Drexel-SDP GK-12 LESSON

Subject Area: Math

Lesson Title
The Pythagorean Theorem

Grade Level 8

Time Required
Lesson time is dependent on student background, and typically requires about 1 hour.

Summary
This lesson is intended to be an introduction to and an engineering application lesson on the Pythagorean theorem. It starts with a manipulative lesson relating the sides of the right trangle to the areas of squares. There are a number of questions to answer concerning the manipulatives. There is also an application page describing the glide path of paper airplanes from the peaks of various buildings in Philadelphia.

Keywords
- Pythagorean theorem
- right trangle
- leg of triangle
- hypotenuse
- squared
- glide path

Educational Standards
PA Math 2.2.8A, 2.3.8F, 2.4.8A, 2.5.8C

Learning Objectives
After this lesson, students will be able to…

- identify the legs and hypotenuse of a right triangle
- understand when to apply the Pythagoream theorem
- recognize how area is related to the Pythagorean theorem
- apply the theorem to real-world problems

Introduction / Motivation

This lesson area relations that help define the Pythagorean theorem and also asks the student to calculate various glide paths.

Associated Activities

Page 1 for **Pythagorean Theorem** is meant for use with cut-outs on page 2.

1. Students should write the lengths of each side of the figures along the side to emphasize that there is a relationship between sides of the figures.

2. Students arrange the figures so that the squares surround the right triangle with sides matching.

3. side*side or side^2

4. This question is meant to be a challenge. Students may not notice a relationship between the sizes of the squares at this point.

5. Fill in the areas of the squares – 9, 16, 25.

6. Students will probably now notice that 9+16=25.

7. Write a general relationships: $3^2+4^2 = 5^2$. This relates the sides of the triangle to each other.

8. Reinforce the fact that right triangle have one 90 degree angle.

9. The sum of the squares of the legs of a right triangle equals the square of the hypotenuse. $a^2 + b^2 = c^2$.

10. Prompt students to think about how this relationship may be useful to us in our day-to-day lives.

Page 2 for **Pythagorean Theorem**

The first page of this lesson is a set of figures meant for cutting out of the paper. As students start to finish their cutting, challenge them to consider how the shapes are related. Give them time to see if they can find the relationship between the sides.

Page 3 for **Pythagorean Theorem**

Read instructions with students. Complete a right triangle describing the height of the structure, the length that a paper airplane glides and the glide path (direct route). Use the right triangle and the Pythagorean theorem to determine the distance traveled. It may be enjoyable for students from the Philadelphia area to speculate what each icon represents. This will give a useful touchstone and physical representation.

City Hall: 1228.9 ft

Liberty One: 2172.3 ft

PSFS Building: 1114.5 ft

School: 111.8 ft

Owner
Drexel University GK-12 Program

Contributors

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The Pythagorean Theorem

Name:_____ Date:_____

1. Measure the sides of each figure that you have cut out. Write the lengths on the sides of each figure.

2. Arrange the figures so that sides with the same length touch each other.

3. What is the formula for the area of a square?

4. Do you notice anything about the sizes of the squares?

5. Find the area of each square. Write the area in the center of each square.

6. Do you notice anything about the areas of the squares now?

7. What relationship can we write about the triangle considering what we know about the area of the squares?

8. What is the special property of right triangles?

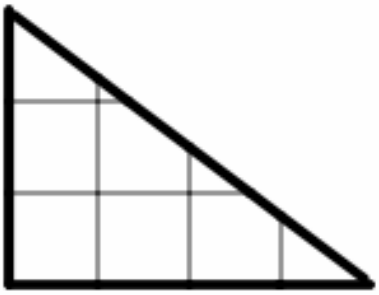
9. How would we write the relationship in question 7 for any right triangle?

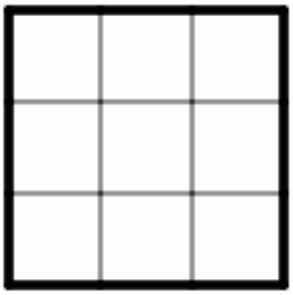
10. How could this be useful to us?

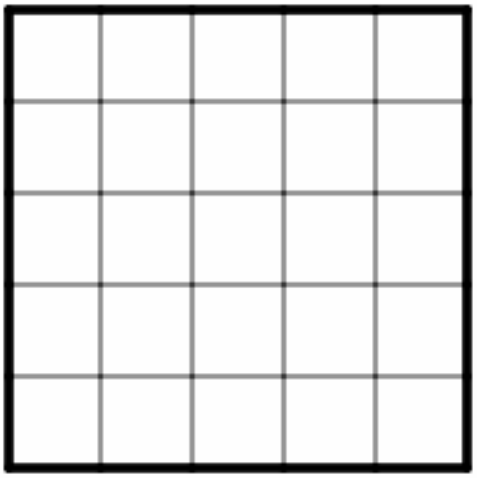
The Pythagorean Theorem

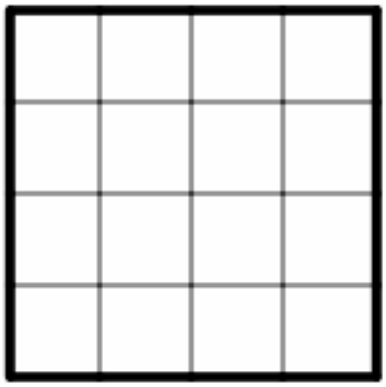
Name: _____ Date:_____

Cut out the figures. Measure the sides of each figure.









The Pythagorean Theorem

Name: _____ Date:_____

A maintenance man drops a paper airplane off of different buildings in Philadelphia. We know how tall the buildings are and we measure how far the paper plane fell from the base of the buildings. How far did it fly? Draw your right triangles.

$$a^2 + b^2 = c^2$$

548 feet 

1100 feet

848 feet 

2000 feet

492 feet 

1000 feet

50 feet 

100 feet