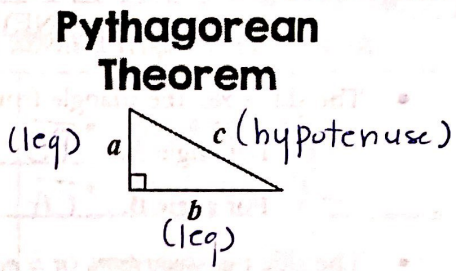
Unit 7 Lesson 1: Pythagorean Theorem & Intro to Trigonometry

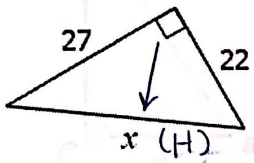
I. Pythagorean Theorem

- Used to find the missing Sides of a Right triangle.
- Sides *a* and *b* are called legs.
- Side *c* is called the hypotenuse.
- For any right triangle: $a^2+b^2=c^2$ or $leg^2+leg^2=hypot^2$



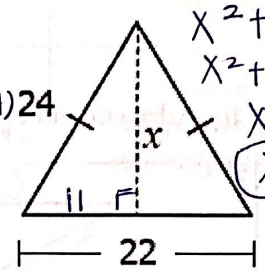
Solve for x. Round to the nearest tenth.

1.



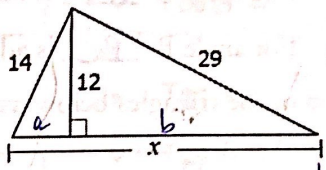
$27^2+22^2=X^2$
$729+484=X^2$
$1213=X^2$
$X=34.8$

2.



$X^2+11^2=24^2$
$X^2+121=576$
$X^2=455$
$X=21.3$

3.

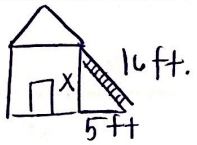


$a^2+12^2=14^2$
$a^2+144=196$
$a^2=52$
$a=7.2$

$12^2+b^2=29^2$
$144+b^2=841$
$b^2=697$
$b=26.4$

$X=a+b=7.2+26.4=33.6$

4. A roofer leaned a 16 foot ladder against a house. If the base of the ladder is 5 feet from the house, how high up the house does the ladder reach?



$X^2+5^2=16^2$
$X^2+25=256$
$X^2=231$
$X=15.2$

15.2 feet

II. Trigonometry

Trigonometry comes from the Greek words *trigonon* meaning Triangle and *metron* meaning measure.

Officially it is the study of the sides and angles of a triangle.

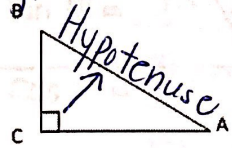
Developed from a need to compute angles and distance in such fields as:

- Engineering
- Surveying
- Astronomy

III. Labeling Sides of a Right Triangle

In a right triangle we usually refer to the sides of the triangle as legs and hypotenuse. When we study trigonometry we give these sides new names **(opposite, adjacent, and hypotenuse)**.

- The *longest* side of each right-angled triangle is called the hypotenuse. It is easily found since it is *always* the side across from the Right angle.

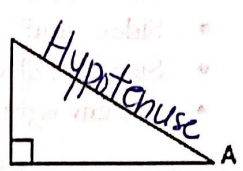


The other two sides are called the opposite and adjacent sides. These sides are labeled in relation to an angle called the reference angle.

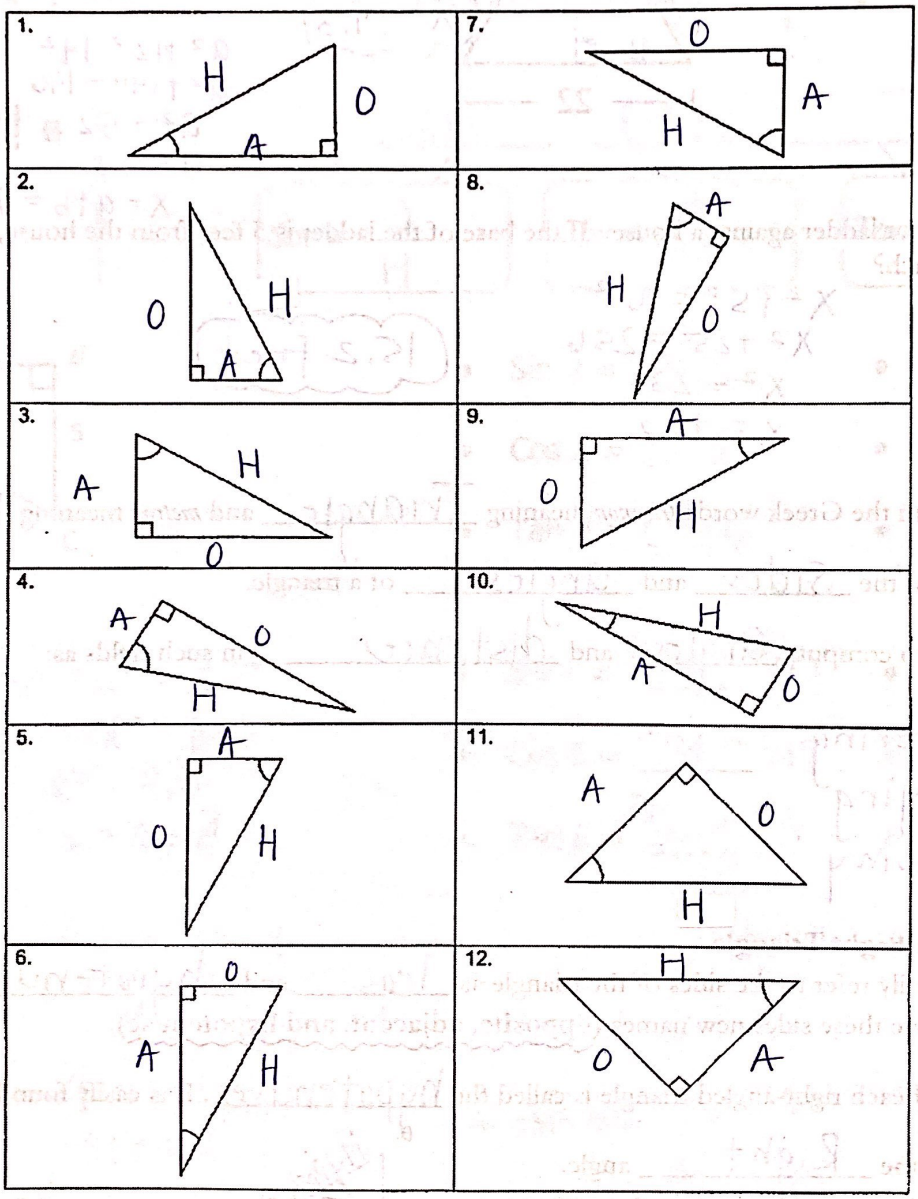
Reference Angle: The ACUTE angle ("point of view") used in the calculation

NEVER use the Right angle as the reference angle!!!!!

- The side *across* the triangle from the reference angle is called the opposite side.
  - For angle A: $\overline{BC}$ is opposite
  - For angle B: $\overline{CA}$ is opposite
- The side that *helps form*, or *is next to*, the reference angle is called the adjacent side.
  - For angle A: $\overline{AC}$ is adjacent to $\angle A$.
  - For angle B: $\overline{BC}$ is adjacent to $\angle B$.

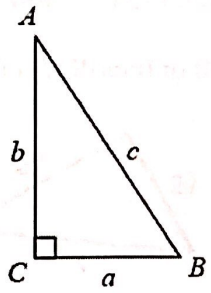


Label the sides of the triangles below with O for Opposite, A for Adjacent and H for Hypotenuse.



IV. Setting up Trig Ratios (fractions)

TRIGONOMETRIC RATIOS



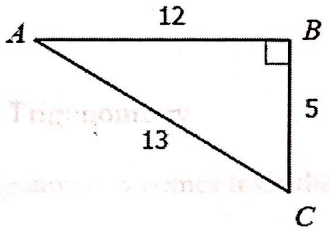
Each acute angle of a right triangle has the following trigonometric ratios: (fraction)

SINE	The ratio of the leg **opposite** the angle to the **hypotenuse**.	• Sin A = a/c • Sin B = b/c
COSINE	The ratio of the leg **adjacent** to the angle to the **hypotenuse**.	• Cos A = b/c • Cos B = a/c
TANGENT	The ratio of the leg **opposite** the angle to the leg **adjacent** to the angle.	• Tan A = a/b • Tan B = b/a

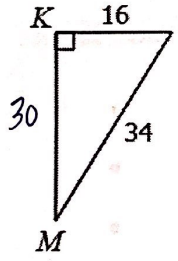
* REMEMBER!! *

SOH CAH TOA

SOH — Sin = $\frac{O}{H}$; CAH — Cos = $\frac{A}{H}$; TOA — Tan = $\frac{O}{A}$

1. 

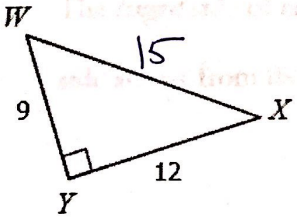
- Sin A = $5/13$
- Cos A = $12/13$
- Tan A = $5/12$
- Sin C = $12/13$
- Cos C = $5/13$
- Tan C = $12/5$

2. 

$16^2 + x^2 = 34^2$
$256 + x^2 = 1156$
$x^2 = 900$
$x = 30$

- Sin L = $30/34 = 15/17$
- Cos L = $16/34 = 8/17$
- Tan L = $30/16 = 15/8$
- Sin M = $16/34 = 8/17$
- Cos M = $30/34 = 15/17$
- Tan M = $16/30 = 8/15$

You Try!

3. 

$9^2 + 12^2 = x^2$
$81 + 144 = x^2$
$225 = x^2$
$x = 15$

- Sin W = $12/15 = 4/5$
- Cos W = $9/15 = 3/5$
- Tan W = $12/9 = 4/3$
- Sin X = $9/15 = 3/5$
- Cos X = $12/15 = 4/5$
- Tan X = $9/12 = 3/4$