**NACA Yearlong UbD Geometry**

**UbD Curriculum Geometry  
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| **Stage 1 Desired Results** | | | |
| **Geometry Common Core State Standards** Congruence  * **Experiment with transformations in the plane** * **Understand congruence in terms of rigid motions** * **Prove geometric theorems** * **Make geometric constructions**  Similarity, Right Triangles, and Trigonometry  * **Understand similarity in terms of similarity transformations** * **Prove theorems involving similarity** * **Define trigonometric ratios and solve problems involving right triangles** * **Apply trigonometry to general triangles**  Circles  * **Understand and apply theorems about circles** * **Find arc lengths and areas of sectors of circles**  Expressing Geometric Properties with Equations  * **Translate between the geometric description and the equation for a conic section** * **Use coordinates to prove simple geometric theorems algebraically**  Geometric Measurement and Dimension  * **Explain volume formulas and use them to solve problems** * **Visualize relationships between two-dimensional and three-dimensional objects**  Modeling with Geometry  * **Apply geometric concepts in modeling situations**  Mathematical Practices  1. **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.** | | | |
| Other than the big ideas explicitly in the standards you chose, what big ideas might frame this yearlong curriculum?   1. Argument (More than just proofs) 2. Logical Conclusions 3. Choosing appropriate strategies (Most geometric problems have multiple approaches, but some are better than others) 4. Make use of Pattern recognition in shapes and forms | | | |
| CHOSEN BIG IDEAS(S):  Transformations  Congruence  Similarity  Rigid Motions  Theorems  Constructions  Trigonometry  Polygon  Circle  Arc  Chord  Volume  Surface Area | ***Transfer*** | | |
| *I want my students to be able to construct viable arguments with evidence, so that in the long-run, on their own, they will be able to discuss any topic with logic and reasoning.. Additionally I would like them to be able to use what they have learned about shapes and geometry to apply them to world around them. I want to foster creativity, cultural connectiveness and symbolism as well, as this will enrich their lives even if they never pursue a STEM career.* | | |
| ***Meaning*** | | |
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| UNDERSTANDINGS  *Students will understand that:*   1. They must question everything, and demand acceptable evidence. 2. to create reasonable arguments and supply appropriate evidence, is necessary in life not just in geometry 3. Geometry is a study of repeating patterns in nature | | ESSENTIAL QUESTIONS   * How do you weigh evidence to determine the validity of someone else’s argument? * What are the requirements needed to prove something to be true? * How are shapes and geometric patterns used in human culture to represent ideas? |
| ***Acquisition*** | | |
| *Students will know…*   * Unit 1: Making Predictions through Logical Arguments; Transformations on a plane; symmetry; Transversals and two dimensional shapes * Unit 2: Congruence and Similarity in Triangles;Trigonometry and Pythagorean Theorem. Pick-A-Strategy * Unit 3: Geometric Proofs and Congruence; Introduction to Construction; Polygons   + that using the tools of geometry (ruler, compass, protractor, straightedge) you can create “perfect” shapes.   + Why Pi is the constant for circles. * Unit 4: Solids and Volume   + How to find the volume of any geometric solid * Unit 5: Circles   + How circles are the culmination of everything we have learned so far (from a line, to three sides….to infinite sides | | *Students will be skilled at…*   * Unit 1:   + presenting logical conclusions   + changing shapes in predictable ways through transformations   + Using symmetry to solve problems   + solve complex transversals * Unit 2:   + Determining the best strategy to solve right triangles   + Solve a tangent ratio   + Use slope to determine a tangent ratio in a real world model   + Solve a sine ratio   + Solve a cosine ratio   + Find shortcuts to solve unknowns in right triangles * Unit 3:   + Using Prior Units to determine what angles and shapes are congruent   + Use congruence to solve a geometric proof   + Applying “given” information to geometric proofs   + Identifying acceptable evidence in geometric proofs * Unit 4:   + how to use geometric tools to construct perfect circles, perfect angle bisectors, perfect right angles, squares and rhombi   + Calculate Surface Area of various prisms   + Calculate Volume of various prisms * Unit 5   + using formulas for area and circumference   + Identify parts of a circle and how to use it to prove congruence. |
| **Stage 2 - Evidence** | | | |
| **Evaluative Criteria** | | **Assessment Evidence** | |
| Standards-based A+ Rubric in Student-friendly Language   |  |  |  | | --- | --- | --- | | Performance Assessment Criteria and Standard Alignment | Complete | Needs Revision | | *Use geometric shapes, their measures, and their properties to describe objects* |  |  | | Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. |  |  | | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). |  |  | | Apply geometric concepts in modeling situations |  |  | | Model with mathematics. |  |  | | Use appropriate tools strategically. |  |  | | Attend to precision. |  |  | | Look for and make use of structure. |  |  | | Prove that all circles are similar. |  |  | | Identify and describe relationships among inscribed angles, radii, and chords. |  |  | | Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. |  |  | | | PERFORMANCE TASK(S): Personal Mandala    What (cognitive verb + big idea): Recognize Geometric shapes in mathematical, cultural and artistic expression.  Why (copied and pasted EUs from Stage 1):  How (GRASPS, written to and for students):  Renovation project remodel a kitchen.  **Goal: Students will design a personal Mandala that utilizes the Geometric tools of construction, geometric shapes and the concepts of area and perimeter in expressing themselves through symbolism and design**  **Role:** Artist  **Audience: Student Led Demos to be presented to Parents and community members**  **Situation: Expressing oneself through Art and Symbolism**  **Product, Performance, and Purpose:** Product: a Mandala, Performance: SLD with appropriate introduction and connection to culture; Purpose: To use Math and Art to foster self-expression  **Standards and Criteria for Success: See A+ rubric for standards and criteria** | |
| Graded using standard method. 70% or higher will represent proficiency in Geometry, and will be averaged into their grade. Students who do not test at proficiency will be given an alternate placement exam to determine general math proficiency. | | OTHER EVIDENCE:  Summative Assessment. Students will take an End of course exam that focuses on mastery of the common core standards listed above. If appropriate, District Testing may be used in place of the End of Course examination. | |
| |  | | --- | | **Stage 3 – Learning Plan** *What units will you teach, and what skills will students master, as a result of this yearlong curriculum?* |   \_\_\_\_2015\_\_\_\_\_ - \_\_\_\_\_\_2016\_\_\_\_ 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. Unit 1:   Prediction  Logical Argument  Transformations  Symmetry | 1. How do teams work together to solve a complex problems?  2. How do you evaluate information, and make the best decisions using logic?  3. How do you communicate ideas accurately and precisely  4. Whare are Geometric transformations seen throughout art and Native American heritage. | 1. Represent transformations in the plane 2. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. 3. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. 4. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure  Understand congruence in terms of rigid motions  1. Prove theorems about lines and angles. 2. Prove theorems about triangles. 3. Prove theorems about parallelograms. | 1. Project: Tesselation    1. Tesselation must include a repeated pattern    2. Must include 1-3 transformations    3. Must include an example of a transversal in the design    4. Must include multiple shapes in the design    5. Turn in a reflection paper that focuses on       1. why they chose this design       2. what transformations were used       3. What are the measurements of the two angles in the transversal (may use a protractor)       4. What shapes they used, and a description of the attributes of those shapes 2. Summative Math Examination based on CCSS for this unit. Student will be given the opportunity to retake until Mastery achieved. 3. Mock Trial? New idea need to develop further. I would like to have each group present a “case” for trial, present evidence and have each student evaluate “guilt” or innocence | 7 school weeks | | 1. Unit 2:   Congruence  Similarity  Trigonometry | 1. What is the difference between Similarity and Congruence?  2. How do you evaluate information, and make the best predictions using logic?  3. How do you communicate ideas accurately and precisely? | 1. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent. 2. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. 3. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. 4. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. 5. Explain and use the relationship between the sine and cosine of complementary angles. 6. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.  Apply trigonometry to general triangles | Project: CSI Albuquerque   1. Using basic geometry, trigonometry, and a clinometer, students will locate clues that must be solved to lead to the next location. 2. Based on answers, could lead to the wrong clue and the wrong conclusion. 3. Reflection paper that details the situation, the clues acquired and the conclusion based on the clues. 4. ???Clues could be logic problems/riddles, or math problems, or both. i like both   Summative Examination of CCSS | 11 school weeks | | 1. Unit 3:   Geometric Proofs  Congruence  Constructions  Polygons | 1. Why Pi? 2. How is a Circle like a Polygon with infinite sides? 3. How do you evaluate information, and make the best predictions using logic? 4. How do you communicate ideas accurately and precisely? | 1. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent. 2. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. 3. Verify experimentally the properties of dilations given by a center and a scale factor: | Project: Build your Dream House   1. Pick a career (assign one to the students (like the Game of Life) to use to develop?) 2. Develop a basic budget. How much home can they afford? 3. Using the square footage, create a floor plan that includes the standard rooms/areas in a home. Must be to scale and drawn with precision using geometric tools   Summative Examination of CCSS | 6 school weeks | | 1. Unit 4:   Solids  Surface Area  Volume | 1. What is the shape for each of the faces or surfaces of a three-dimensional shape? How can the area for each face or surface be found? 2. How can formulas for surface area of right rectangular and triangular prisms help me finding the surface areas? 3. How are the units of measurement for area different from those used for volume? 4. What information is essential in finding volume? | 1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. 2. Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. 3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.\* 4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. | Project: Using concepts learned, expand the Dream House project to be a 3-D model.   1. Student add height to their floor plan and draw or construction the front, back and sides of the floorplan model 2. Students must calculate Volume 3. Students must calculate “paintable” surface area of outside of house, and two rooms inside the house.   Summative Examination of CCSS | 6 school weeks | | 1. Unit 5:   Circles | 1. What happens as the number of sides approaches infinity? 2. How are right triangles and circles related? 3. What if the Chord is a Semicircle? 4. What is the relationship between radius and area? 5. What is the relationship between radius and circumference? | 1. Prove that all circles are similar. 2. Identify and describe relationships among inscribed angles, radii, and chords. 3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. 4. Construct a tangent line from a point outside a given circle to the circle. 5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. | See Above: Personal Mandala and End of Course Examination. | 6 school weeks | | | | |