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**Native American Community Academy UbD 2.0**

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| **Stage 1 Desired Results** *What are your unit objectives and outcomes?* |
| BIG IDEAS Connections | ***Transfer*** |
| *Students will be able to independently use their learning to…*recognize when a situation requires the Pythagorean Theorem and follow through with a solution. |
| ***Meaning*** |
| UNDERSTANDINGS *Students will understand that the Pythagorean Theorem is a useful tool to find distances on and off the coordinate plane.* | ESSENTIAL QUESTIONS 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?
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| ***Acquisition*** |
| *As a result of this unit, students will know…* * 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
 | *As a result of this unit, students will be be able to…* * 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
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| Common Core Content Standards**8.NS.A.1**Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational. *Investigation 4***8.NS.A.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., *π*2). *Investigations 2 and 4***8.EE.A.2**Use square root and cube root symbols to represent solutions to equations of the form *x*2=*p* and *x*3=*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. *Investigations 2 and 4***8.G.A.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 two-dimensional figures, describe a sequence that exhibits the similarity between them.*Investigation 3 and 5***8.G.B.6**Explain a proof of the Pythagorean Theorem and its converse.*Investigations 1, 2, and 3***8.G.B.7**Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. *Investigations 2, 3, 4, and 5***8.G.B.8**Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. *Investigations 1, 2, 3, and 5***A-CED.A.1**Create equations and inequalities in one variable and use them to solve problems. *Investigation 4***A-CED.A.2**Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *Investigation 5***A-REI.D.10**Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). *Investigation 5***N-Q.A.3**Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *Investigations 2, 4, and 5*Facilitating the Mathematical PracticesStudents in *Connected Mathematics* classrooms display evidence of multiple Standards for Mathematical Practice every day. Here are just a few examples of when you might observe students demonstrating the Standards for Mathematical Practice during this Unit.**Practice 1: Make sense of problems and persevere in solving them.**Students are engaged every day in solving problems and, over time, learn to persevere in solving them. To be effective, the problems embody critical concepts and skills and have the potential to engage students in making sense of mathematics. Students build understanding by reflecting, connecting, and communicating. These student-centered problem situations engage students in articulating the “knowns” in a problem situation and determining a logical solution pathway. The student-student and student-teacher dialogues help students not only to make sense of the problems, but also to persevere in finding appropriate strategies to solve them. The suggested questions in the Teacher Guides provide the metacognitive scaffolding to help students monitor and refine their problem-solving strategies.**Practice 2: Reason abstractly and quantitatively.**In Problem 5.3, students reason quantitatively to find the radius of a circle. Given the coordinates of a point on a circle with a center at the origin, they use the Pythagorean Theorem to find the radius. Students then reason abstractly to write the equation of any circle with a center at the origin and radius *r*.**Practice 3: Construct viable arguments and critique the reasoning of others.**In Problem 2.3, students must decide whether two sample student answers (8√ units and 22√ units) for the length of a segment are correct. They must explain their reasoning and apply it to expressing other segment lengths.**Practice 4: Model with mathematics.**Using grids to model squares, students find that the areas of squares on the legs and the hypotenuse of a right triangle satisfy a simple relationship. Representing the legs as *a* and *b*, and the hypotenuse as *c*, students find that the areas always satisfy the relationship *a*2+*b*2=*c*2.**Practice 5: Use appropriate tools strategically.**In Problem 5.2, students use paper folding to make observation about the side lengths and angle measures of equilateral triangles. From their observations, they make conjectures about 30-60-90 triangles: The hypotenuse of a 30-60-90 triangle is twice the length of the shorter leg and the longer leg is 3√ times the shorter leg.**Practice 6: Attend to precision.**In Problem 4.2, students see that that rational numbers include terminating and repeating decimals. They realize the importance of finding the most precise value for each number in order to write decimals as fractions. If decimals are rounded, then they do not provide the precision that is necessary. Students see that they cannot accurately write fractions for decimals unless they know whether they are repeating or terminating.**Practice 7: Look for and make use of structure.**In Problem 4.3, students see a pattern among certain fractions. They find a specific group of fractions that they can represent as repeating decimals. They make a conjecture based on this pattern. Then they use the conjecture to find the decimal representations for other fractions that follow this same pattern.**Practice 8: Look for and express regularity in repeated reasoning.**Students examine triangles with side lengths that are multiples of lengths for known right triangles. They discover that the larger triangles are similar to the smaller triangles. The side lengths of the larger triangles also satisfy the Pythagorean Theorem.Students identify and record their personal applications of the Standards for Mathematical Practice during the Mathematical Reflections at the end of each Investigation. |

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| **Stage 2 – Evidence** *How will you assess student learning?* |
| **Evaluative Criteria** | **Assessment Evidence** |
| <not developed yet | SUMMATIVE PERFORMANCE TASK(S) * Final project on the Hopewell Indians
* Final Television project
* Baseball problem
* Modified project – ( Looking Back )
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| <Skill ckeck- in per investigation | ASSESSMENT (Formative) * Short quizzes after each investigation
* Exit cards
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| **Stage 3 – Learning Plan** *What lessons will you teach, and what skills will students master, as a result of this unit?* |
| **Topical EU/EQ****For Lesson** | **CCSS Alignment with Stage 1** | **Formative Assessment of Lesson** | **Unit Modifications** | **Activities to Support the Lesson** |
| * 1. How do driving distances and flying distance relate?
 |  | Warm up on Day 2 | None needed- all levels can do this and mastery is not essentialWork in teams if necessary | 1.1 Driving around Euclid |
| * 1. How do the coordinates of endpoints help draw parallel and perpendicular lines?
 |  | Warm up on day 3 | 1.2 Planning Parks |
| 1.3 How does knowing how to calculate areas of squares help you calculate irregular areas? |  | Handout on irregular shapesExit card before they leave | 1.3 Finding Areas |
| Check-up |  | Plotting points, finding areas on dot paper |  |
| 2.1 How many different squares are possible on a 5x5 |  | Whole class share to find all 8 squares | 2.1 Looking for Squares |
| * 1. What does squ. root x mean and how does it relate to x^2
 |  | Exit card- x^2 and sqrt.x | 2.2 Square Roots |
| 2.3How do you find the distance between any 2 points on a grid? |  | 2 days  | 2.3 Using squares to find lengths |
| 2.4 What does it mean to take the cube root of a number? |  | Exit card-x^3 and cube root | 2.4 Cube Roots |
| Check up INV2 |  |  |  |
| 3.1 What is the relationship among the sides of a right triangle? |  |  | 3.1 Discovering the PT |
| 3.2How can you prove the relationship from 3.1 for all triangles |  |  | This is a modification for students who do not understand PT from 3.1 | 3.2The proof of the PT |
| 3.3 How can you find the distance between and 2 points on a plane? |  | This lesson is an assessment of 3.1 and 3.2 | Use whole numbers for struggling students | 3.3 Finding Distances |
| 3.4 Is a triangles that satisfies a^2+b^2 = c^2 |  |  |  | Measuring the Egyptian way |
| 4.1 Can you find exact square roots? Can you order them on a number line? |  |  |  | 4.1Analyzing the Wheel of Theodrus |
| 4.2 How can you represent every fraction as a repeating or terminating decimal? |  |  |  | 4.2Representing fractions as decimals |
| 4.3 Can you represent every decimal as a fraction? |  |  |  | 4.3 Representing decimals as fractions |
| 4.4 How do decide if a number is rational or irrational? |  |  |  | 4.4 Getting Real |
| Check up INV45.1 How can you use the PT to stop sneaky say? |  | Day 2 will be a unique problem that assesses if they can use the PT on a square field |  | Stopping Sneaky Sally |
| 5.2 What is so special about a 30-60-90 triangle? |  | ACE question ( ski resort) |  | 5.2 Analyzing Traiangles |
| How can you solve real world problems using the PT? |  | Handouts where students have to draw the situation, solve the problem |  |  |
| 5.3 What is the relationship b/w the coordinates of a point (x,y) on a circle with circle at the origin |  |  |  | 5.3Analyzing Circles |
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