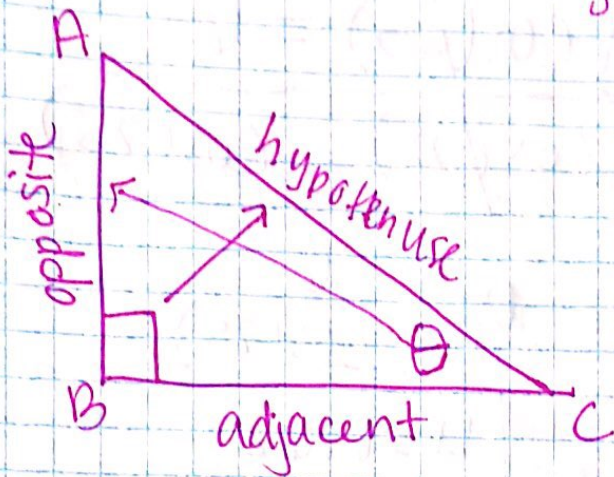


Right Triangle Trig!

S
O
H
C
A
H
T
O
A

What are our trig functions?

- ① sine ② cosine ③ tangent



* adjacent, touches the angle.

θ = reference angle

Sine

$$\sin \theta = \frac{\text{opp}}{\text{hypo}}$$

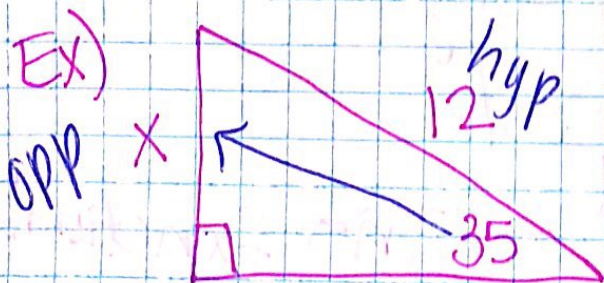
Cosine

$$\cos \theta = \frac{\text{adj}}{\text{hypo}}$$

tangent

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

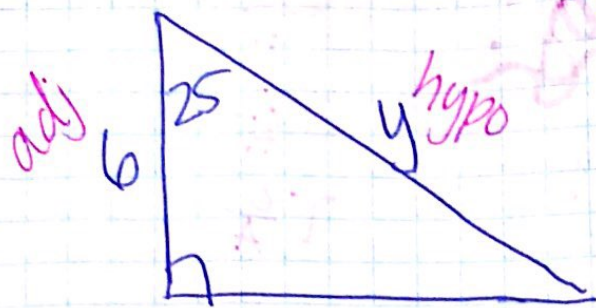
Let's try solving using Trig



$$\sin(35) = \frac{x}{12} \quad *12$$

$$12 \cdot \sin(35) = x$$

$$\boxed{x = 6.88}$$



Solve for y!

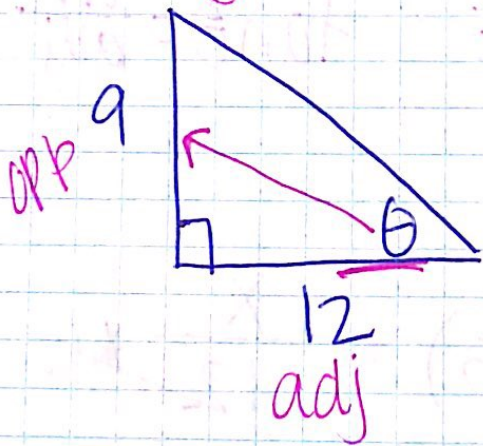
$$\cos(25) = \frac{6}{y}$$

$$\frac{y \cos(25)}{\cos(25)} = \frac{6}{\cos(25)}$$

$$y = \frac{6}{\cos(25)}$$

$$y = 6.62$$

Solving for angles!

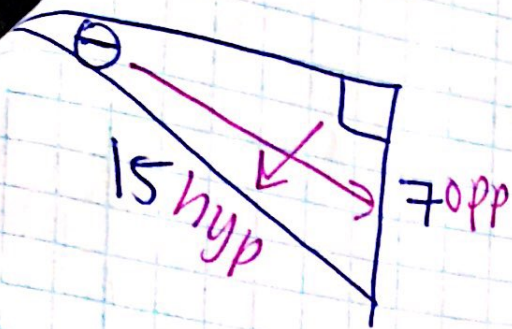


$$\tan \theta = \frac{9}{12}$$

$$\tan^{-1}\left(\frac{9}{12}\right) = \theta$$

$$\theta = 36.87^\circ$$

To do in calculator 2nd \rightarrow Trig function

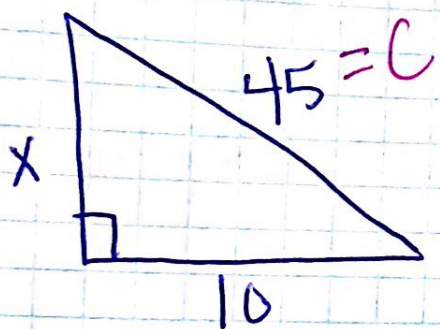


$$\sin \theta = \frac{7}{15}$$

$$\sin^{-1}\left(\frac{7}{15}\right) = \theta$$

$$\theta = 27.82^\circ$$

Solving for missing side, given 2 sides of a Right Triangle!



Pythagorean Thm.

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

↗ hypotenuse

$$10^2 + x^2 = 45^2$$

$$100 + x^2 = 2025$$

$$\begin{array}{r} -100 \\ -100 \end{array}$$

$$\sqrt{x^2} = \sqrt{1925}$$

$$x = \sqrt{1925} = 43.87$$

nasty decimal,
so keep as
a radical

there are 3 more trig functions!

original:

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} \quad \cos \theta = \frac{\text{adj}}{\text{hypo}} \quad \tan \theta = \frac{\text{opp}}{\text{adj}}$$

New: (call them reciprocals)

cosecant
 $\csc \theta = \frac{\text{hyp}}{\text{opp}}$

secant
 $\sec \theta = \frac{\text{hyp}}{\text{adj}}$

cotangent
 $\cot \theta = \frac{\text{adj}}{\text{opp}}$

Ex) original
 $\frac{2}{3}$

Reciprocal
 $\frac{3}{2}$

Flipped the
numerator &
denominator

CO's don't go!

$$\sin \theta \rightarrow \csc \theta$$

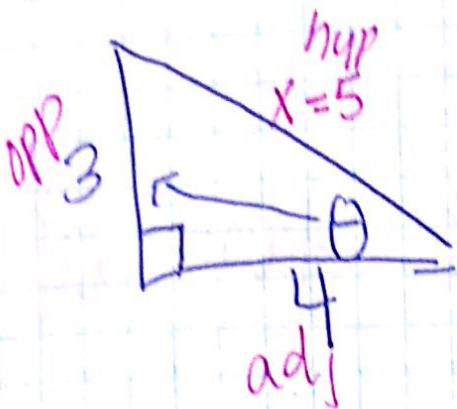
$$\cos \theta \rightarrow \sec \theta$$

$$\tan \theta \rightarrow \cot \theta$$

C's should
be paired
with S's

Practice!

Find all six trig functions!



$$\sin \theta = \frac{3}{5}$$

$$\cos \theta = \frac{4}{5}$$

$$\tan \theta = \frac{3}{4}$$

$$\csc \theta = \frac{5}{3}$$

$$\sec \theta = \frac{5}{4}$$

$$\cot \theta = \frac{4}{3}$$

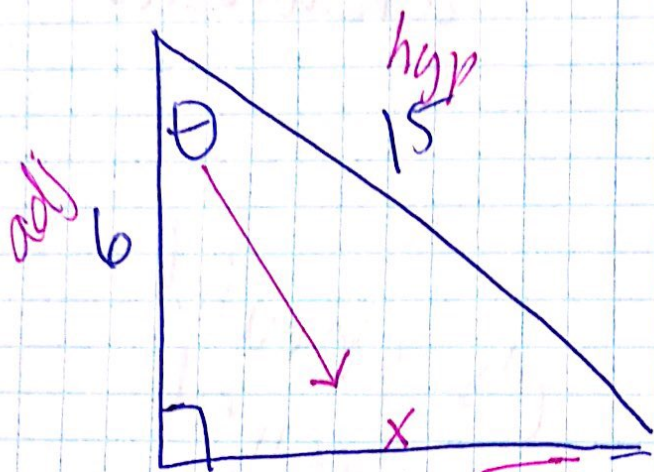
$$a^2 + b^2 = c^2$$

$$3^2 + 4^2 = x^2$$

$$9 + 16 = x^2$$

$$\sqrt{25} = \sqrt{x^2}$$

$$5 = x$$



$$\sin \theta = \frac{\sqrt{189}}{15}$$

$$\cos \theta = \frac{6}{15}$$

$$\tan \theta = \frac{\sqrt{189}}{6}$$

$$\csc \theta = \frac{15}{\sqrt{189}}$$

$$\sec \theta = \frac{15}{6}$$

$$\cot \theta = \frac{6}{\sqrt{189}}$$

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

$$6^2 + x^2 = 15^2$$

$$36 + x^2 = 225$$

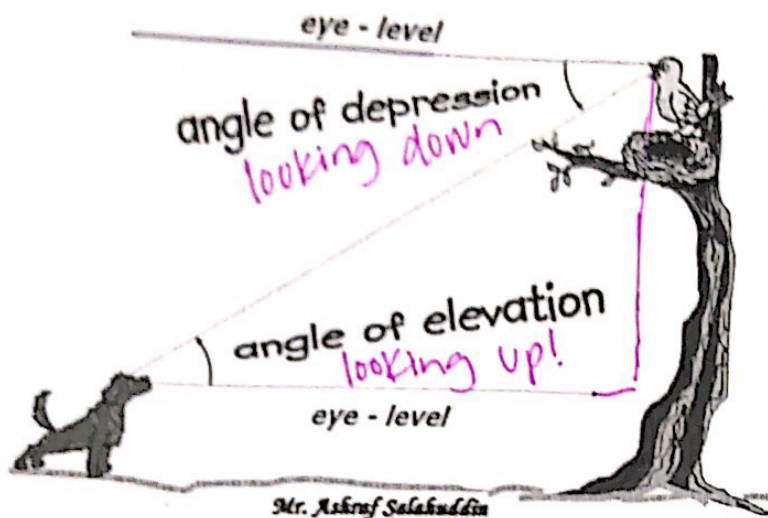
$$x^2 = 189$$

$$x = \sqrt{189}$$

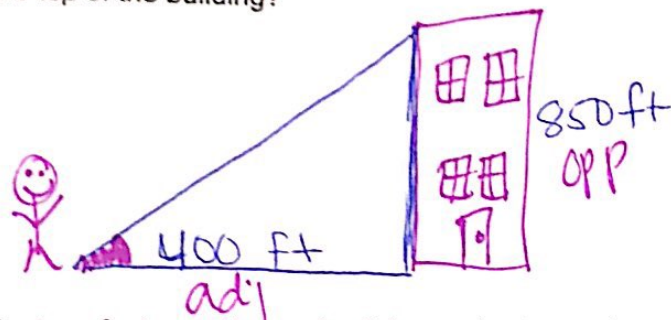
opp

angle of elevation and angle of depression are \cong

Elevation and Depression angles



EX1. You are standing 400 feet away from a building that is 850 feet tall. What is the angle of elevation to the top of the building?



$$\tan \theta = \frac{850}{400}$$

$$\tan^{-1}\left(\frac{850}{400}\right) = \theta$$

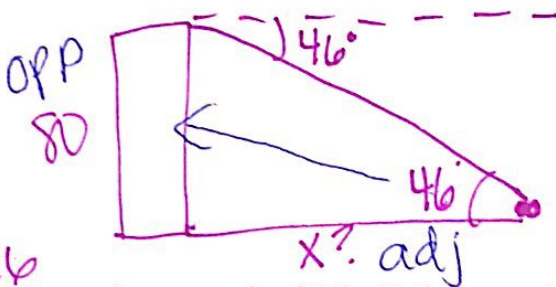
$$\theta = 64.80^\circ$$

EX2. From the top of a tower, the angle of depression to a stake on the ground is 46° . The top of the tower is 80 meters above ground. How far is the stake from the foot of the tower?

$$\tan(46) = \frac{80}{x} * x$$

$$\frac{x \tan(46)}{\tan(46)} = \frac{80}{\tan(46)}$$

$$x = 77.26$$



77.26 meters
use context!

EX3. A ladder leaning against a house makes an angle of 74° with the ground. The foot of the ladder is 7 feet from the foot of the house. How long is the ladder?

$$\cos(74) = \frac{7}{x}$$

$$x = 25.40 \text{ feet!}$$

