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Mr. Rogove Date:________

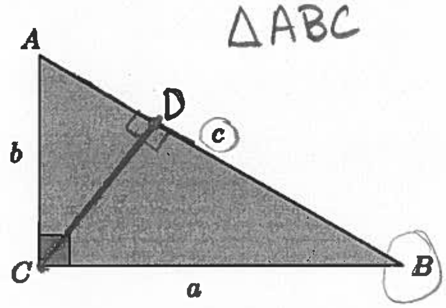
Learning Objective:

We will prove the Pythagorean theorem using similar triangles. (Lesson 75)

Concept Development:

We can use similar triangles to provide another proof of the Pythagorean Theorem:

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

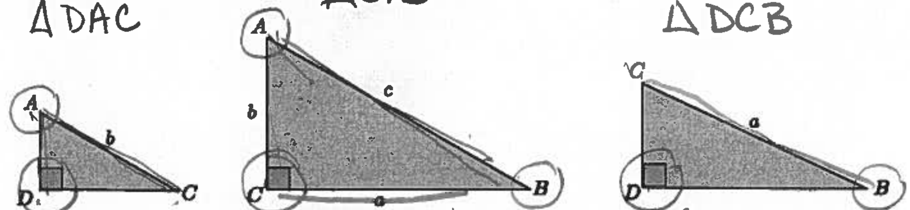


$\triangle ABC$

$c = \overline{AB}$
$b = \overline{AC}$
$a = \overline{BC}$

Name these three triangles

① $\triangle DAC$ ② $\triangle CAB$ ③ $\triangle DCB$



90° 90° 90°

Are these three triangles similar? We need AA similarity...

$\triangle DAC \sim \triangle CAB \rightarrow$ AA similarity
$\triangle CAB \sim \triangle DCB \rightarrow$ AA similarity.

Proving the Pythagorean Theorem:

CORRESPONDING SIDES OF SIMILAR $\triangle$'S ARE PROPORTIONAL!!

$\frac{\overline{AC}}{\overline{AD}} \times \frac{\overline{AB}}{\overline{AC}}$ $(\overline{AC})^2 = \overline{AD} \cdot \overline{AB}$ $b^2 = c(\overline{AD})$

$\frac{\overline{BA}}{\overline{BC}} \times \frac{\overline{BC}}{\overline{BD}}$ $(\overline{BC})^2 = \overline{BA} \cdot \overline{BD}$ $+ \quad a^2 = c(\overline{BD})$

$a^2+b^2 = c(\overline{AD}) + c(\overline{BD})$

$a^2+b^2 = c(\overline{AD}+\overline{BD})$

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

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

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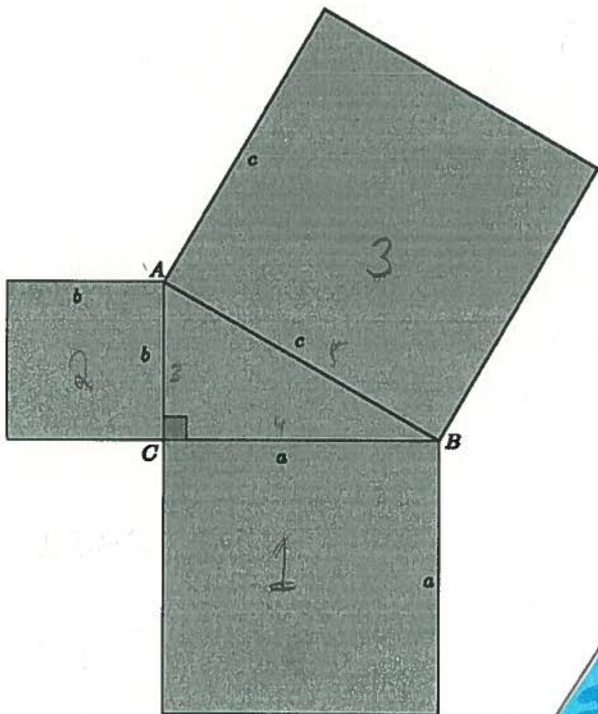
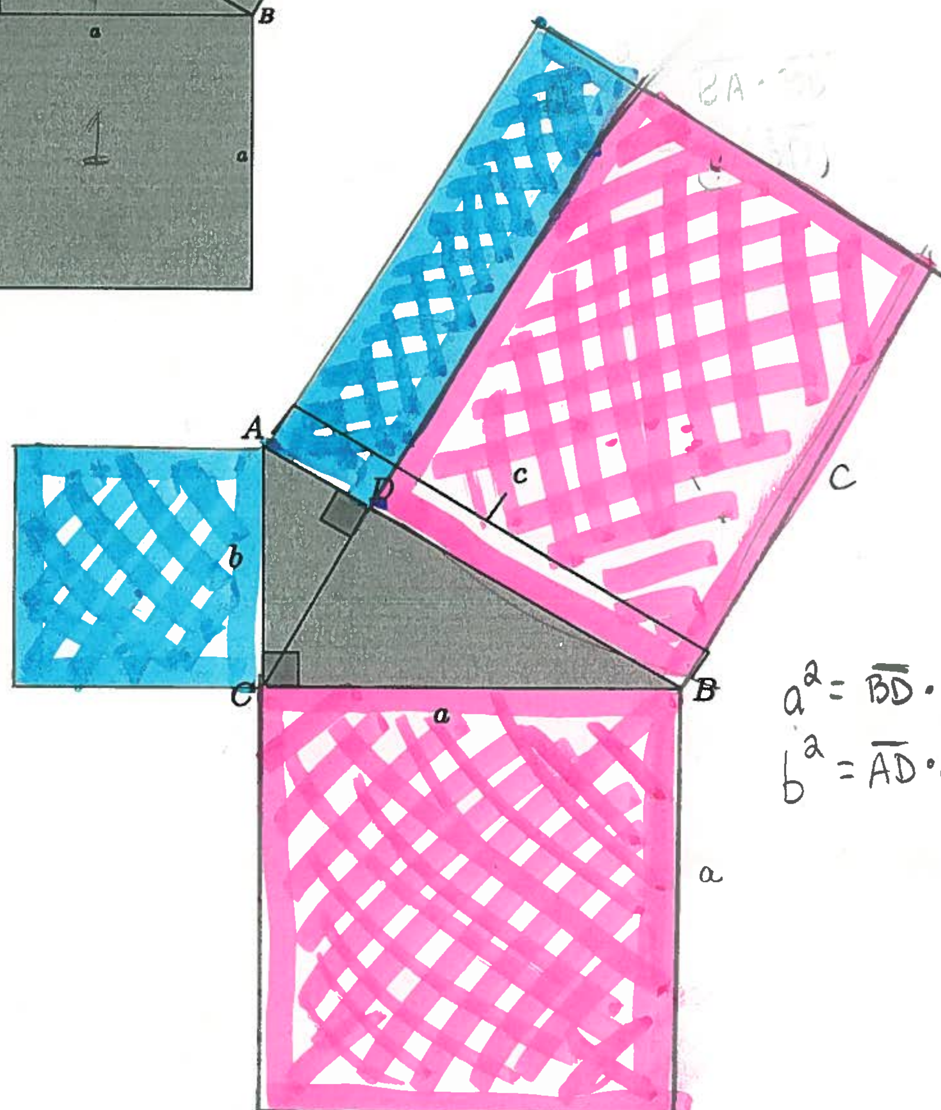
Another Proof using Similar Triangles and Areas





$a^2 = \overline{BD} \cdot c$

$b^2 = \overline{AD} \cdot c$

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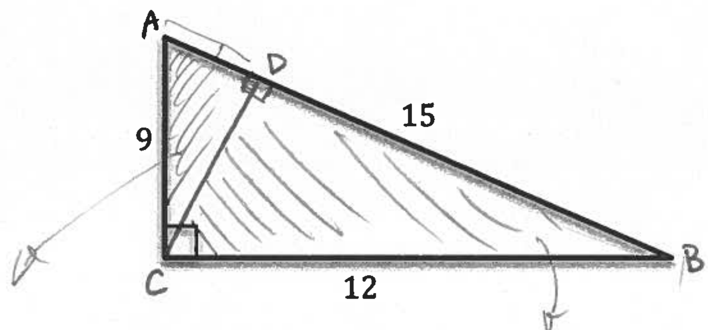
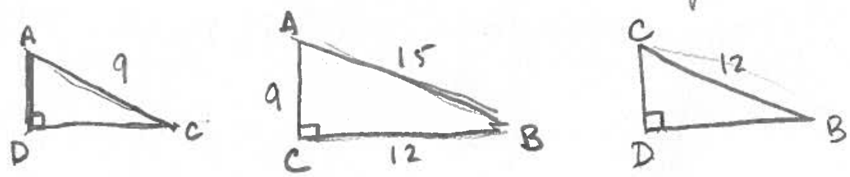
Guided Practice:

Steps for Proving the Pythagorean Theorem Using Similar Triangles

1. Draw a line from the right angle perpendicular to the hypotenuse. This will create three similar triangles.
2. Label, reorient, and draw the three similar triangles.
3. Set up a series of proportions to show that $a^2 + b^2 = c^2$ using the steps demonstrated on the first page of the notes.





$\frac{9}{\overline{AD}} \times \frac{15}{9}$

$\frac{15}{12} \times \frac{12}{\overline{BD}}$

$9^2 = 15(\overline{AD})$

$12^2 = 15(\overline{BD})$

$9^2 + 12^2 = 15(\overline{AD}) + 15(\overline{BD})$

$9^2 + 12^2 = 15(\overline{AD} + \overline{BD})$

$9^2 + 12^2 = 15^2$

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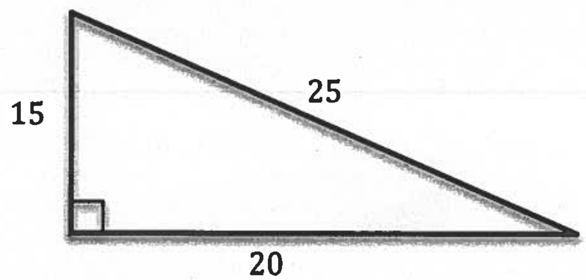

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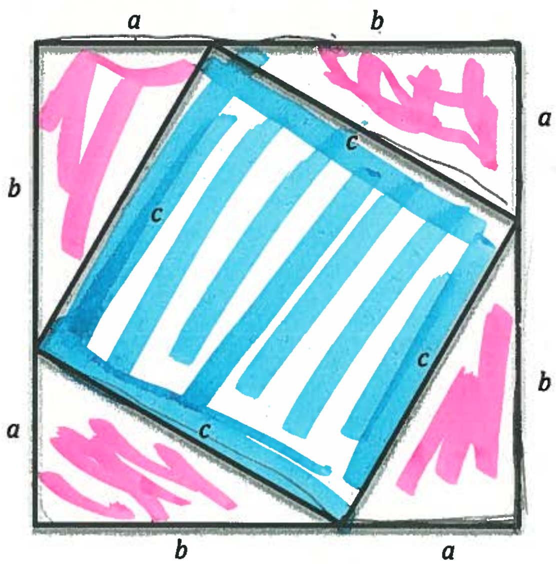
Independent Practice:

No independent practice...

Activating Prior Knowledge:

Module 3 → Congruence

We know the Pythagorean Theorem is $a^2 + b^2 = c^2$, AND we know one way to prove it.



$$(a+b)^2 = c^2 + 4\left(\tfrac{1}{2}ab\right)$$

$$(a+b)(a+b) = c^2 + 2ab$$

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

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

$$-2ab \qquad\qquad -2ab$$

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

Closure:

Why are the three triangles created during the proof similar?

Notes:

Maps to Grade 8, Lesson 15, Module 7.