1.1 notes

Friday, November 6, 2020 10:10 AM

Foundations and Pre-Calculus 10

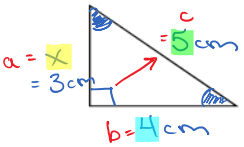
evaluate
BEDMAS
solve

1.1 Trigonometry-Finding a missing side

non-hypotenuse sides

Recall: Pythagorean Theorem $a^2 + b^2 = c^2$ (hypotenuse)

→We used this formula to find a missing side of a right triangle when we knew the other 2 sides.



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

$(x)^2 + (4)^2 = (5)^2$

$x^2 + 16 = 25$

$-16 \quad -16$

$x^2 = 9$

$x = 3\text{cm}$

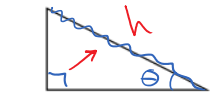
Steps:
① label Δ: c, a, b
② sub values into formula
③ simplify & solve

Trigonometry looks at the relationships between side lengths and angles in triangles.

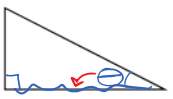
In this course we are going to focus on right triangles. These triangles have one 90° angle and two acute (smaller than 90°) angles.

Sides are labeled specific to one of the two acute angles involved in the triangle (never the right angle). We describe the angle that we are labeling our sides in respect to as "theta" θ. The sides are labeled **O**pposite (to θ), **A**djacent (to θ) and the **H**ypotenuse.

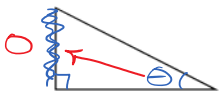
Greek letters are commonly used as variables for angles



- hypotenuse is across from 90°; longest side.



- adjacent side (touching) to θ



- opposite to θ

The angle θ is related to the opposite, adjacent and hypotenuse sides by the following trig ratios:

SIN θ = $\frac{\text{opposite side}}{\text{hypotenuse}}$ COS θ = $\frac{\text{adjacent side}}{\text{hypotenuse}}$ TAN θ = $\frac{\text{opposite side}}{\text{adjacent side}}$

$\sin\theta = \frac{O}{h}$ $\cos\theta = \frac{a}{h}$ $\tan\theta = \frac{O}{a}$

TO REMEMBER THE DIFFERENT TRIGONOMETRIC RELATIONSHIPS USE:

SOHCAHTOA → Sir Cah Toa

You choose the appropriate trig function depending on the information given in the question. If you are given (and/or want to know what is) the *Opposite* side and the *Hypotenuse* side then you use $\sin\theta = \frac{O}{h}$.

given/want to know:

O and h → SOH → $\sin\theta = \frac{O}{h}$

a and h → CAH → $\cos\theta = \frac{a}{h}$

O and a → TOA → $\tan\theta = \frac{O}{a}$

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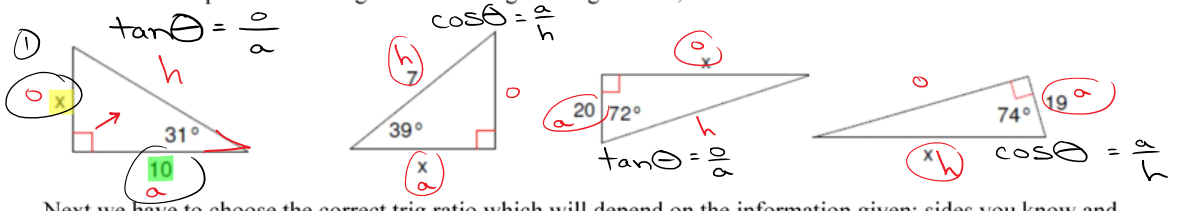
The most important step of the process of finding a missing side length or angle is being able to accurately label the sides…Let's practice labeling the sides of right triangles as O, A and H.



Next we have to choose the correct trig ratio which will depend on the information given; sides you know and sides you want to know. Then we use cross-multiplying to solve for a missing side or angle.

Let's practice cross-multiplying:

1. $\frac{x}{2} = \frac{10}{4}$ → $x = \frac{(2)(10)}{4}$ → $x = \frac{20}{4}$ → $x = 5$

2. $\frac{3}{5} = \frac{a}{10}$ → $x = \frac{(3)(10)}{5}$ → $x = 6$

3. $\frac{1}{s} = \frac{4}{9}$ → $s = \frac{(1)(9)}{4}$ → $s = \frac{9}{4}$

4. $\frac{x}{4} = \frac{\sin 90°}{1}$ → $x = \frac{(4)(\sin 90°)}{1} = 4$

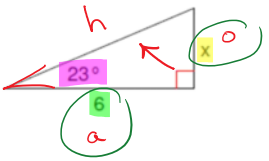
5. $\frac{\cos 36°}{1} = \frac{x}{18}$ → $x = \frac{(\cos 36°)(18)}{1}$ → $x = 14.56...$

6. $\frac{1}{x} = \frac{\tan 45°}{9}$ → $x = \frac{(9)(1)}{\tan 45°} = 9$

Cross-Multiplying *Shortcut* Steps:
1. multiply where there's numbers on the diagonal
2. divide by the only other number left over

soh cah toa

Ex. Find the missing side "x". to nearest tenth.



$\tan\theta = \frac{o}{a}$

$\tan 23° = \frac{x}{6}$

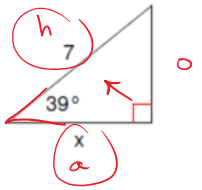
$x = \frac{(6)(\tan 23°)}{1}$

$x = 2.5468...$

$x = 2.5$

Steps:
① label sides: h, a, o
② choose trig ratio
③ sub values → trig ratio
④ solve: algebra (cross-multiply)

You try: Find the missing side "x".



$\cos\theta = \frac{a}{h}$

$\cos 39° = \frac{x}{7}$

$x = \frac{(7)(\cos 39°)}{1}$

$x = 5.4$

SohCahToa

HW: p111 #4, 5ab, 9a, 10b