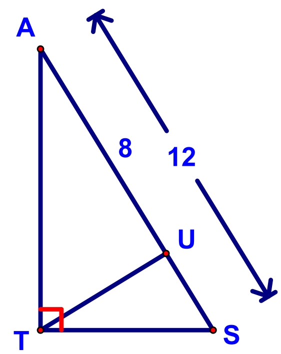
## Lesson 9-3 - Altitude-on-Hypotenuse Theorems

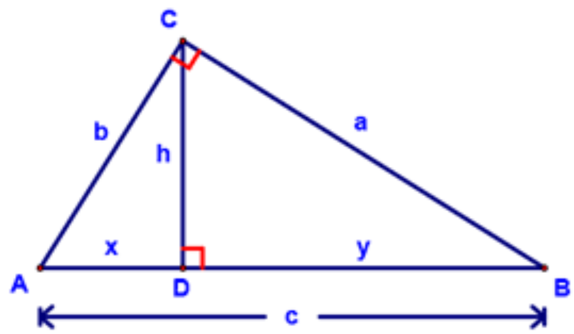
Here's a warmup!

**Given:** $\angle ATS$ is a right angle
$\overline{TU}$ is an altitude of $\triangle ATS$
$\triangle AUT \sim \triangle ATS$
AS = 12; AU = 8

**Find:** AT



Today, we're going to use similar triangles to prove the following theorem:




***Theorem 67:***

**If an altitude is drawn to the hypotenuse of a right triangle, then**

a. **The two triangles formes are similar to the given right triangle and to each other ($\triangle ADC \sim \triangle ACB \sim \triangle CDB$).**

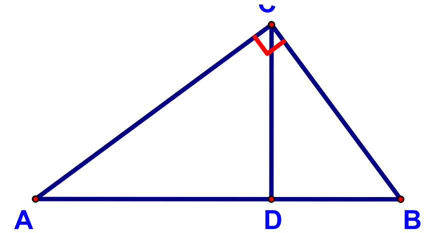
b. **The altitude to the hypotenuse is the mean proportional between the segments of the hypotenuse $\left(\frac{x}{h} = \frac{h}{y} \text{ or } h^2 = xy\right)$.**

c. **Either leg of the given right triangle is the mean proportional between the hypotenuse of the given right triangle and the segment of the hypotenuse adjacent to that leg $\left(\frac{y}{a} = \frac{a}{c} \text{ or } a^2 = yc \text{ and } \frac{x}{b} = \frac{b}{c} \text{ or } b^2 = xc\right)$**

See if you can prove this version of the theorem…think CSSTP and MEPT!!

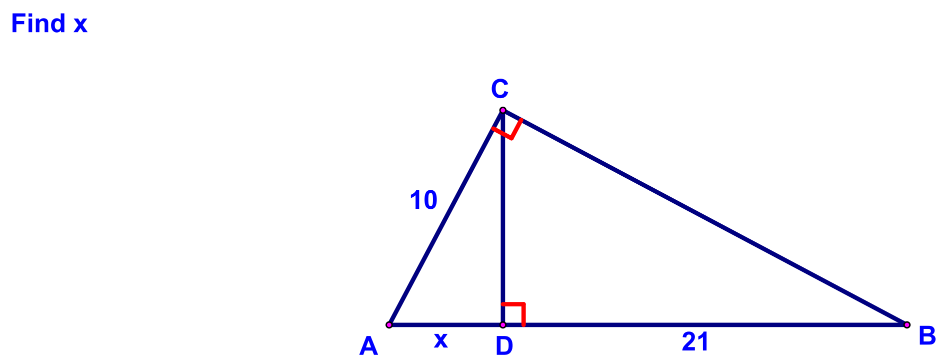
**Given:** ∠ACB is a right ∠
$\overline{CD}$ is an altitude

**Prove:** $(AC)^2 = (AD)(AB)$




| Statements | Reasons |
|---|---|
| | |

Now see if you can use it to find x in the diagram below:




Make sure you know these three relationships!!