Section 11.4

Objective: Right Triangle Trigonometry Notes
Missing Sides, Use One Function to Find Others Notes

Using the value of one trigonometric function to find the values of the others

1) Draw and label a triangle to illustrate the situation.

2) Find the length of the missing side by using the Pythagorean Theorem.

3) Give the values of the requested functions by using **SOH-CAH-TOA**

4) Give the measure of the angle to the nearest tenth of a degree by using the lengths of the sides and using inverse functions ($\sin^{-1}$, $\cos^{-1}$, or $\tan^{-1}$) to figure out the angle measure.

Examples:

1) Draw and label a triangle to illustrate the situation. 2) Find the length of the missing side. 3) Give the values of the requested functions. 4) Give the measure of the angle to the nearest tenth of a degree.

a) Given $\sin\theta = \frac{4}{5}$ (opp/hyp), find $\tan\theta$, $\cos\theta$, and the measure of θ.

Find adj

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

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

$x^2=5^2-4^2$

$x=\sqrt{25-16}$

$x=\sqrt{9}$

$x=3$ adj = 3

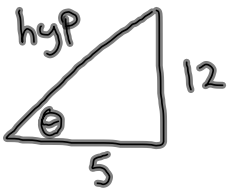
$\sin\theta = \frac{4}{5}$

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

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

$\theta = \sin^{-1}\left(\frac{4}{5}\right) \approx 53.1^\circ$

b) Given $\tan\theta = \frac{12}{5}$ (opp/adj), find $\sin\theta$, $\cos\theta$, and the measure of θ.



Find hyp

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

$c^2=12^2+5^2$

$c=\sqrt{12^2+5^2}$

$c=13$

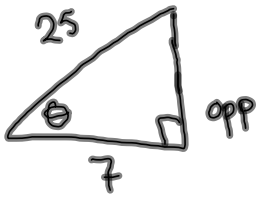
$\sin\theta = \frac{12}{13}$

$\cos\theta = \frac{5}{13}$

$\tan\theta = \frac{12}{5}$

$\theta = \tan^{-1}\left(\frac{12}{5}\right) \approx 67.4^\circ$

c) Given $\cos\theta = \frac{7}{25}$ (adj/hyp), find $\tan\theta$, $\sin\theta$, and the measure of θ.



find opp

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

$7^2+b^2=25^2$

$b^2=25^2-7^2$

$b=\sqrt{25^2-7^2}$

$b=\sqrt{576}$

$b=24$

$\cos\theta = \frac{7}{25}$

$\sin\theta = \frac{24}{25}$

$\tan\theta = \frac{24}{7}$

$\theta = \cos^{-1}\left(\frac{7}{25}\right) \approx 73.7^\circ$

STEPS to find the missing side of a right triangle if you know an angle and one other side

1) **Label each side using hyp (hypotenuse), opp (opposite side), adj (adjacent side)**

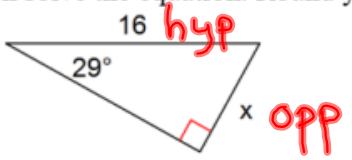
2) **Decide if you need sin, cos, or tan by using SOH-CAH-TOA**

3) **Use SOH-CAH-TOA to write an equation with the missing variable**

4) **Solve the proportion using cross multiplication**

Examples: Write an equation involving sine, cosine, or tangent that can be used to find the missing length. Then solve the equation. Round your answers to the nearest tenth.

a)



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

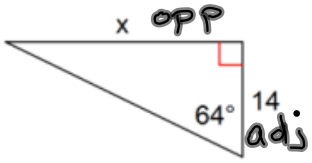
$\frac{\sin 29}{1} = \frac{x}{16}$

cross multiply

$x = 16\sin 29$

$x \approx 7.8$

b)



use $\tan\theta$

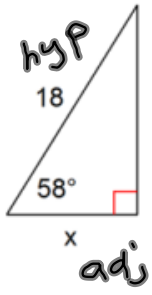
$\tan\theta = \frac{opp}{adj}$

$\frac{\tan 64}{1} = \frac{x}{14}$

$x = 14\tan 64$

$x \approx 28.7$

c)



use $\cos\theta$

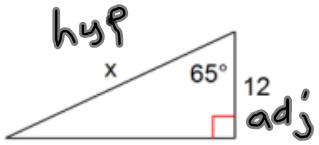
$\cos\theta = \frac{adj}{hyp}$

$\frac{\cos 58}{1} = \frac{x}{18}$

$x = 18\cos 58$

$x \approx 9.5$

d)



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

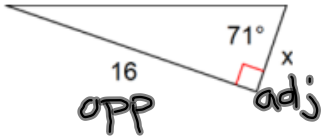
$\frac{\cos 65}{1} = \frac{12}{x}$

$x \cos 65^\circ = 12$

$x = 12 \div \cos 65^\circ$

$x \approx 28.4$

e)



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

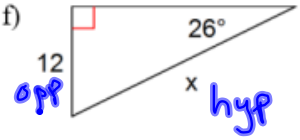
$\frac{\tan 71}{1} = \frac{16}{x}$

$x \tan 71^\circ = 16$

$= 16 \div \tan 71$

$x \approx 5.5$

f)



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

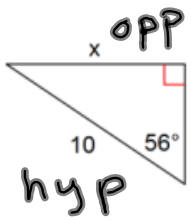
$\frac{\sin 26}{1} = \frac{12}{x}$

$x \sin 26^\circ = 12$

$x = 12 \div \sin 26^\circ$

$x \approx 27.4$

g)



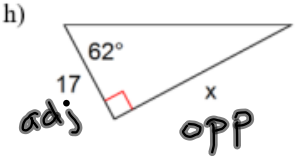
$\sin\theta = \frac{opp}{hyp}$

$\frac{\sin 56}{1} = \frac{x}{10}$

$x = 10 \sin 56^\circ$

$x \approx 8.3$

h)



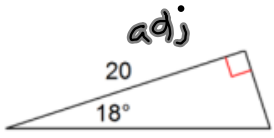
$\tan\theta = \frac{opp}{adj}$

$\frac{\tan 62}{1} = \frac{x}{17}$

$x = 17 \tan 62^\circ$

$x \approx 32.0^\circ$

i)



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

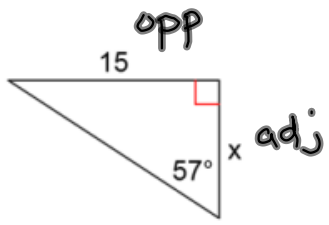
$\frac{\cos 18}{1} = \frac{20}{x}$

$x \cos 18^\circ = 20$

$x = 20 \div \cos 18^\circ$

$x \approx 21.0$

j)



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

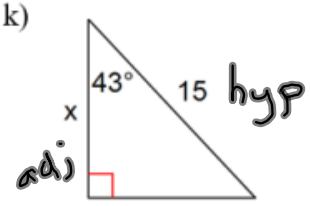
$\frac{\tan 57}{1} = \frac{15}{x}$

$x \tan 57 = 15$

$x = 15 \div \tan 57$

$x \approx 9.7$

k)



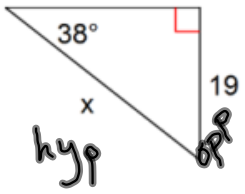
$\cos\theta = \frac{adj}{hyp}$

$\frac{\cos 43}{1} = \frac{x}{15}$

$x = 15\cos 43°$

$x \approx 10.97$ or 11.0

l)



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

$\sin 38 = \frac{19}{x}$

$x \sin 38 = 19$

$x = 19 \div \sin 38°$

$x \approx 30.9$