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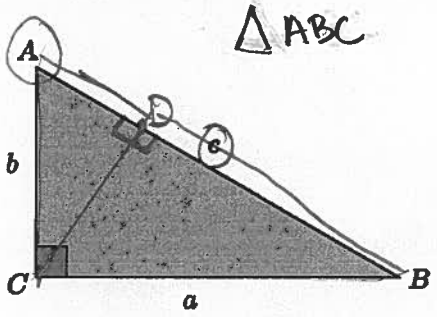
LEARNING OBJECTIVE: We will prove the Pythagorean theorem using similar triangles. (Lesson 75)

CONCEPT DEVELOPMENT:

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



$\triangle ABC$

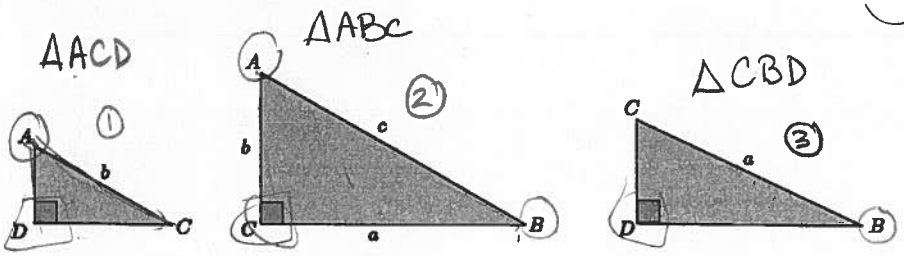
$a = \overline{BC}$

$b = \overline{AC}$

$c = \overline{AB}$

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

Name these three triangles



Are these three triangles similar? AA Similarity.

$\triangle ACD \sim \triangle ABC \rightarrow$ AA Similarity

$\triangle ABC \sim \triangle CBD \rightarrow$ AA Similarity.

Proving the Pythagorean Theorem:

CORRESPONDING SIDES OF SIMILAR Δ'S ARE PROPORTIONAL

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

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

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

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

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

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

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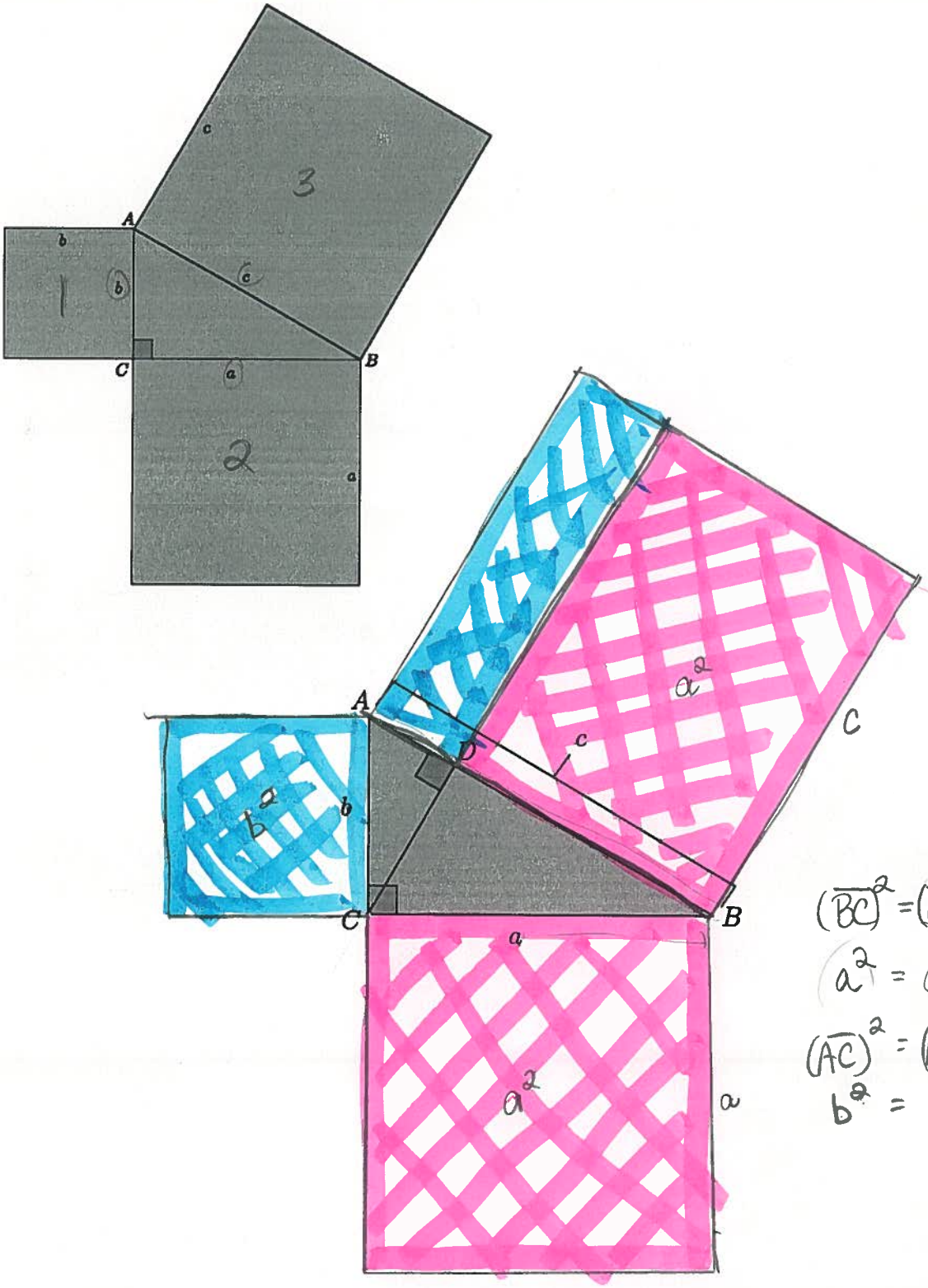
Another Proof using Similar Triangles and Areas



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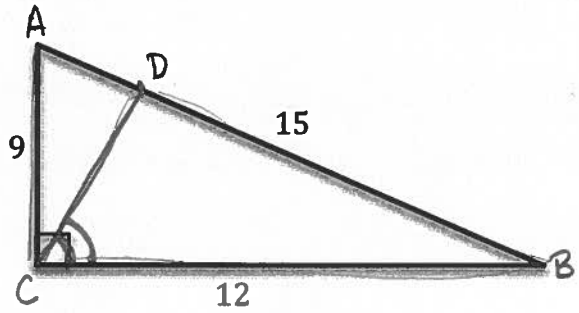
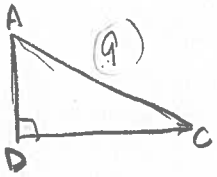
GUIDED PRACTICE:

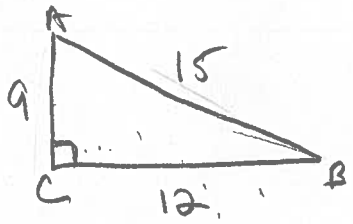
Steps for Proving the Pythagorean Theorem Using Similar Triangles

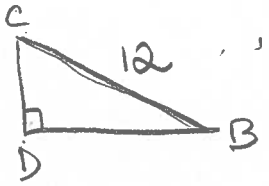
1. Draw a line from the right angle perpendicular to the hypotenuse. This will create three similar triangles.
2. Label, reorient, and draw the three similar triangles.
3. Set up a series of proportions to show that $a^2 + b^2 = c^2$ using the steps demonstrated on the first page of the notes.

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









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

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

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

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

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

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

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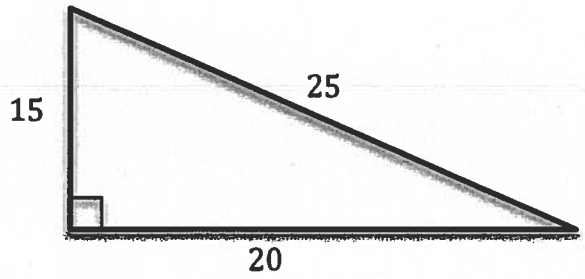

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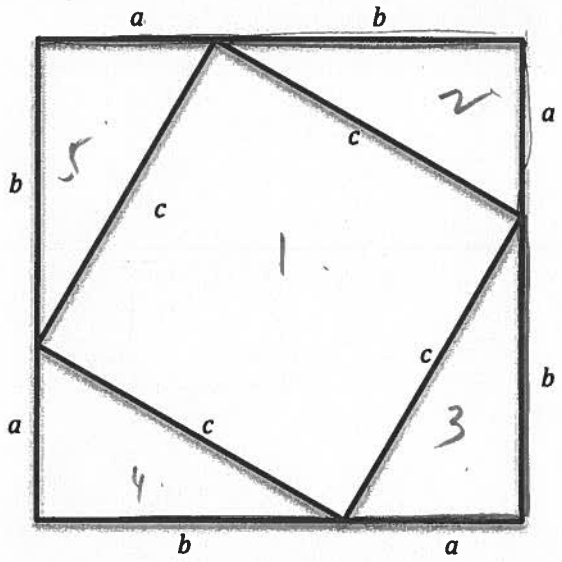
INDEPENDENT PRACTICE:

No independent practice...

ACTIVATING PRIOR KNOWLEDGE:

Module 3 Lesson 30

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



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

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

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

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

$-2ab \qquad -2ab$

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

CLOSURE:

Why are the three triangles created during the proof similar?

NOTES:

Maps to Grade 8, Lesson 15, Module 7.