OER In Mathematics Professional Development Project

Lesson Plan

Topic of the lesson:	Standard(s)/Learning Result(s):
Pythagorean Theorem	Geometry: Geometric Figures Students solve problems involving geometric properties; – Students know and use the Pythagorean Theorem.

Goal(s) of the Lesson:

What do you want the students to know and be able to do? What overarching questions do you want them to be able to answer?

The students will be able to:

-Find the square of a number using the area of a square.

-Find a square root of a number by using the length of the side of a square of the same area

The students will discover the Pythagorean theorem

Students will find the sides of a right triangle using the Pythagorean Theorem.

Context

What should students know to engage in the lesson?

-The students should have experience with exponents especially with squares (Ex. 5^2)

- The students should have experience finding the area of a square.

Associated Student Difficulties

Describe known misconceptions (overgeneralizations, common errors, and misunderstandings) associated with the content in this lesson?

Students often confuse the Area of Squares and Length of Sides when investigating the Pythagorean Theorem. If they use dot paper, they sometimes miscount (Ex. They think that the distance on dot paper from A to B is how many dots there are or use the diagonal length between two dots)

Students sometimes have flawed understanding of squares and square roots such as thinking that squaring is doubling ($5^2 = 10$) or square roots are half (square root 8 = 4)

Students sometimes have difficulties when they develop the Theorem through an activity. For example, they often have trouble remembering that the **area** of the square on the side of the triangle is a^2 and, the **length** of the side of the triangle is a. Because students remember the area of the square on one leg + area of the square on the other leg = area of large square leads to thinking that a + b = c. Remind **square** of a is (a^2) and **square** of b is b^2 so $a^2 + b^2 = c^2$

Students also forget that only applies to right triangles and sometimes misidentify legs and hypotenuse.

Planning for Differentiation

Describe how the lesson design incorporates a plan for differentiation.

There are very many applets available for understanding the derivation of the Pythagorean Theorem but since students often lack a deep understanding of squares and square roots, it is important to engage these prerequisite ideas prior to having students engage with the formula.

If students continue to have difficulty with an understanding of squares and square roots, more problems may need to be introduced before moving on to the Pythagorean Theorem.

Pre/Post Assessment

Review what you want students to know and be able to do. How will you determine what they know and don't know? How will you determine that they have met the target? (Describe the pre/post assessment)

Pre-Assessment

-The students will take a 5 question probe to determine if they are able to apply the Pythagorean Theorem.

Post-Assessment

-The students will take retake the same probe after remediating with applets.

Materials & Resources

Describe any tools and resources that are needed to support the lesson.

-Student explorations for practice with squares, square roots, and the Pythagorean Theorem

Technology Tools / Applets

What technology tools, applets, and/or resources you will use for this lesson?

-Laptop cart/Laptops

-Moodle / That Quiz / Activ Expression access (Network Access)

-Student Passwords for network and online tools

-Applet designed for squares, square roots, and the Pythagorean Theorem [Visualizing Square Roots, Pythagoras 1, Pythagorean Theorem]

What management strategies will you utilize during the lesson?

Work in groups differentiated by applet.

Teacher Notes:

Lesson Description

Preparation

What resources will you need? What type of preparation is needed before you can begin the lesson?

- Laptops
- Print Pre and Post Lesson Probes (Or make sure the probes are in an online administration site such as ThatQuiz.org)
- Print Exploration(s) for Pythagorean Theorem tool(s) planning to use

Approximate Time: 15-30 minutes one class, 45-60 minutes the second class

	Lesson	Questions for Learners	Notes / Reflections
Introduction	The day before the lesson, administer the pre-assessment so you can analyze the data. • Students complete the "Pythagorean Theorem" pre-assessment(s) (5-15 min). Use that data to determine which errors/misconceptions students have. Engage students in responding to the pre-assessment questions and results without sharing definitive "answers." Show and analyze electronic results (if using clickers, ThatQuiz, Google Forms, etc.) and/or elicit example responses and student opinions. (5-10 min.) Introduce the overview of Squares and Square Roots • Introduce the idea focusing on the concept of area of a square.	Write down everything you know about exponents in the first column. What do you know about exponents? Squaring a number? Square roots? - Clarify what students explain… - Provide me more detail about… A square that has a side length of x has an area of x^2. Example a 2 by 2 square has an area of 2^2 that is 2x2 or 4. If you are given 5^2, what does that mean? How do you evaluate the value of this term?	Provide student a paper. Have them fold it in three equal parts. Label the columns K-W-L: - Know - Want to know - Learned

	Lesson	Questions for Learners	Notes / Reflections
Core Instruction	Build on the definitions and details that the students shared about exponents and square root. Launch the "Visualizing Square Roots" applet. http://maine.edc.org/file.php/1/AssessmentResources/SqrtsVisual_F.html - Check the length of side checkbox. - Move the slide to set up the side of the square. - Check the grid checkbox. - Check the area of the square checkbox Find the "Square" of various numbers (Area of Square) Move to finding the square root of some squares Use the applet to estimate square roots Have students complete the exploration. Introduce right triangle with squares on the sides.	When you set the side of the square as 4, what is the area of the square? (Stress square units) Point out 4 x 4 can be represented as 4^2 so the area of the square represents 4^2. Each side of the square represents the square root of the area of the square. $\sqrt{4^2} = 4$ "Apply what you know about squares & square roots to find the sides of the triangle."	$\sqrt{a^2 + b^2} = c$ Use applet to generate the Pythagorean Theorem
Closure	Summarize the Pythagorean Theorem The sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse. (Right Triangle) $a^2 + b^2 = c^2$ $\sqrt{a^2 + b^2} = c$	Note – Use the Pythagorean Theorem applet to check some problems. http://www2.esc9.net/math/geogebra/Pythagorean%20Theorem/pythagorean_theorem.html	