

Algebra II - Notes

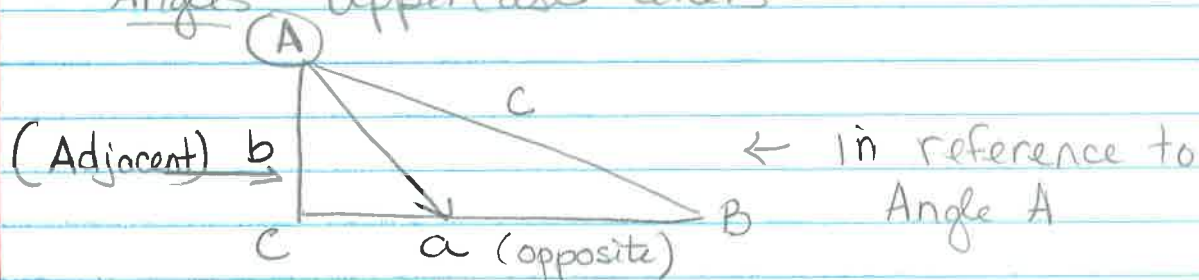
Alg. II
12-1
Notes
5-8-14

5-8-14 12-1 Trigonometric Functions with Right Triangles

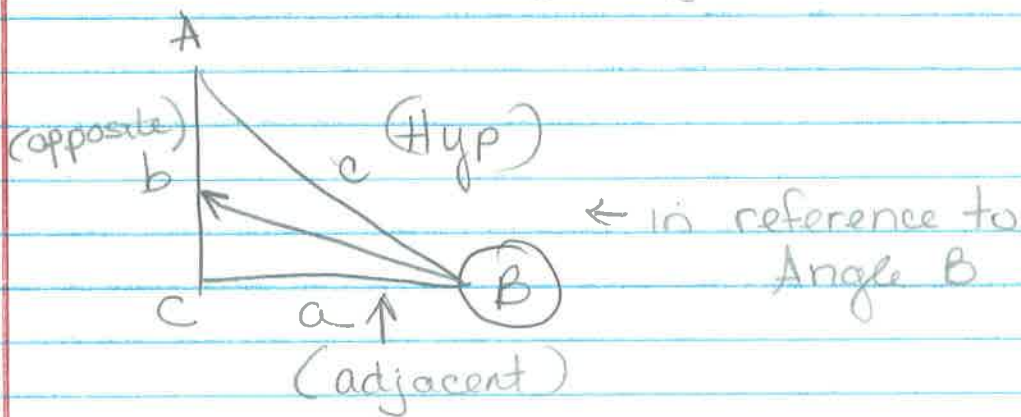
Trig. Ratios:
(Right Triangles only!)

Sides - Lowercase letters

Angles - Uppercase letters



hypotenuse of Right Triangle - opposite of right angle



$\begin{matrix} \text{opp.} & \text{Hyp} & \text{Adj} & \text{Hyp} & \text{opp.} & & \text{adj.} \\ \downarrow & / & | & / & | & / & / \\ \underline{\text{SOH}} & & \underline{\text{CAH}} & & \underline{\text{TOA}} & & \end{matrix}$

Sine :

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$



Cosine :

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

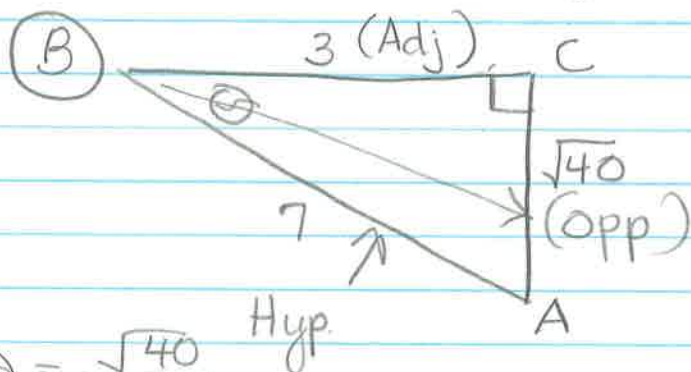


Tangent :

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$



1. Find the 3 trig. functions for θ ← "theta" ← missing angle



$$\sin \theta = \frac{\sqrt{40}}{7}$$

$$\cos \theta = \frac{3}{7}$$

$$\tan \theta = \frac{\sqrt{40}}{3}$$

②

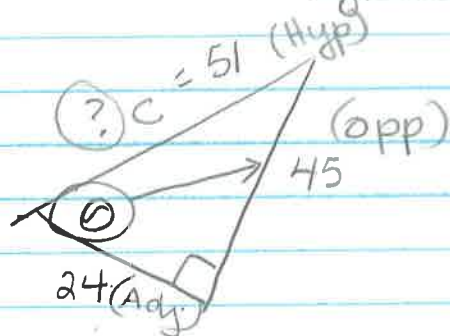
SOH CAH TOA

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* use pythagorean theorem to find c (Hyp.)

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

↑ hypotenuse



$$\sin \theta = \frac{45}{51}$$

$$\cos \theta = \frac{24}{51}$$

$$\tan \theta = \frac{45}{24}$$

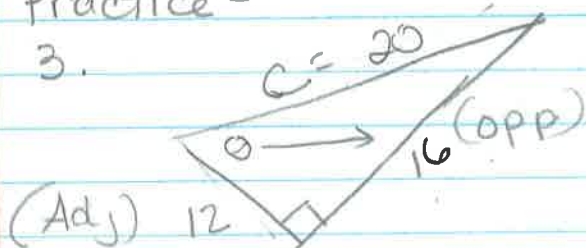
$$24^2 + 45^2 = c^2$$

$$\sqrt{2601} = \sqrt{c^2}$$

$$51 = c$$

Practice =

3.



$$\sin \theta = \frac{16}{20}$$

$$\cos \theta = \frac{12}{20}$$

$$\tan \theta = \frac{16}{12}$$

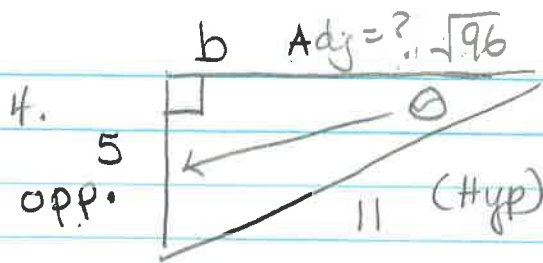
$$12^2 + 16^2 = c^2$$

$$144 + 256 = c^2$$

$$\sqrt{400} = \sqrt{c^2}$$

$$20 = c$$

SOH CAH TOA



$$\sin \theta = \frac{5}{11}$$

$$\cos \theta = \frac{\sqrt{96}}{11}$$

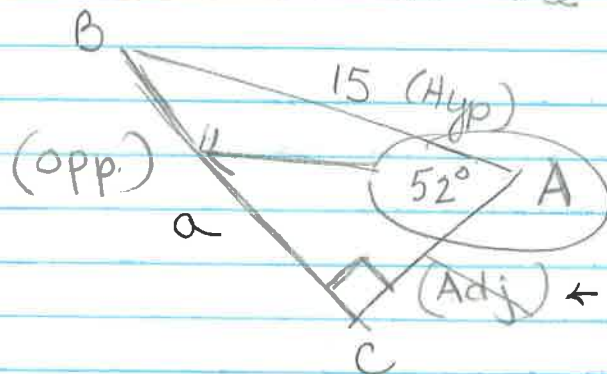
$$\tan \theta = \frac{5}{\sqrt{96}}$$

$$5^2 + b^2 = 11^2$$

$$\begin{array}{r} 25 + b^2 = 121 \\ -25 \quad -25 \\ \hline b^2 = 96 \end{array}$$

$$b = \sqrt{96}$$

How do we find the value of a (a missing side)



1. SOH CAH TOA

$$\sin 52 = \frac{a}{15}$$

2. always multiply by denominator

3. enter in calculator

$$15 \cdot \sin 52 = \frac{a}{15} (15)$$

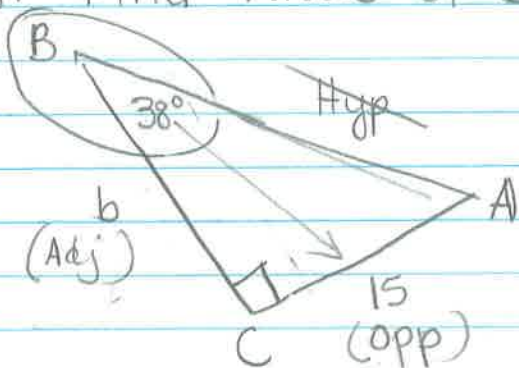
↑
enter in calculator

$$11.82 = a$$

3

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8. Find value of b



1. SOH CAH **TOA**

$$(b) \tan 38 = \frac{15}{b} \quad (\cancel{b})$$

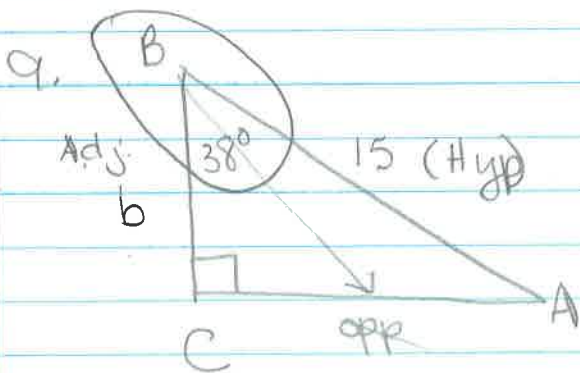
$$\cancel{(b)} \tan 38 = \frac{15}{\cancel{b} \tan 38}$$

$$b = \frac{15}{\tan 38}$$

$$b = 19.2$$



$$\frac{O}{T} = \frac{15}{\tan 38}$$

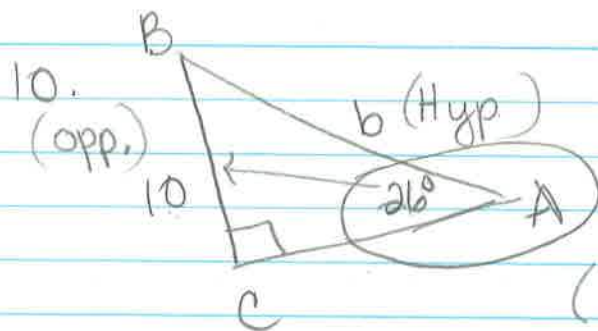


SOH **CAH** TOA

$$(15) \cos 38 = \frac{b}{15} \quad (\cancel{15})$$

$$(15) \cos 38 = b$$

$$11.82 = b$$



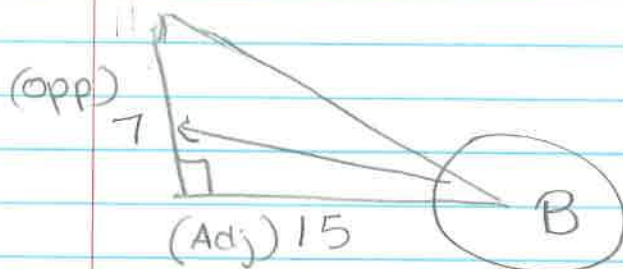
SOH CAH TOA

$$(b) \sin 26 = \frac{10}{b} (b)$$

$$(b) \sin 26 = \frac{10}{\sin 26}$$

$$b = 22.8$$

* How do we find a missing angle?



$$\sin \theta = \frac{O}{H}$$

↓

$$\sin^{-1}\left(\frac{O}{H}\right) = \theta$$

use inverse

SOH CAH TOA

$$\tan B = \frac{7}{15}$$

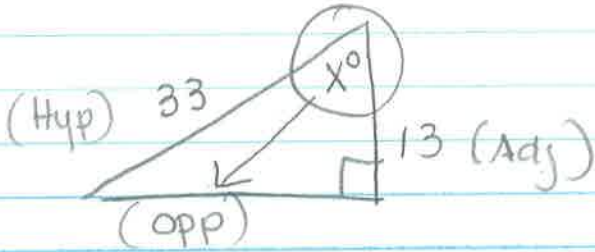
$$\tan^{-1}\left(\frac{7}{15}\right) = B$$

$$\tan^{-1}\left(\frac{7}{15}\right) = 25.02^\circ$$

← Make sure to put "degree" for angle

(4)

12. Find $\angle X$



SOH (CAH) TOA

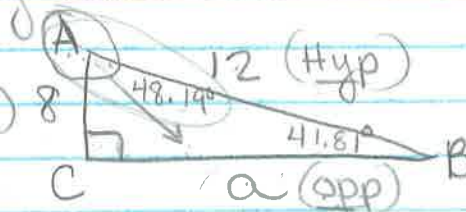
$$\cos X = \frac{13}{33}$$

$$\cos^{-1}\left(\frac{13}{33}\right) = X$$

$$66.8^\circ = X$$

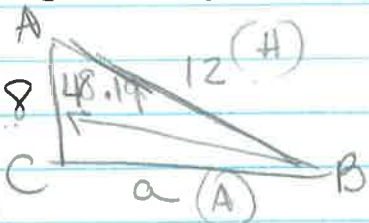
15. Find missing values:

angle A = 48.19°
angle B = 41.81°



(SOH) (CAH) TOA

side a =



$$\cos A = \frac{8}{12}$$

$$\cos^{-1}\left(\frac{8}{12}\right) = A$$

$$48.19^\circ = A$$

$$\sin B = \frac{8}{12}$$

$$\sin^{-1}\left(\frac{8}{12}\right) = B$$

$$41.81^\circ = B$$

Both correct

Find a =
(12) $\sin 48.19 = \frac{a}{12}$ (12)
 $a = 8.94$
or use $a^2 + b^2 = c^2$

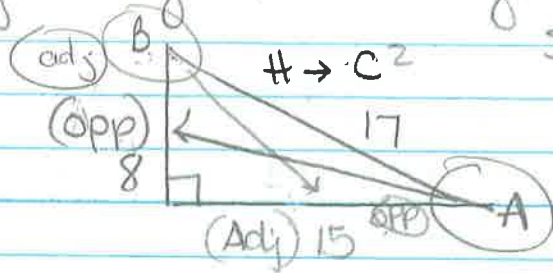
$$a^2 + 8^2 = 12^2$$

$$a^2 + 64 = 144$$

$$\begin{array}{r} -64 \\ \hline a^2 = 80 \end{array} \quad a = \sqrt{80}$$

17. right triangle angle A and angle B are acute,

$$\tan A = \frac{8}{15}$$



SOH CAH TOA

$$\begin{aligned} 8^2 + 15^2 &= c^2 \\ 64 + 225 &= c^2 \\ \sqrt{289} &= \sqrt{c^2} \\ 17 &= c \end{aligned}$$

$$\begin{aligned} \sin A &= \frac{8}{17} & \cos B &= \frac{8}{17} \\ \downarrow & & \downarrow & \\ \sin^{-1}\left(\frac{8}{17}\right) &= A & \cos^{-1}\left(\frac{8}{17}\right) &= B \\ 28.07^\circ &= A & 61.93^\circ &= B \end{aligned}$$

HW.

