

Using Trig to Solve right triangle problems

Thursday, November 24, 2016 3:53 PM

In our last 3 lessons we learned to use the Primary Trigonometric Ratios

$$\begin{aligned}\tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \sin \theta &= \frac{\text{opp}}{\text{hyp}} \\ \cos \theta &= \frac{\text{adj}}{\text{hyp}}\end{aligned} \quad \left[\text{SOH CAH TOA} \right]$$

In every Trig Problem you will work with three quantities

Every Trig Ratio has three quantities!!!!

Ex.

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

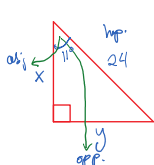
$$\sin \text{angle} = \frac{\text{side}}{\text{side}}$$

In order for you to solve any trig problem you MUST know two of the three quantities

$$\tan ? = \frac{\text{side}}{\text{side}}$$

$$\cos \text{angle} = \frac{\text{side}}{?}$$

Ex.



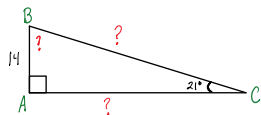
Can you use tan ratio to solve for x?

Which one can you use?

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

$$\begin{aligned}\cos \theta &= \frac{\text{adj}}{\text{hyp}} \\ \cos 11 &= \frac{x}{24} \\ 24 \cdot 0.9816 &= \frac{x}{24} \cdot 24 \\ 24(0.9816) &= x \\ 23.56 &= x \\ \boxed{23.6 = x}\end{aligned}$$

Solve the following triangle (this means to solve for all sides and angles)



It's important to make a list of what you need to solve for.

Remember there are multiple ways of solving right angle triangle.

List of unknowns you must find.

$$\begin{aligned}\angle B \\ \overline{BC} \\ \overline{AC}\end{aligned}$$

Out of these three that you must find, which is the easiest to find?

$$\begin{aligned}\angle B &= 180^\circ - 90^\circ - 21^\circ \\ \angle B &= 69^\circ\end{aligned}$$

After you solve for the easiest one, you have a choice on which one to solve for.

$$\begin{aligned}\overline{BC} &= 39.1 \\ \overline{AC} &= 36.5\end{aligned}$$

$$\begin{aligned}\overline{AC} &\rightarrow \tan \theta = \frac{\text{opp}}{\text{adj}} \\ \tan 21 &= \frac{14}{\overline{AC}} \\ (\overline{AC}) \tan 21 &= \frac{14}{\tan 21} \\ \overline{AC} &= 36.5\end{aligned}$$

$$\begin{aligned}\overline{BC} &\rightarrow \sin \theta = \frac{\text{opp}}{\text{hyp}} \\ \sin 21 &= \frac{14}{\overline{BC}} \\ (\overline{BC}) \sin 21 &= \frac{14}{0.3583} \\ \overline{BC} &= 39.1\end{aligned}$$

TRY!!

Solved AB

$$\overline{AB} = \text{Pythag.}$$

$$17^2 + 17^2 = \overline{AB}^2$$

Solved ZA using given values

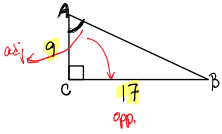
$$\begin{aligned}\angle A: \tan \theta &= \frac{\text{opp}}{\text{adj}} \\ \tan \theta &= \frac{17}{9}\end{aligned}$$

Solve CA using solved hyp.

$$\begin{aligned}\angle A: \cos \theta &= \frac{\text{adj}}{\text{hyp}} \\ \cos \theta &= \frac{9}{19.23}\end{aligned}$$

Solve for CB

$$\begin{aligned}\angle B &= 180^\circ - 90^\circ - 62^\circ \\ \angle B &= 28^\circ\end{aligned}$$



$\overline{AB}$ = Pythag.

$$9^2 + 17^2 = \overline{AB}^2$$

$$81 + 289 = \overline{AB}^2$$

$$\sqrt{370} = \sqrt{\overline{AB}^2}$$

$$\boxed{19.23 = \overline{AB}}$$

$$\angle A: \tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan \theta = \frac{17}{9}$$

$$\theta = \tan^{-1}\left(\frac{17}{9}\right)$$

$$\boxed{\theta = 62^\circ}$$

$$\angle A: \cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\cos \theta = \frac{9}{19.23}$$

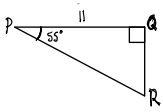
$$\theta = \cos^{-1}\left(\frac{9}{19.23}\right)$$

$$\boxed{\theta = 62^\circ}$$

$$\angle B = 180^\circ - 90^\circ - 62^\circ$$

$$\angle B = 28^\circ$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} \quad \left[\text{Have to switch your labels} \right]$$



$$\angle R = 35^\circ$$

$$\angle R = 180^\circ - 90^\circ - 55^\circ$$

$$\boxed{\angle R = 35^\circ}$$

$$\overline{QR} = 15.7 \quad (\text{using } \tan \theta = \frac{\text{opp}}{\text{adj}})$$

$$\overline{PR} = 19.2 \quad (\text{using pythag})$$

Answers

$$\angle A = 62.1^\circ$$

$$\angle B = 27.9^\circ$$

$$\overline{AB} = 19.2$$

$$\angle R = 35^\circ$$

$$\overline{QR} = 15.7$$

$$\overline{PR} = 19.2$$

How about word problems like this

Solve for $\angle ABC$, where angle C = 90 degrees, AB = 22 cm, BC = 10 cm

Step 1- Determine the vertex (what is a vertex?)

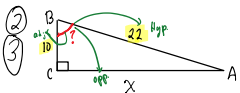
Step 2- Draw the triangle (the longest side will most likely be the hypotenuse)

Step 3 - Label the sides

Step 4 - solve for the vertex

① Vertex is the middle letter in the measurement. For the example $\angle ABC$ The middle letter is B.

$\angle B = \text{vertex}$



$$\angle B: \cos B = \frac{10}{22}$$

$$\angle B = \cos^{-1}\left(\frac{10}{22}\right)$$

$$\boxed{\angle B = 63^\circ}$$

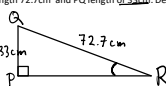
TRY!!

The triangle PQR has an angle P = 90 degrees, QR length 72.7cm and PQ length of 33cm. Determine

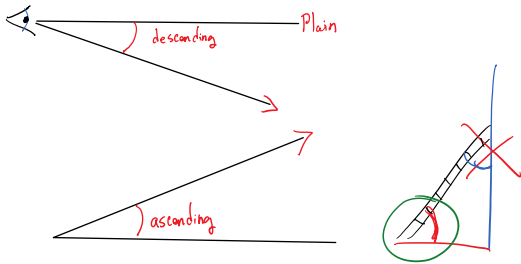
$\angle PRQ$

Answer $\angle R = 27^\circ$

Determine Vertex



- ② Draw triangle
- ③ Solve for Vertex



HW Pg. III # 3, 4, 6, 7, 8, 9, 11

Formal Quiz

- Unknown side
- Solving a triangle
- One word problem