LOOKING FOR PYTHAGORAS The Pythagorean Theorem

Instructional Time and Investigations	29 days	• Inv. 1: Coordinate Grids (3 Problems) • Inv. 2: Squaring Off (4 Problems) • Inv. 3: The Pythagorean Theorem (4 Problems) • Inv. 4: Using the Pythagorean Theorem: Understanding Real Numbers (4 Problems) • Inv. 5: Using the Pythagorean Theorem: Analyzing Triangles and Circles (3 Problems)
Goals	**Pythagorean Theorem:** Understand and apply the Pythagorean Theorem. • The Pythagorean Theorem relates the areas of the squares on the sides of a right triangle to the area of the square on the hypotenuse. As a result, the Pythagorean Theorem is useful for finding the length of an unknown side of a right triangle given the length of the other two sides, finding the length of a segment joining any two points on a coordinate grid, and for writing the equation of a circle centered at the origin. • The converse of the Pythagorean Theorem can be used to determine whether a triangle is a right triangle.	**Real Numbers:** Understand that the set of real numbers consists of rational and irrational numbers. • The relationship between a number and its square root is the same as the relationship between the area of a square and the length of its side. The relationship between a number and its cube root is the same as the relationship between the volume of a cube and the length of one of its edges. • The set of real numbers is comprised of the set of rational numbers and the set of irrational numbers. Decimals that neither repeat nor terminate are called irrational numbers. You can locate irrational numbers on a number line, and you can work with them in the same way as with rational numbers.
Common Core Standards	**Common Core Standards for Mathematical Practice** **MP.1:** Make sense of problems and persevere in solving them. **MP.2:** Reason abstractly and quantitatively. **MP.3:** Construct viable arguments and critique the reasoning of others. **MP.4:** Model with mathematics. **MP.5:** Use appropriate tools strategically. **MP.6:** Attend to precision. **MP.7:** Look for and make use of structure. **MP.8:** Look for and express regularity in repeated reasoning.	**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. **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 $\sqrt{2}$ is irrational. **8.G.B.6:** Explain a proof of the Pythagorean Theorem and its converse. **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. **8.G.B.8:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system **Also 8.NS.A.2, 8.G.A.4**

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Content Connections to Other Units

Goals of the Unit	Prior Work	Future Work
Pythagorean Theorem: Understand and apply the Pythagorean Theorem	• Measuring lengths (*Covering and Surrounding; Shapes and Designs; Stretching and Shrinking*) • Working with coordinates (*Variables and Patterns; Stretching and Shrinking; Comparing and Scaling; Moving Straight Ahead; Thinking With Mathematical Models*) • Measuring areas of polygons and irregular figures (*Covering and Surrounding; Stretching and Shrinking*) • Applying the formula for area of a square (*Covering and Surrounding*) • Formulating, reading, and interpreting symbolic rules (*Covering and Surrounding; Variables and Patterns; Shapes and Designs; Comparing and Scaling; Moving Straight Ahead; Thinking With Mathematical Models*) • Working with the triangle inequality (*Shapes and Designs*) • Solving problems in geometric and algebraic contexts (*Covering and Surrounding; Shapes and Designs; Moving Straight Ahead; Thinking With Mathematical Models*)	• Finding midpoints of line segments (*Butterflies, Pinwheels, and Wallpaper*) • Studying transformations and symmetries of plane figures (*Butterflies, Pinwheels, and Wallpaper*) • Looking for patterns in square numbers (*Frogs, Fleas, and Painted Cubes; Function Junction; High School*) • Formulating and using symbolic rules and the syntax for manipulating symbols (*Growing, Growing, Growing; Say It With Symbols; It's In the System; Frogs, Fleas, and Painted Cubes; Function Junction*) • Solving geometric and algebraic problems (*Growing, Growing, Growing; Butterflies, Pinwheels, and Wallpaper; Say It With Symbols; Frogs, Fleas, and Painted Cubes; Function Junction*) • Exploring trigonometric functions (*High School*)
Real Numbers: Understand that the set of real numbers consists of rational and irrational numbers.	• Understanding fractions and decimals (*Comparing Bits and Pieces; Let's Be Rational; Decimal Ops*) • Representing fractions as decimals and decimals as fractions (*Comparing Bits and Pieces; Let's Be Rational; Decimal Ops*) • Finding slopes of lines and investigating parallel lines (*Variables and Patterns; Shapes and Designs; Moving Straight Ahead*)	• Exploring sampling and approximations (*High School*) • Solving quadratic equations (*Say It With Symbols; Frogs, Fleas, and Painted Cubes; Function Junction*) • Investigating symmetry (*Butterflies, Pinwheels, and Wallpaper*)