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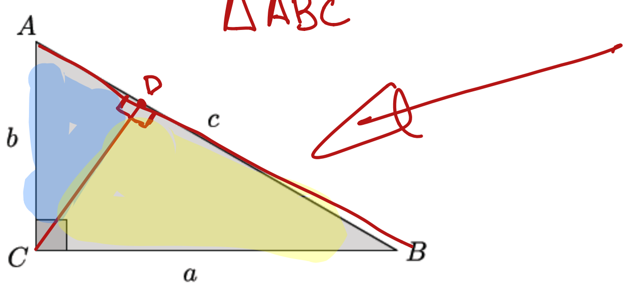
Mr. Rogove Date:_________

Learning Objective: We will prove the Pythagorean theorem using similar triangles. (G8M7L9)

Concept Development:

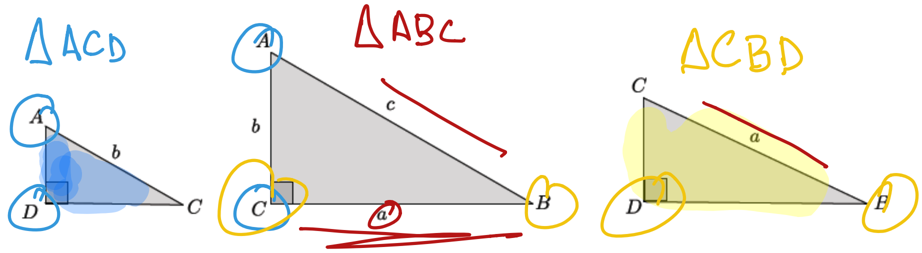
We can use similar triangles to provide another proof of the Pythagorean Theorem:

ΔABC



Name these three triangles

ΔACD ΔABC ΔCBD



$\Delta ACD \sim \Delta CBD$ Are these three triangles similar? YES!

$\Delta ACD \sim \Delta ABC$ AA Similarity

$\Delta CBD \sim \Delta ABC$ AA Similarity.

Transitive property

Proving the Pythagorean Theorem:

CORRESPONDING SIDES OF SIMILAR Δ's ARE PROPORTIONAL

$$\frac{\overline{BC}}{\overline{BD}} = \frac{\overline{AB}}{\overline{BC}} \qquad (\overline{BC})^2 = \overline{AB}\cdot\overline{BD} \qquad \boxed{a^2 = \overline{AB}\cdot\overline{BD}}$$

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

ADD EQUATIONS

$$a^2+b^2 = \overline{AB}\cdot\overline{BD} + \overline{AB}\cdot\overline{AD}$$

$$a^2+b^2 = \overline{AB}\,(\overline{BD}+\overline{AD}) \leftarrow \text{FACTOR } \overline{AB}$$

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

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

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

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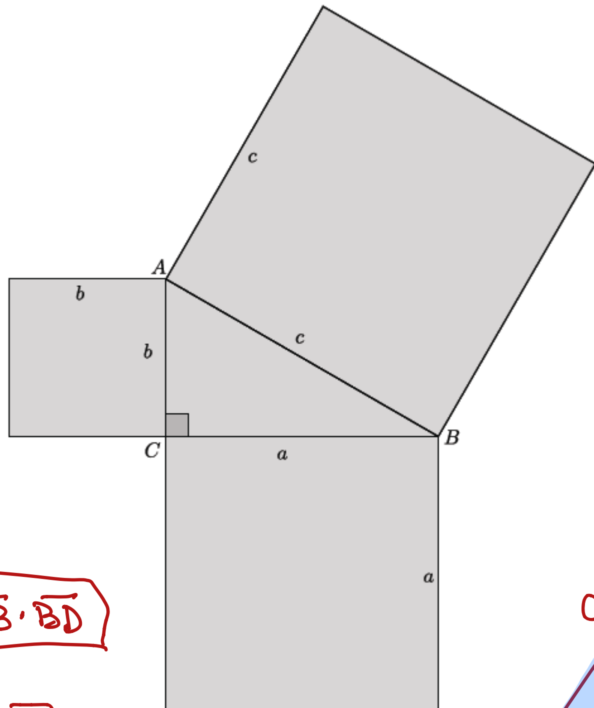
Another Proof using Similar Triangles and Areas

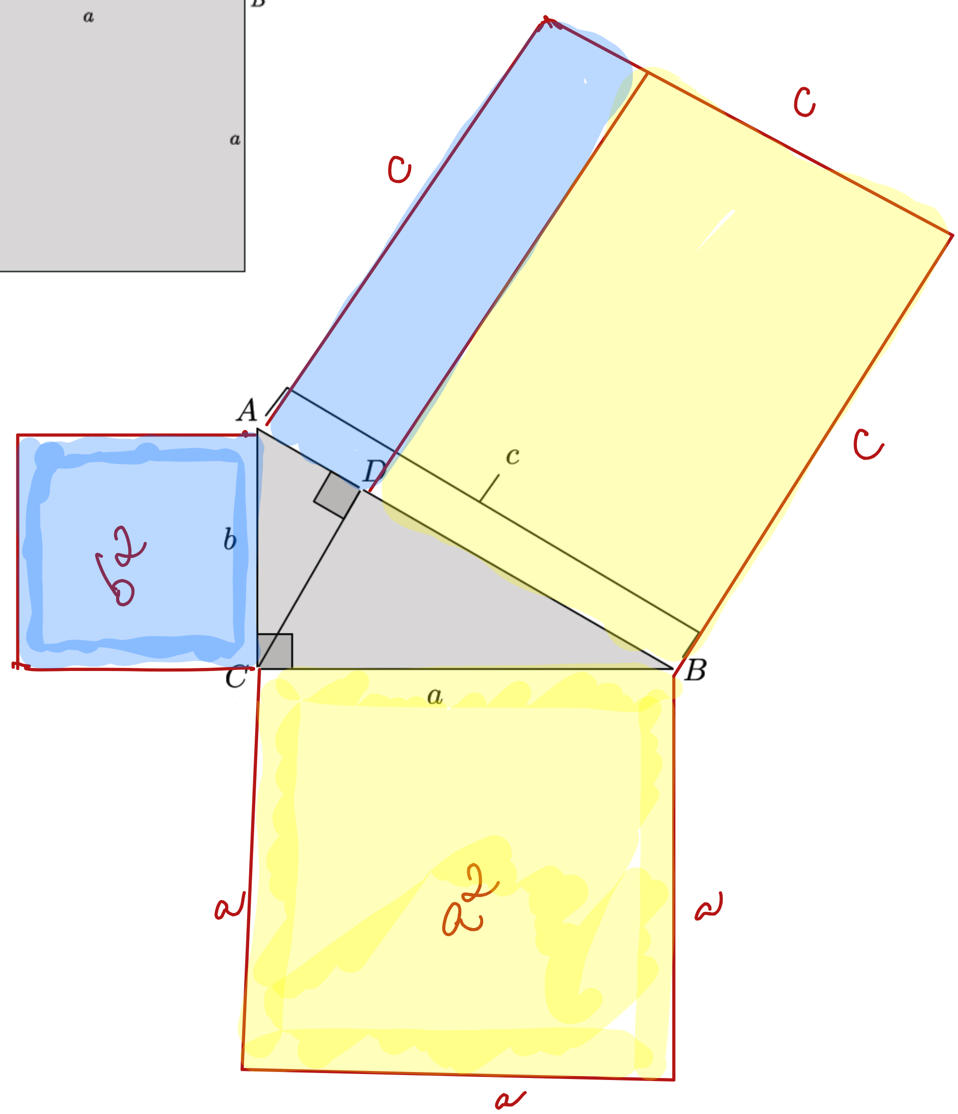


$\boxed{a^2 = \overline{AB} \cdot \overline{BD}}$

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

$\boxed{b^2 = \overline{AB} \cdot \overline{AD}}$

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



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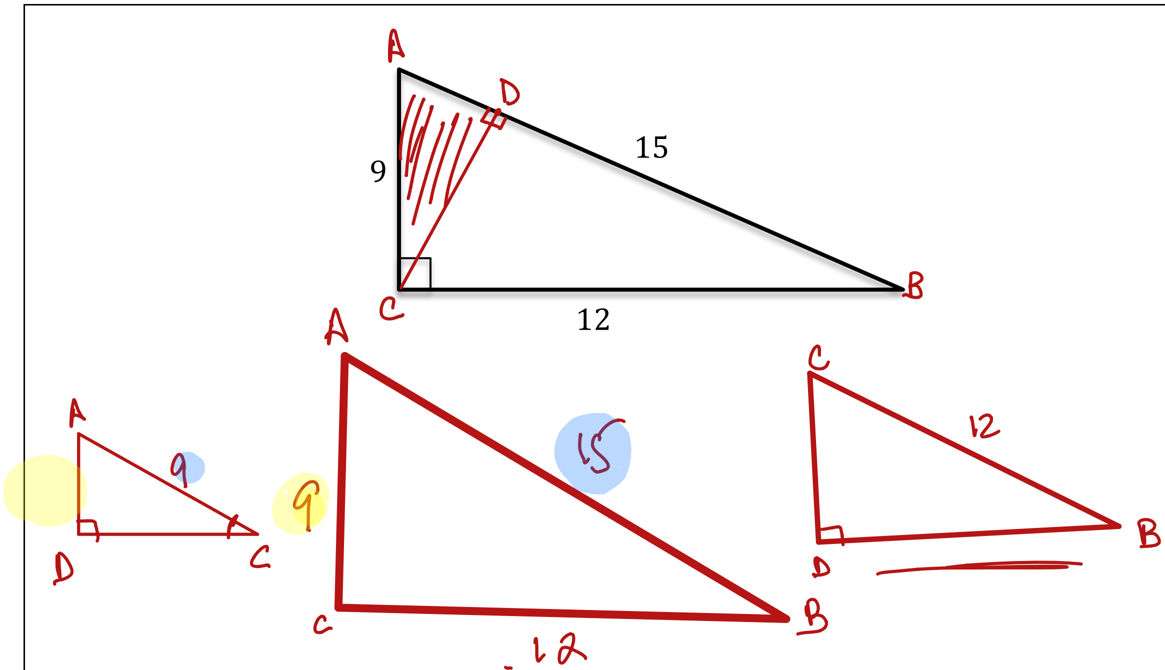
Guided Practice:

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.



$\frac{9}{15} = \frac{\overline{AD}}{9}$ $9^2 = 15 \cdot \overline{AD}$

$\frac{15}{12} = \frac{12}{\overline{BD}}$ $12^2 = 15 \cdot \overline{BD}$

ADD EQUATIONS

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

FACTOR

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

$\overline{AD} + \overline{BD} = 15$

$9^2 + 12^2 = 15^2$ YAY! HOORAY!

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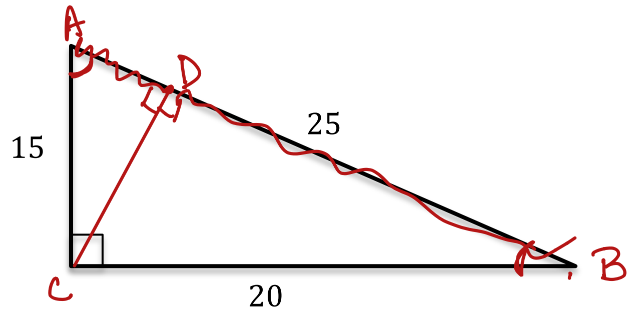

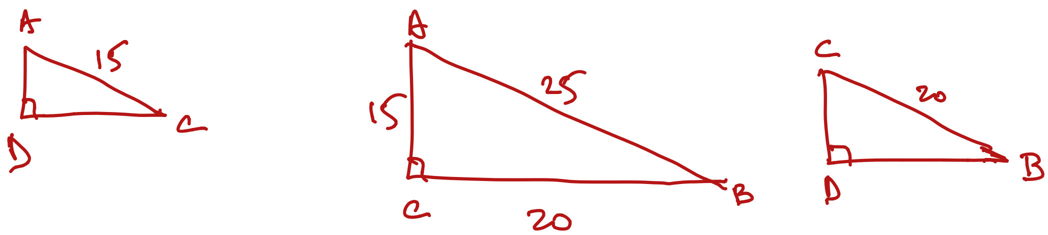

$$\frac{15}{25} = \frac{\overline{AD}}{15} \qquad 15^2 = 25(\overline{AD})$$

$$\frac{20}{25} = \frac{\overline{DB}}{20} \qquad 20^2 = 25(\overline{DB})$$

ADD EQUATIONS

$$15^2 + 20^2 = 25 \cdot \overline{AD} + 25 \cdot \overline{BD}$$

$$15^2 + 20^2 = 25(\overline{AD} + \overline{BD})$$ FACTOR!

$$15^2 + 20^2 = 25 \cdot 25$$

$$15^2 + 20^2 = 25^2$$

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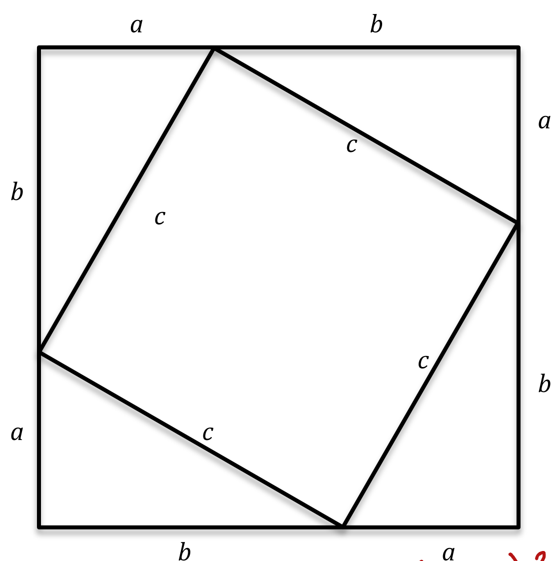
Independent Practice:

No independent practice…

Activating Prior Knowledge:

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



BIG SQUARE = LITTLE SQUARE +4 TRIANGLES

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

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

$-2ab \qquad -2ab$

$\boxed{a^2+b^2=c^2}$

$(a+b)^2 \neq a^2+b^2$

	a	b
a	a^2	ab
b	ab	b^2

Closure:

Why are the three triangles created during the proof similar?

Notes:

Maps to Grade 8, Lesson 15, Module 7.

HW could be lesson 15 problem set minus probs 1-2.