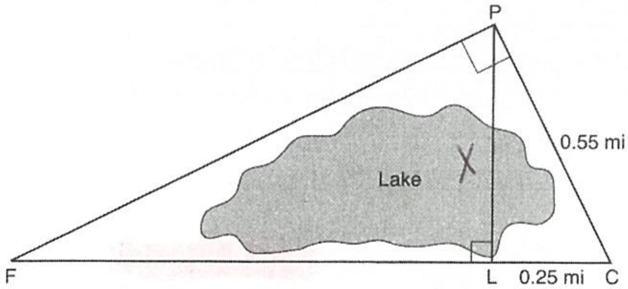
Name: Key   Date: ______________

UNIT 5   **LESSON 5**

AIM: HOW DO WE SOLVE PROPORTIONS IN SIMILAR RIGHT TRIANGLES (DAY 1- SAAS)?

Do Now: Determine and state to the nearest hundredth of a mile the length of $\overline{PL}$.



$(.25)^2 + x^2 = (.55)^2$

$.0625 + x^2 = .3025$

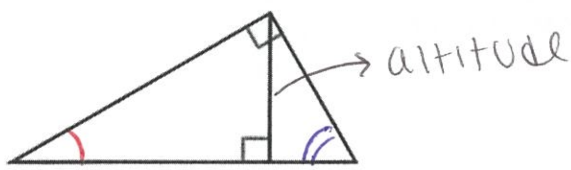
$\sqrt{x^2} = \sqrt{.24}$

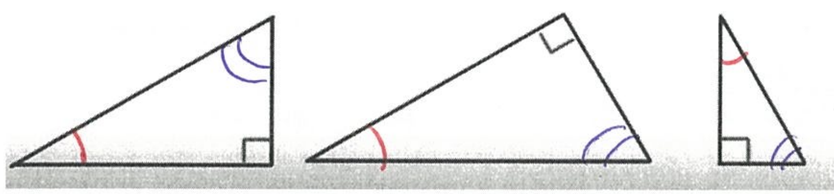
$x = .49$

Follow along with the video to complete the following *(STOP @ 9:48)*:

- Define **ALTITUDE**: How tall a $\triangle$ is - forms right $\measuredangle$'s

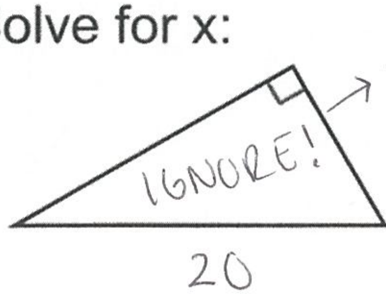
- Follow along and mark the diagrams below with the video:



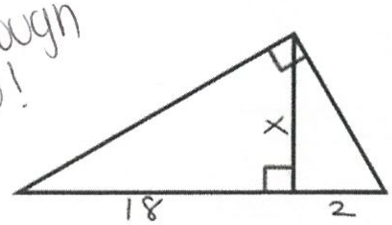


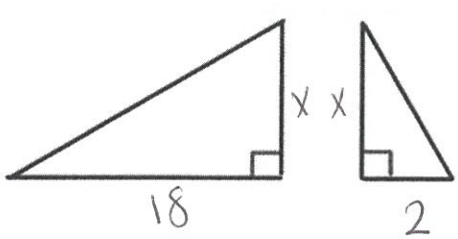
- Therefore, whenever you have a right triangle with an altitude drawn to the hypotenuse, all 3 triangles will be similar! Sides of similar triangles are in proportion!

Solve for x:



not enough info!





$$\frac{18}{x} = \frac{x}{2}$$

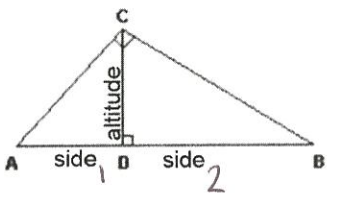
$\sqrt{x^2} = \sqrt{36}$

$\boxed{x = 6}$

WHAT IS A FASTER WAY TO DO THIS?!

> **Definition:** The **mean proportional, or geometric mean,** of two positive numbers a and b is the positive number x such that $\frac{a}{x} = \frac{x}{b}$. When solving, $x = \sqrt{a \bullet b}$.
>
> Notice that the x value appears TWICE in the "means" positions of the proportion.

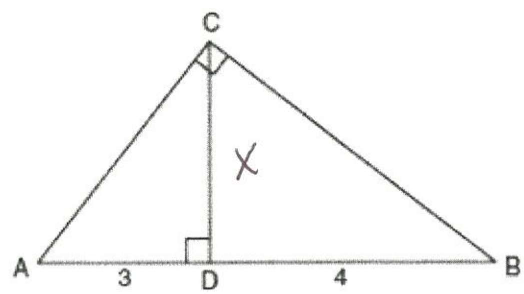
GEOMETRIC MEAN (ALTITUDE) THEOREM



$\frac{side_1}{alt.} = \frac{alt}{side_2} \rightarrow \frac{S_1}{A} = \frac{A}{S_2} \rightarrow$ SAAS!

PRACTICE PROBLEMS!

1. In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. If $AD = 3$ and $DB = 4$, find the length of $\overline{CD}$ in simplest radical form.



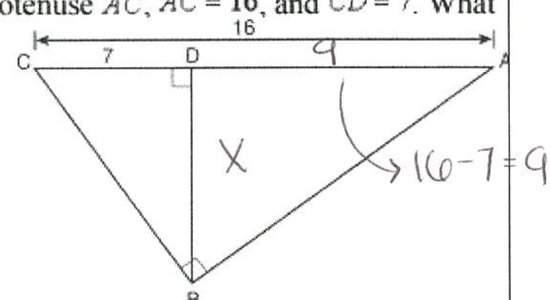
$\frac{3}{x} = \frac{x}{4}$

$\sqrt{x^2} = \sqrt{12}$

$x = \sqrt{4}\sqrt{3}$

$\boxed{x = 2\sqrt{3}}$

2. In the diagram below of right triangle ABC, altitude $\overline{BD}$ is drawn to hypotenuse $\overline{AC}$, $AC = 16$, and $CD = 7$. What is the length of $\overline{BD}$ in simplest radical form?



$\frac{7}{x} = \frac{x}{9}$

$\sqrt{63} = \sqrt{x^2}$

$x = \sqrt{9}\sqrt{7}$

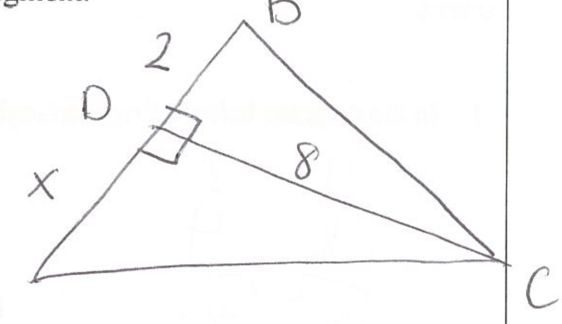
$\boxed{x = 3\sqrt{7}}$

3 In right triangle ABC, $\overline{CD}$ is the altitude to the hypotenuse, $\overline{AB}$. If the length of the altitude is 8 feet and the length of the shorter segments is 2 feet, find the length of the longer segment.

$$\frac{2}{8} = \frac{8}{x}$$

$$2x = 64$$

$$\boxed{x = 32}$$

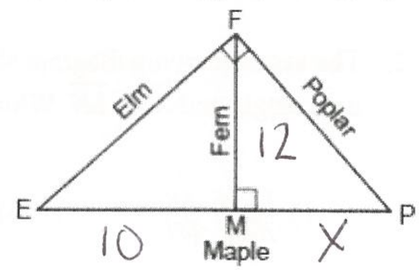


4 Four streets in a town are illustrated in the accompanying diagram. If the distance from F to M is 12 miles and the distance on Maple Street from E to M is 10 miles, find the distance on Maple Street, in miles, from M to P.

$$\frac{10}{12} = \frac{12}{x}$$

$$10x = 144$$

$$\boxed{x = 14.4}$$



5 In right triangle ABC, $\overline{CD}$ is the altitude to the hypotenuse, $\overline{AB}$. The segments of the hypotenuse, $\overline{AB}$, are in the ratio of 1:4. The altitude is 6. Find the two segments of the hypotenuse.

add x's!

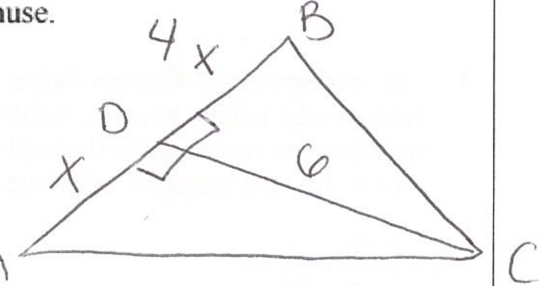
$$\frac{x}{6} = \frac{6}{4x}$$

$$4x^2 = 36$$

$$x^2 = 9$$

$$x = 3$$

AD = 3
DB = 12



6 Given the diagram to the right, solve for x.

$$\frac{x+5}{6} = \frac{6}{x}$$

FACTOR!

$$x(x+5) = 36$$

$$x^2 + 5x = 36$$

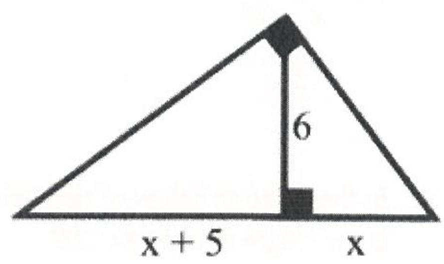
set = to zero!

$$-36 \quad -36$$

$$x^2 + 5x - 36 = 0$$

$$(x+9)(x-4) = 0$$

$$\cancel{x = -9} \text{ reject} \qquad \boxed{x = 4}$$



Name: ______________________________ Date: ______________________

UNIT 5 **LESSON 5**

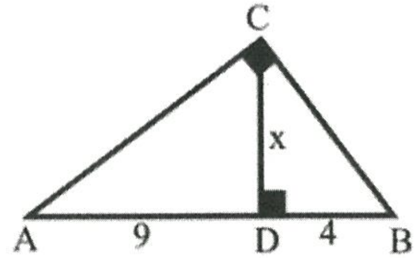
HOMEWORK

1. In the diagram below of right triangle ACB, altitude $\overline{CD}$ intersects $\overline{AB}$ at D. Find the length of $\overline{CD}$.

$$\frac{9}{x} = \frac{x}{4}$$

$$\sqrt{x^2} = \sqrt{36}$$

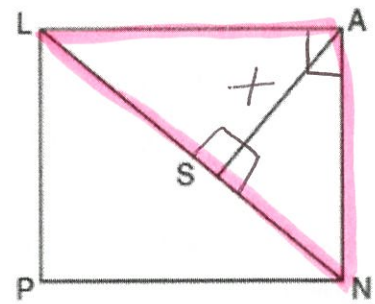
$$x = 6$$



2. The accompanying diagram shows part of the architectural plans for a structural support of a building. $PLAN$ is a rectangle and $\overline{AS} \perp \overline{LN}$. Which equation can be used to find the length of $\overline{AS}$?

1) $\frac{LS}{AS} = \frac{AS}{SN}$ 3) $\frac{AS}{SN} = \frac{AS}{LS}$

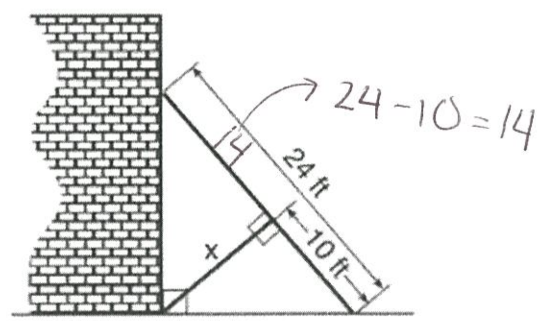
2) $\frac{AN}{LN} = \frac{AS}{LS}$ 4) $\frac{AS}{LS} = \frac{LS}{SN}$



3. The accompanying diagram shows a 24-foot ladder leaning against a building. A steel brace extends from the ladder to the point where the building meets the ground. The brace forms a right angle with the ladder. If the steel brace is connected to the ladder at a point that is 10 feet from the foot of the ladder, which equation can be used to find the length, x, of the steel brace?

(1) $\frac{10}{x} = \frac{x}{14}$ ~~(3)~~ $10^2 + x^2 = 14^2$

(2) $\frac{10}{x} = \frac{x}{24}$ ~~(4)~~ $10^2 + x^2 = 24^2$

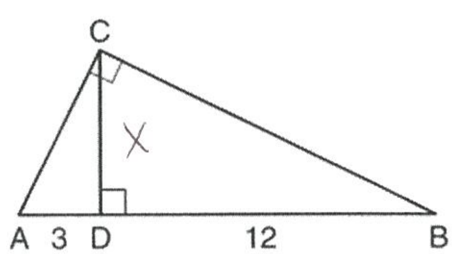


4. In the diagram below of right triangle ABC, altitude $\overline{CD}$ is drawn to hypotenuse $\overline{AB}$. If $AD = 3$ and $DB = 12$, what is the length of altitude $\overline{CD}$?

$$\frac{3}{x} = \frac{x}{12}$$

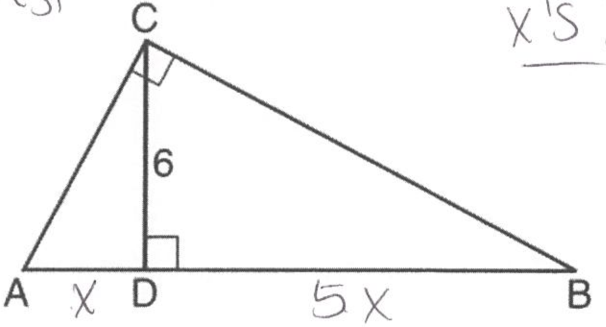
$$\sqrt{36} = \sqrt{x^2}$$

$$\boxed{x = 6}$$



5. In right triangle ABC below, $\overline{CD}$ is the altitude to hypotenuse $\overline{AB}$. If $CD = 6$ and the ratio of AD to AB is 1:5, determine and state the length of $\overline{BD}$. to the nearest tenth

x's!



$$\frac{x}{6} = \frac{6}{5x}$$

$$5x^2 = 36$$

$$x^2 = 7.2$$

$$\boxed{x = 2.7}$$

6. What is the solution set for the equation $x^2 - 5x = 6$? FACTOR! Set = to 0!

$$-6 \quad -6$$

$$x^2 - \overset{a}{5}x - \overset{m}{6} = 0$$

$$(x-6)(x+1) = 0$$

$x = 6$ | $x = -1$

$$\{-1, 6\}$$