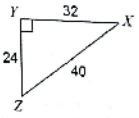
Find each ratio and be sure to reduce, if possible.

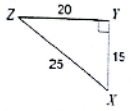
1. Tan Z

Tan Z = $\frac{32}{24} \approx 1.333$

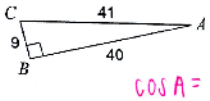


2. Sin X

Sin X = $\frac{20}{25} \approx .8$



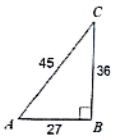
3. Cos A



Cos A = $\frac{40}{41} \approx .976$

4. Sin C

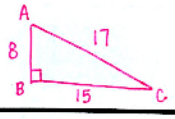
Sin C = $\frac{27}{45} \approx .6$



Draw ΔABC where ∠ABC = 90°, AB = 8, BC = 15, and AC = 17.

5. What is tan C? Tan C = $\frac{8}{15} \approx .533$

6. What is sin A? Sin A = $\frac{15}{17} \approx .882$

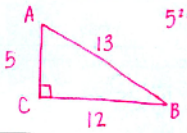


Draw ΔABC where ∠ACB = 90°, AC = 5, and CB = 12.

7. What is the length of AB? 13

8. What is cos A? Cos A = $\frac{5}{13} \approx .385$

9. What is tan B? Tan B = $\frac{5}{12} \approx .417$



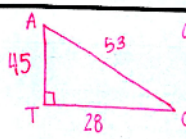
$5^2 + 12^2 = c^2$
$c^2 = 169$
$c = 13$

Draw ΔCAT where ∠ATC = 90°, CA = 53, and CT = 28.

10. What is the length of AT? 45

11. What is sin C? Sin C = $\frac{45}{53} \approx .849$

12. What is tan A? Tan A = $\frac{28}{45} \approx .622$



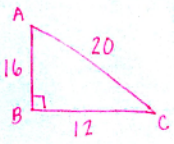
$a^2 + 28^2 = 53^2$
$a^2 = 2025$
$a = 45$

Draw ΔABC where ∠B = 90° and $\sin A = \frac{12}{20}$.

13. What is the length of AB? 16

14. What is tan A? Tan A = $\frac{12}{16} \approx .75$

15. What is cos A? Cos A = $\frac{16}{20} \approx .8$



$a^2 + 12^2 = 20^2$
$a^2 = 256$
$a = 16$

Sine and cosine are called **cofunctions** because the value of one ratio for one angle is the same as the value of the other ratio for the other angle. Since the two remaining angles of a right triangle add to 90°, you can use the sine of one acute angle to find the cosine of the other acute angle and vice versa.

Sine and Cosine Cofunction Identities

$\sin \theta = \cos (90° - \theta)$

$\cos \theta = \sin (90° - \theta)$

Practice: Determine a value of θ for which cos θ = sin ____ is true or sin θ = cos _____ is true.

a. cos 35° = sin 55°

b. cos 27° = sin 63°

c. cos 83° = sin 7°

90 - 35 = 55

90 - 27 = 63

90 - 83 = 7

d. sin 67° = cos 23°

e. sin 6° = cos 84°

f. sin 42° = cos 48°

g. sin x° = cos (90-x)

h. cos j° = sin (90-j)

j. sin β° = cos (90-β)

Answer the Following:

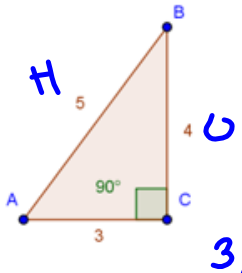
a. Sin 40° ≈ 0.643. What is cos 50° ?

.643

b. Find sin 28° if cos 62° = 0.469.

.469

c.

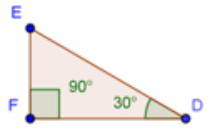


H O A

sine A = 4/5 sine B = 3/5

cosine A = 3/5 cosine B = 4/5

d.



m∠E = 60°

sine D = 0.5000 sine E = .8660

cosine D = 0.8660 cosine E = .5

Using the Calculator

Find the following

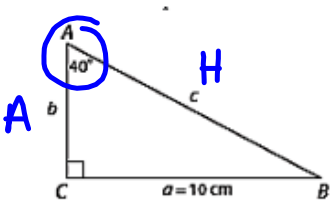
1. sin 34

2. tan 52

Solving Equations with Trig Ratios

We can use trig ratios to also create equations that allow us to find missing sides or angles. It is extremely IMPORTANT to label your triangle with the types of sides you have on the diagram (opp, adj, or hyp). By labeling your sides, you see which trig ratio you can use to solve the problem.

Example 1: Label each of the sides as opposite, adjacent, or hypotenuse. Then create a trig ratio equation that can be used to find both missing sides.



H
A
O

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

$\frac{\sin 40}{1} = \frac{10}{c}$

$c \cdot \sin 40 = 10$

$\frac{c \cdot \sin 40}{\sin 40} = \frac{10}{\sin 40}$

$c = 15.56$

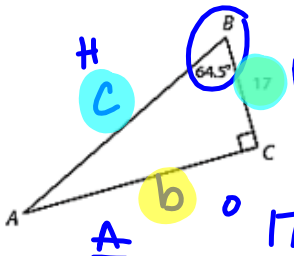
$\tan A = \frac{O}{A}$

$\frac{\tan 40}{1} = \frac{10}{b}$

$b \cdot \tan 40 = 10$

$\frac{b \cdot \tan 40}{\tan 40} = \frac{10}{\tan 40}$

$b = 11.92$



H
C
A
O

$\cos 64.5 = \frac{17}{c}$

$c \cdot \cos 64.5 = 17$

$\frac{c \cdot \cos 64.5}{\cos 64.5} = \frac{17}{\cos 64.5}$

$c = 39.49$

$\tan B = \frac{O}{A}$

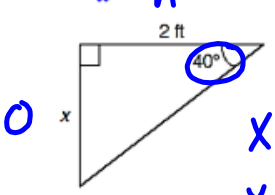
$\frac{\tan 64.5}{1} = \frac{b}{17}$

$17 \cdot \tan 64.5 = b$

$35.64 = b$

Example 2: Create a trig ratio equation that can be used to find the missing side. Then solve for x.

a.



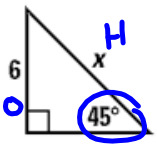
A O

$\frac{\tan 40}{1} = \frac{x}{2}$

$x = 2 \cdot \tan 40$

$x = 1.68$

b.



H O

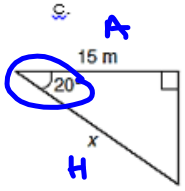
$\frac{\sin 45}{1} = \frac{6}{x}$

$x \cdot \frac{\sin 45}{\sin 45} = \frac{6}{\sin 45}$

$x = 6\sqrt{2}$

$x = 8.49$

c.



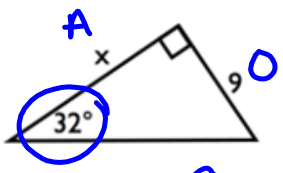
A H

$\frac{\cos 20}{1} = \frac{15}{x}$

$x \cdot \frac{\cos 20}{\cos 20} = \frac{15}{\cos 20}$

$x = 15.96$

d.



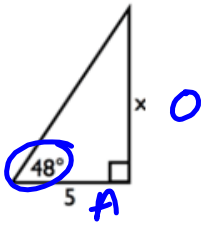
A O

$\frac{\tan 32}{1} = \frac{9}{x}$

$x \cdot \frac{\tan 32}{\tan 32} = \frac{9}{\tan 32}$

$x = 14.4$

e.



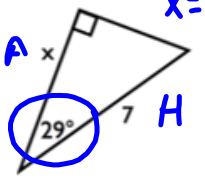
O A

$\frac{\tan 48}{1} = \frac{x}{5}$

$5 \cdot \tan 48 = x$

$5.55 = x$

f.



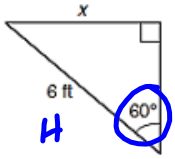
A H

$\frac{\cos 29}{1} = \frac{x}{7}$

$7 \cdot \cos 29 = x$

$6.12 = x$

g.



O
H

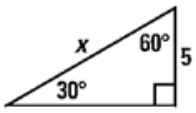
$\frac{\sin 60}{1} = \frac{x}{6}$

$6 \cdot \sin 60 = x$

$X = 5.20$

$X = 3\sqrt{3}$

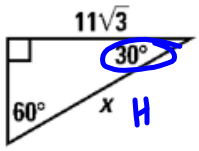
h.



$X = 10$

i.

A $\cos = \frac{A}{H}$

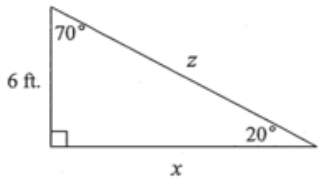


$\cos 30 = \frac{11\sqrt{3}}{x}$

$x \cdot \cos 30 = 11\sqrt{3}$

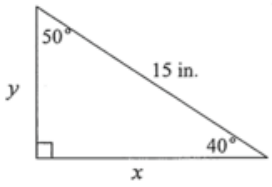
$X = 22$

Example 3: Create a trig ratio equation that can be used to find the missing sides. Then solve for the missing variables.



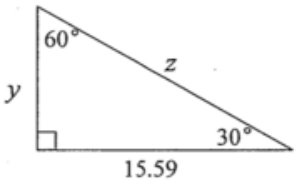
$X = 16.48$

$Z = 17.54$



$x = 11.49$

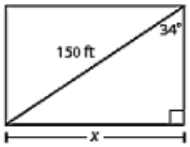
$y = 9.64$



$y = 9.00$

$Z = 18.00$

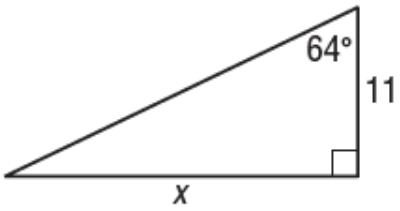
Example 4: Create a trig ratio equation that can be used to find the missing side. Then find the missing side.
Michael is building a concrete pathway 150 feet long across a rectangular courtyard, as shown below. What is the length of the courtyard, x, to the nearest thousandth?



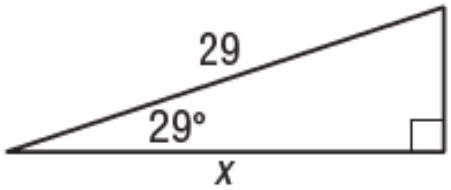
Grab the following and head to a board

Try the following examples on the board

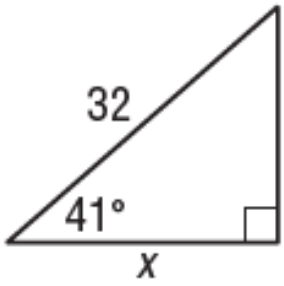
1. Find x



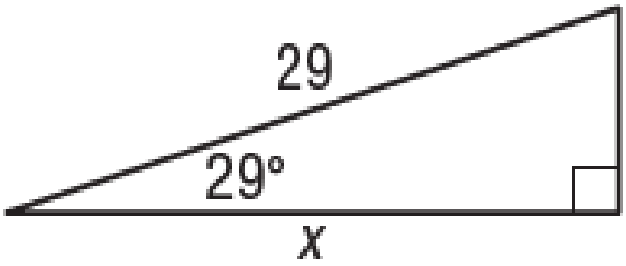
2. Find x



3. Find x



Find x



Find x