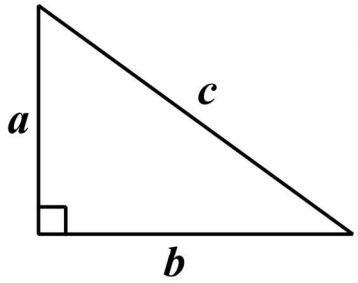
Name: _____ Date: _____

# PROVING THE PYTHAGOREAN THEOREM
## N-GEN MATH® GEOMETRY

*One of the most important theorems in all of math is the **Pythagorean Theorem**. You have now used it for a few years in math to solve for **unknown sides** of a right triangle. In this lesson, you will learn how to prove that the Pythagorean Theorem is true by using similar right triangles.*

***Exercise* #1:** A right triangle is shown below with its legs having lengths of $a$ and $b$ and its hypotenuse having a length of $c$.

(a) State the Pythagorean Theorem below:




(b) Sketch squares on the triangle that have areas of $a^2$, $b^2$, and $c^2$. Label the squares with their areas.

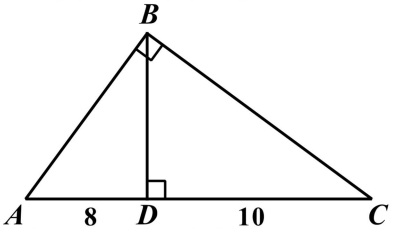
***Exercise* #2:** A right triangle has legs of lengths 5 and 12.

(a) What is the length of its hypotenuse?

(b) Draw a sketch of this triangle illustrating the Pythagorean Theorem in terms of the areas involved.

*In order to **prove** the **Pythagorean Theorem** we need to recall a fact we have seen in the last few lessons.*

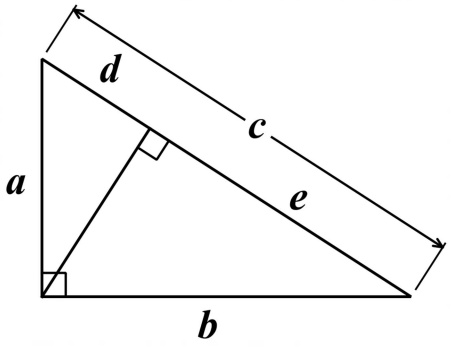
***Exercise* #3:** In the diagram shown, altitude $\overline{BD}$ partitions hypotenuse $\overline{AC}$ as shown. Set up a ratio based on similarity or geometric means to find the length of $\overline{AB}$.



*We can generalize what we did in the last exercise to **prove** the **Pythagorean Theorem**.*

***Exercise* #4:** In the diagram shown below, a right triangle has been drawn with legs of lengths $a$ and $b$ and a hypotenuse with a length of $c$. The altitude from the right angle to the hypotenuse is drawn and partitions the hypotenuse into lengths of $d$ and $e$.

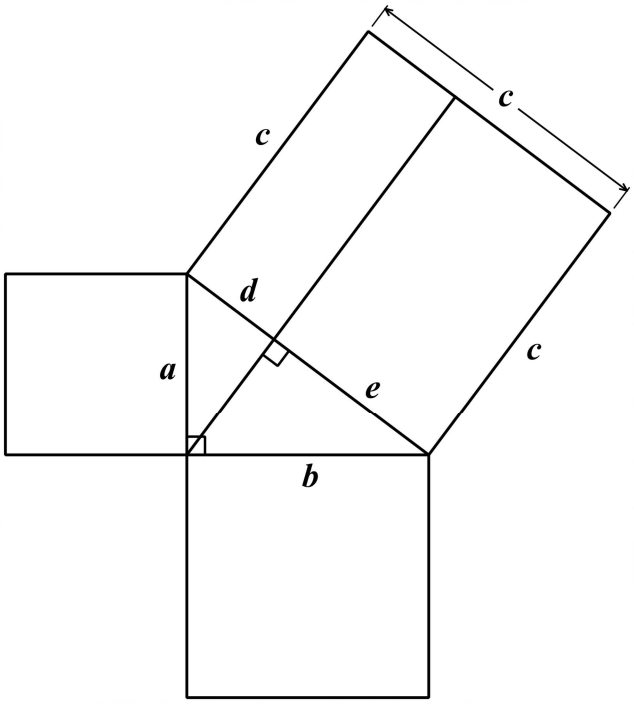
(a) Write an equation that relates the values of $c$, $d$, and $e$.




(b) Using similar right triangles or geometric means, write an expression that could be used to solve for $a$. Leave in product form.

(c) Using similar right triangles or geometric means, write an expression that could be used to solve for $b$. Leave in product form.

(d) Illustrate what each equation from (b) and (c) represent in terms of areas on the diagram to the right.




(e) Add the two equations from (b) and (c) together using the **addition property of equality**. Combine this expression with your equation from (a) to **prove** the **Pythagorean Theorem**.