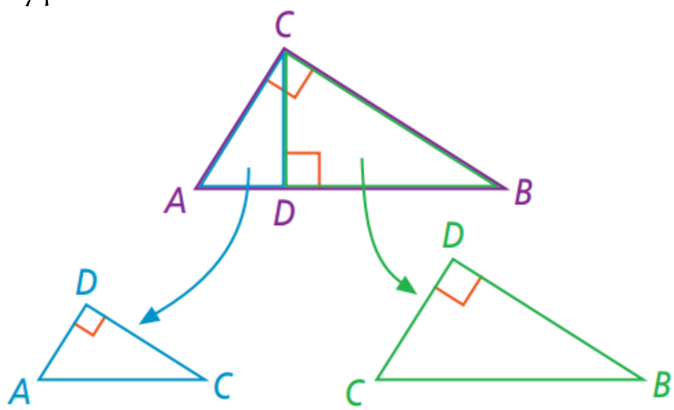
❖ Right Triangle/Altitude Similarity Theorem

- **If an altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are similar to the original triangle and to each other.**
  - $\triangle ABC$ is a right triangle with right $\angle ACB$; $\overline{CD}$ is the altitude to the hypotenuse:



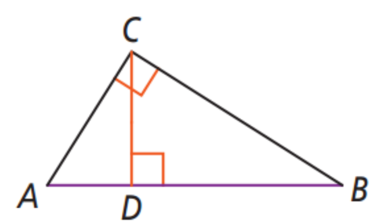
$\triangle ABC \sim \triangle ACD$

$\triangle ABC \sim \triangle CBD$

$\triangle ACD \sim \triangle CBD$

❖ Right Triangle Altitude/Hypotenuse Theorem

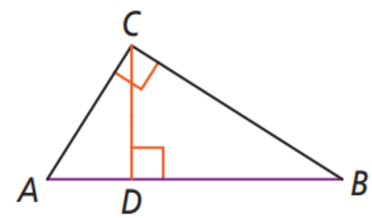
- **The measure of the altitude (drawn from the vertex of the right angle of a right triangle to its hypotenuse) is the geometric mean between the measures of the two segments of the hypotenuse.**
  - Altitude: $\overline{CD}$
  - Hypotenuse: $\overline{AB}$
  - Two segments of the hypotenuse: $\overline{AD}$ & $\overline{BD}$



$$\frac{CD}{AD} = \frac{BD}{CD}$$

❖ Right Triangle Altitude/Leg Theorem

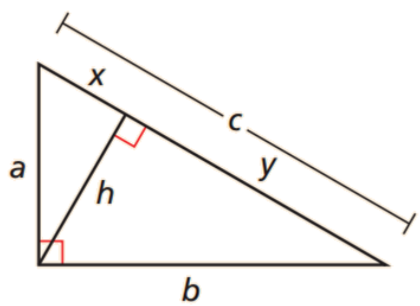
- If the altitude is drawn to the hypotenuse of a right triangle, each leg of the right triangle is the geometric mean of the hypotenuse and the segment of the hypotenuse adjacent to the leg.
  - Leg: $\overline{AC}$, Segment: $\overline{AD}$
  - Leg: $\overline{BC}$, Segment: $\overline{BD}$
  - Hypotenuse: $\overline{AB}$



$$\frac{AC}{AB} = \frac{AD}{AC} \qquad \frac{BC}{AB} = \frac{BD}{BC}$$

❖ You can label a diagram as shown below.

- The legs are a & b, the hypotenuse is c, and the altitude is h.
  - Notice that segment x is adjacent to leg a, and that segment y is adjacent to leg b.



<u>Right Triangle Altitude/Hypotenuse Theorem</u>

$$\frac{h}{x} = \frac{y}{h} \qquad h^2 = xy$$

<u>Right Triangle Altitude/Leg Theorem</u>

$$\frac{a}{c} = \frac{x}{a} \qquad a^2 = cx \qquad \frac{b}{c} = \frac{y}{b} \qquad b^2 = cy$$

<u>Additional Formulas</u>

$$x + y = c$$

You can also use the Pythagorean Theorem.

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

$$x^2 + h^2 = a^2$$

$$y^2 + h^2 = b^2$$