation into simpler forms, until an equivalent equation of**  **the form x = a, a = a, or a = b results (where a and b are different**  **numbers).**  **b. Solve linear equations with rational number coefficients, including**  **equations whose solutions require expanding expressions using**  **the distributive property and collecting like terms.**  **Common Core State Standards for MAT HEMAT ICS**  **grade 8 | 55**  **8. Analyze and solve pairs of simultaneous linear equations.**  **a. Understand that solutions to a system of two linear equations**  **in two variables correspond to points of intersection of their**  **graphs, because points of intersection satisfy both equations**  **simultaneously.**  **b. Solve systems of two linear equations in two variables**  **algebraically, and estimate solutions by graphing the equations.**  **Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x +**  **2y = 6 have no solution because 3x + 2y cannot simultaneously be 5**  **and 6.**  **c. Solve real-world and mathematical problems leading to two linear**  **equations in two variables. For example, given coordinates for two**  **pairs of points, determine whether the line through the first pair of**  **points intersects the line through the second pair.**  **Functions 8.F**  **Define, evaluate, and compare functions.**  **1. Understand that a function is a rule that assigns to each input exactly**  **one output. The graph of a function is the set of ordered pairs**  **consisting of an input and the corresponding output.1**  **2. Compare properties of two functions each represented in a different**  **way (algebraically, graphically, numerically in tables, or by verbal**  **descriptions). For example, given a linear function represented by a table**  **of values and a linear function represented by an algebraic expression,**  **determine which function has the greater rate of change.**  **3. Interpret the equation y = mx + b as defining a linear function, whose**  **graph is a straight line; give examples of functions that are not linear.**  **For example, the function A = s2 giving the area of a square as a function**  **of its side length is not linear because its graph contains the points (1,1),**  **(2,4) and (3,9), which are not on a straight line.**  **Use functions to model relationships between quantities.**  **4. Construct a function to model a linear relationship between two**  **quantities. Determine the rate of change and initial value of the**  **function from a description of a relationship or from two (x, y) values,**  **including reading these from a table or from a graph. Interpret the rate**  **of change and initial value of a linear function in terms of the situation**  **it models, and in terms of its graph or a table of values.**  **5. Describe qualitatively the functional relationship between two**  **quantities by analyzing a graph (e.g., where the function is increasing**  **or decreasing, linear or nonlinear). Sketch a graph that exhibits the**  **qualitative features of a function that has been described verbally.**  **Geometry 8.G**  **Understand congruence and similarity using physical models, transparencies,**  **or geometry software.**  **1. Verify experimentally the properties of rotations, reflections, and**  **translations:**  **a. Lines are taken to lines, and line segments to line segments of the**  **same length.**  **b. Angles are taken to angles of the same measure.**  **c. Parallel lines are taken to parallel lines.**  **2. Understand that a two-dimensional figure is congruent to another if**  **the second can be obtained from the first by a sequence of rotations,**  **reflections, and translations; given two congruent figures, describe a**  **sequence that exhibits the congruence between them.**  **1Function notation is not required in Grade 8.**  **Common Core State Standards for MAT HEMAT ICS**  **grade 8 |**  **3. Describe the effect of dilations, translations, rotations, and reflections**  **on two-dimensional figures using coordinates.**  **4. Understand that a two-dimensional figure is similar to another if the**  **second can be obtained from the first by a sequence of rotations,**  **reflections, translations, and dilations; given two similar twodimensional**  **figures, describe a sequence that exhibits the similarity**  **between them.**  **5. Use informal arguments to establish facts about the angle sum and**  **exterior angle of triangles, about the angles created when parallel lines**  **are cut by a transversal, and the angle-angle criterion for similarity of**  **triangles. For example, arrange three copies of the same triangle so that**  **the sum of the three angles appears to form a line, and give an argument**  **in terms of transversals why this is so.**  **Understand and apply the Pythagorean Theorem.**  **6. Explain a proof of the Pythagorean Theorem and its converse.**  **7. Apply the Pythagorean Theorem to determine unknown side lengths**  **in right triangles in real-world and mathematical problems in two and**  **three dimensions.**  **8. Apply the Pythagorean Theorem to find the distance between two**  **points in a coordinate system.**  **Solve real-world and mathematical problems involving volume of**  **cylinders, cones, and spheres.**  **9. Know the formulas for the volumes of cones, cylinders, and spheres**  **and use them to solve real-world and mathematical problems.**  **Statistics and Probability 8.SP**  **Investigate patterns of association in bivariate data.**  **1. Construct and interpret scatter plots for bivariate measurement**  **data to investigate patterns of association between two quantities.**  **Describe patterns such as clustering, outliers, positive or negative**  **association, linear association, and nonlinear association.**  **2. Know that straight lines are widely used to model relationships**  **between two quantitative variables. For scatter plots that suggest a**  **linear association, informally fit a straight line, and informally assess**  **the model fit by judging the closeness of the data points to the line.**  **3. Use the equation of a linear model to solve problems in the context**  **of bivariate measurement data, interpreting the slope and intercept.**  **For example, in a linear model for a biology experiment, interpret a slope**  **of 1.5 cm/hr as meaning that an additional hour of sunlight each day is**  **associated with an additional 1.5 cm in mature plant height.**  **4. Understand that patterns of association can also be seen in bivariate**  **categorical data by displaying frequencies and relative frequencies in**  **a two-way table. Construct and interpret a two-way table summarizing**  **data on two categorical variables collected from the same subjects.**  **Use relative frequencies calculated for rows or columns to describe**  **possible association between the two variables.**  **Mathematical Practices Naca Core Values**  1. Make sense of problems and persevere in solving them. 1. Respect  2. Reason abstractly and quantitatively. 2. Responsibility  3. Construct viable arguments and critique the reasoning of others. = 3. Community/Service  4. Model with mathematics. 4. Culture  5. Use appropriate tools strategically. 5. Perseverance  6. Attend to precision. 6. Reflection  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning. | | | |
| Other than the big ideas explicitly in the standards you chose, what big ideas might frame this yearlong curriculum?   1. How do you use the Pythagorean Theorem to solve problems 2. How do you write then use equations to predict future events 3. How do you use rules of Transformations to predict how figures will move on a coordinate plane 4. How do you fluently manipulate equations to solve problems with one and two variables | | | |
| CHOSEN BIG IDEAS(S):    prediction | ***Transfer*** | | |
| *I want my students to persevere, so that in the long-run, on their own, they will be able to attack any problem that they are presented with and be prepared for a successful year in Algebra.* | | |
| ***Meaning*** | | |
| ***Enduring Understandings***  UNDERSTANDINGS  ● *Students will understand that…in order to be a competent math student, they need to make sense of problems and persevere in solving them.*  ● *Understanding math is about observing patterns in the world around them.* | | ***Essential Questions***     * How do you solve a problem when you don’t know where to begin. * What “toolbox” can I build to help me solve any problem that I am presented with. |
|  | | | |
|
|  | ***Acquisition*** | | |
|  | *Students will know…*   * Unit 1: Looking For Pythagoras * What irrational numbers are * How to calculate area for squares * How to use the side length to find the area and vice versa * Where the PT comes from * How to use information to find a missing side length in a right triangle * Unit 2:Linear situations Mathematical Models * *write equations to predict future events* * *create useful strategies for solving linear equations* * *represent data using graphs, tables word descriptions and expressions* * *recognize linear and nonlinear relationships in tables and graphs* * *use linear and inverse variation equations to model bivariate data* * *use residual analysis to measure the fit of linear and inverse models* * *analyze, approximate and solve linear equations* * *use linear and inverse variation equations to solve problems and to make predictions and decisions* * *use scatterplots, 2 way tables and correlation coefficients to describe patterns of association in pairs of variables* * *use standard deviation to measure variability in data distributions* * Unit 3: Transformations: Butterflies/Hubcaps * that a reflection is a flip, a rotation is a turn and a translation is a slide * That dilations involve multiplying the coordinates by the same number * Know what vertical, cooresponding, supplementary, alternate interior and exterior angles are and how you can find them on a transversal * Unit 4:Linear Situations/ Say it with Symbols * … How to represent patterns and relationships in symbolic form * How do you determine when different symbolic expresssions are mathematically equivalent * How to write algebraic expressions in useful forms * Combine algebraic forms * Analyze expressions to find the pattern of change in a graph/table/equation * Solve linear equations * Use algebraic reasoning to validate generalizations and conjectures   Unit 5: It’s in the System   * Develop understanding of linear equations and systems of linear equations * Develop understanding of graphing and symbolic methods for solving linear inequalities with one and two variables | | *Students will be skilled at…*   * Unit 1:Pythagoras * Approximate square roots * Find square roots of perfect squares * Use ratios to find a missing side length * Apply strategies about right triangles to solve complex problems * Develop strategies for finding the distance between 2 points * Explain the proof of the Pythagorean Theorem * Understand and use the PT to solve everyday problems * Write fractions as repeating or terminating decimals * Write fractions as decimals * Recognize rational and irrational numbers * Locate irrational numbers on a number line * Relate the area of a square to it’s side length and the volume of a cube to its side lengths * Unit 2:Linear Situations * *make predictions about future events in linear and non-linear situations by writing equations to model the situations.* * *organize and display data from experiments and see patterns* * *understand and apply y- intercept and slope in an equation, graph, table and a problem solving situation* * *solve linear equations* * *solve rate time and distance problems* * *write an equation for the line of best fit in a scatterplot* * *calculate the standard deviation for a data distribution* * *display frequency tables to understand data in bivariate categorical data* * Unit 3:Transformations * Recognize properties of reflection, rotation and translation * Explore techniques for using rigid motion transformations to make symmetric designs * Developing and Using coordinate rules for rigid transformations * Recognize that figures are congruent if you can obtain one from another using a transformation * Describe the effects of dilations and translations on two- dimensional figures * Use informal arguments to establish facts about the angle sum and the exterior angle of triangles and about angles created when parallel lines are cut by a transversal * Unit 4 Linear situations * Analyze given situations and find out the break even point in a business. * Decide which equivalent expression is more efficient. * Solve complex linear equations that involve combining “LIKE “terms * Solve inequality siutations and be able to compare 2 companies   It’s in the System   * Recognize equations in the form Ax +BY=C and know it is the same as Y= mx+b * Recognize that solving system of linear equations is equivalent to finding values of the variables that will simultaneously satisfy all equations in that system * Solve systems using graphing and elimination * Gain fluency with symbol manipulation from Thinking book |
| **Stage 2 – Evidence** | | | |
| **Evaluative Criteria** | | **Assessment Evidence** | |
| Standards-based A+ Rubric in Student-friendly Language   |  |  |  | | --- | --- | --- | | Performance Assessment Criteria and Standard Alignment | Complete | Needs Revision | | See below |  |  | |  |  |  | |  |  |  | |  |  |  | | | PERFORMANCE TASK(S):    What (cognitive verb + big idea):   * Write, graph, solve and interpret linear equations and systems of linear equations * Grasp the concept of a function and using a function to describe relationships * Analyze 2 and 3 dimensional figures using distance, angle, similarity, congruence, and understanding and applying the Pythagorean Theorem   Why (copied and pasted EUs from Stage 1):  ● *Students will understand that…in order to be a competent math student, they need to make sense of problems and persevere in solving them.*  ● *Understanding math is about observing patterns in the world around them.*  How (GRASPS, written to and for students):  .  **Goal: Create an Algebra Book Project**  **Role:**  **Audience: Student/ teacher**  **Situation:**  You are creating an Algebra book to highlight your understanding of the key linear components presented to you this year.  **Product, Performance, and Purpose:**  **Create an algebra bridge project that encompasses all the main components of Linear Systems. Students will add to the book after each unit is complete. This will be done as part of their end of unit assessment.**  **Standards and Criteria for Success:**  8.F 1,2,3,4,5 8.EE.7 and 8.EE.8 8.G.6.7.8, 8.EE.C.8 (a,b,c), 8.F.A.3 | |
| <type here> | | OTHER EVIDENCE: | |
| |  | | --- | | **Stage 3 – Learning Plan** *What units will you teach, and what skills will students master, as a result of this yearlong curriculum?* |   **\_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_ Academic Year Curriculum Map Template**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **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. **Pythagorean Theorem** | **1. How can the relationship between the sides of a right triangle be used to solve problems?**  **2. Where does the Pythagorean Theorem come from?** | **The Number System**  **• Know that there are numbers that are not**  **rational, and approximate them by rational**  **numbers.**  Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project.  **• Understand and apply the Pythagorean**  **Theorem.**  **• Solve real-world and mathematical problems**  **involving volume of cylinders, cones and**  **spheres.** | * Check ups and quizzes after each investigation. * Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project. | Looking for Pythagoras  (5 weeks) | | 1. **Linear situations** | 1. *make predictions about future events in linear and non-linear situations by writing equations to model the situations.* 2. *organize and display data from experiments and see patterns* | **The Number System**  **• Know that there are numbers that are not**  **rational, and approximate them by rational**  **numbers.**  **Expressions and Equations**  **• Work with radicals and integer exponents.**  **• Understand the connections between**  **proportional relationships, lines, and linear**  **equations.**  **• Analyze and solve linear equations and pairs of**  **simultaneous linear equations.**  **Functions**  **• Define, evaluate, and compare functions.**  **• Use functions to model relationships between**  **quantities.**  **Statistics and Probability**  **• Investigate patterns of association in bivariate**  **data.** | * Check ups and quizzes after each investigation * Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project. | **Thinking with Mathematical Models**  (6-8 weeks) | | 1. **Transformations** | 1. Develop and use coordinate rules for rigid transformations | **The Number System**  **• Know that there are numbers that are not**  **rational, and approximate them by rational**  **numbers.**  **Geometry**  **• Understand congruence and similarity using**  **physical models, transparencies, or geometry**  **software.** | * Check ups and quizzes after each investigation * Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project. | **Kaleidoscope hubcaps and wheels**  ( 5 weeks) | | 1. **Linear situations/ applications** | * How do you solve complex linear equations that involves combining like terms | **The Number System**  **• Know that there are numbers that are not**  **rational, and approximate them by rational**  **numbers.**  **Expressions and Equations**  **• Work with radicals and integer exponents.**  **• Understand the connections between**  **proportional relationships, lines, and linear**  **equations.**  **• Analyze and solve linear equations and pairs of**  **simultaneous linear equations.**  **Functions**  **• Define, evaluate, and compare functions.**  **• Use functions to model relationships between**  **quantities.** | * Check ups and quizzes after each investigation      * Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project. | **Say it with Symbols**  Inv 1, 2.1,2.2.3.1,3.2  ( 4 weeks) | | **5. System of equations** | * What does it tell you when two lines intersect * How do you find a solution to a situation graphically, tabularlly and in an equation | **The Number System**  **• Know that there are numbers that are not**  **rational, and approximate them by rational**  **numbers.**  **Expressions and Equations**  **• Work with radicals and integer exponents.**  **• Understand the connections between**  **proportional relationships, lines, and linear**  **equations.**  **• Analyze and solve linear equations and pairs of**  **simultaneous linear equations.**  **Functions**  **• Define, evaluate, and compare functions.**  **• Use functions to model relationships between**  **quantities.** | * Check ups and quizzes after each investigation      * Create a vocabulary book in their notebook under the first tab for all key vocabulary. They will keep this for the year so they can utilize this for their final book project. | **It’s in the System**  ( 4 weeks) | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  | | | | |

**Algebra Bridge Book Final Project**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Page** | **Item** | | | | Complete | Needs revision | points |  |
|  | Cover (title/color/math picture) | | | |  |  |  | |
| 1 | Table of Contents | | | |  |  |  | |
| 2 | Equality (explain what it means in math and include a visual example) | | | |  |  |  | |
| 3 | Solving Linear Equations  · Example with step by step instruction  · Visual (use pouches and coins)  · Color | | | |  |  |  | |
| 4 | Combining **“LIKE”** terms ( explain what it means and include a visual) | | | |  |  |  | |
| 5 | Linear Situations ( in words)  · Problem(can be original or taken from MSA)  · Graph it  · Write an equation for it (explain what each part of the equation means) | | | |  |  |  | |
| 6 | Describe the process for graphing a linear equation  (words, symbols, picture) Explain whet the y- intercept and slope are | | | |  |  |  | |
| 7 | Write a word problem that uses the y-intercept (starting point) and slope (constant rate of change) ,then solve it. Identify the y- intercept and the slope. Feel free to adapt one from MSA textbooks | | | |  |  |  | |
| 8 | Write an exponential example ( in words- you can use an example from Growing^3). Make a table, graph and equation to model the situation. Label the **y-intercept** and **growth factor**. | | | |  |  |  | |
| 9 | Write a paragraph that explains the difference between a linear situation and an exponential one. Include an example of each | | | |  |  |  | |
| 10 | Write a paragraph about how your project connects to the Wellness Wheel and/or the Core Values | | | |  |  |  | |
| 11 | Write a paragraph to tie this project to your culture. Where do linear equations tie into your life/culture? | | | |  |  |  | |
| 12 | Reflection ( write a paragraph reflecting on your year in math-some **strengths** and aspects of math that you are **still struggling** with.  · | | | |  |  |  | |
| 13 | |  |  | Math Vocabulary (What is essential) (write the words, show what it means with pictures/words or both)  · Y-intercept  · slope  · rise  · run  · constant rate  · growth factor  · distributive property  · equality  · coefficient  · break- even point  · solution  · linear relationship  · exponential growth  · exponential decay | | | | |
|  |  |  |  |  |  |  |  |  |

|  |
| --- |
|  |

Ø **All pages should be neatly organized, colorful, and accurate**

Ø **This project counts as 3 test grades**

Ø **No late projects can be accepted**

Ø **Date Due: May 15th. If you choose to turn it in early, 200 extra credit points will be awarded.**

Ø **Include anything that will make your project standout and be totally awesome!!!!!!!!!**