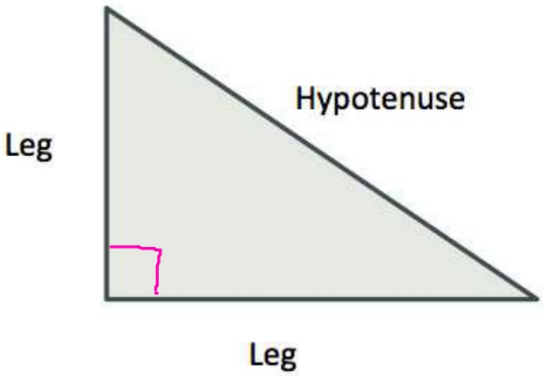
Geometry BASICS
Working with right Δs

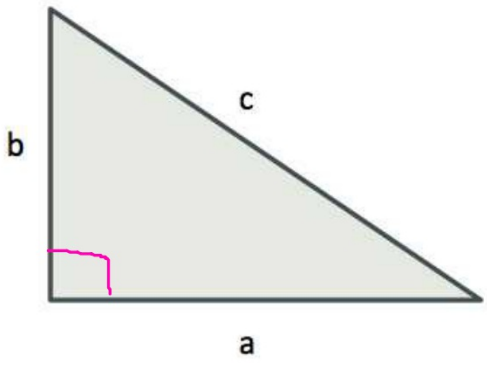
HOMEWORK: Worksheet given

Working with Right Triangles: P.T.

Pythagoras Theorem

- Given a Right triangle. The sum of the each leg squared equals the hypotenuse squared.

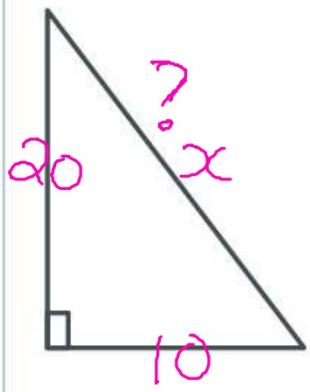




Two examples

- Given the following right triangle, find the length of the hypotenuse.

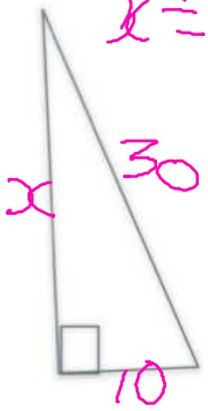
$x^2 = 10^2 + 20^2$



- Find the missing length.

$30^2 = x^2 + 10^2$

$x^2 = 30^2 - 10^2$



The converse of Pythagoras, check to see if a Δ is a right Δ

6, 5, 10

If it was a Right Δ, then "10" would be the hypotenuse

$10^2 \stackrel{?}{=} 6^2 + 5^2$

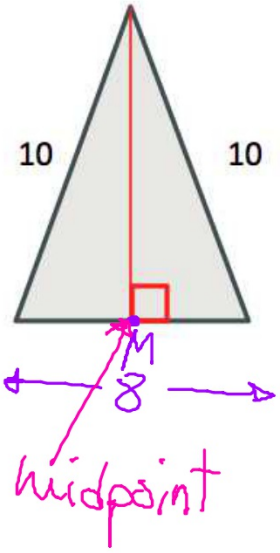
$100 \stackrel{?}{=} 36 + 25$

$100 \neq 61$

It is no a Right Δ

Application of Pyth. in other shapes

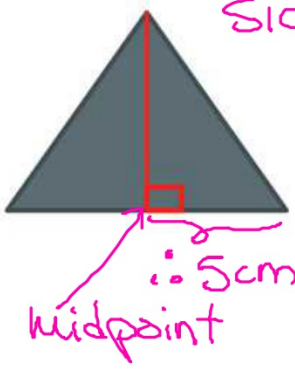
- Area of Isosceles Δ



- Area of Equilateral Δ

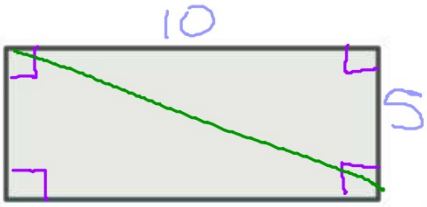
example

Sides are 10cm



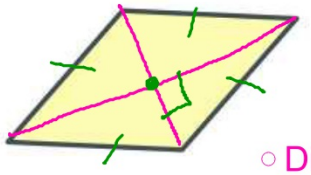
Applications to other shapes

Rectangles (and its diagonal)

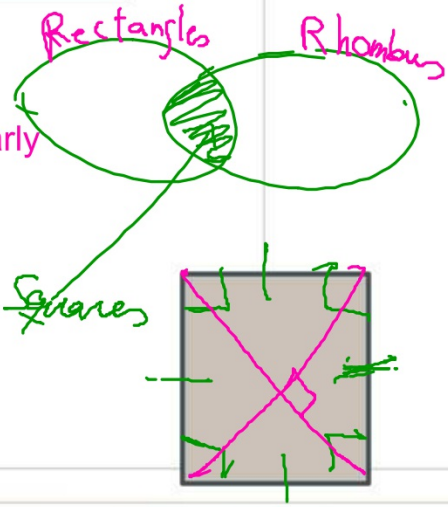


- Diagonales bisect each other. NOT perpendicularly

Rhombus (and its diagonals)

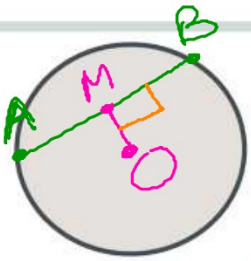


- Diagonals bisect each other
- Diagonals are perpendicular



Circles and segments

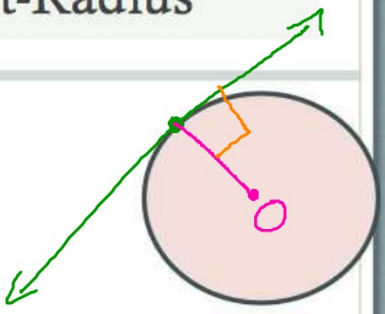
Chord



segment AB is a Chord

If you connect the center of a circle (O) with the midpoint of the chord (M) you will have a 90° angle

Tangent-Radius



A segment or line that is a tangent to a circle, it creates a 90° with the radius

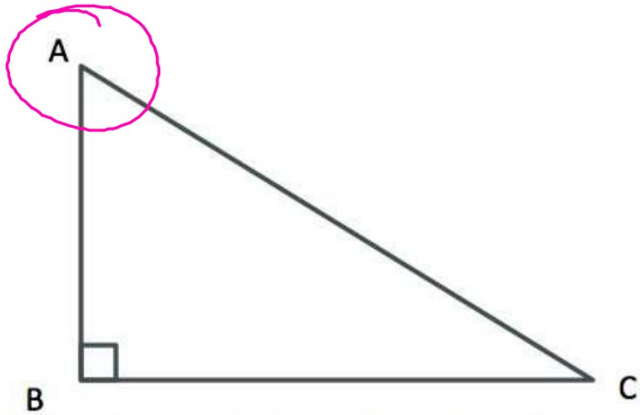
TRIGONOMETRY FOR RIGHT Δs

Page 106-3H: all (optional)
Page 108-3I: all
Page 109-3J: all
Page 112-113: all

Labeling the right triangle

- Select a reference angle i.e. <A to label the sides: Hypotenuse, opposite leg, adjacent leg.

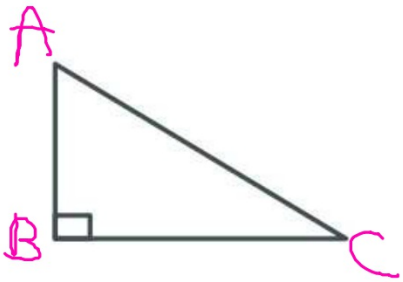
If my angle of reference is <A, then the opposite leg = BC and the adjacent leg =AB, and the hypotenuse =AC



If angle of reference is <C, then the opposite leg = AB, and the adjacent leg =BC, and the hypotenuse = AC (note still the same, the hypotenuse does not change)

SINE OF θ

- Sine $\theta = \frac{\text{opposite leg}}{\text{hypotenuse}}$



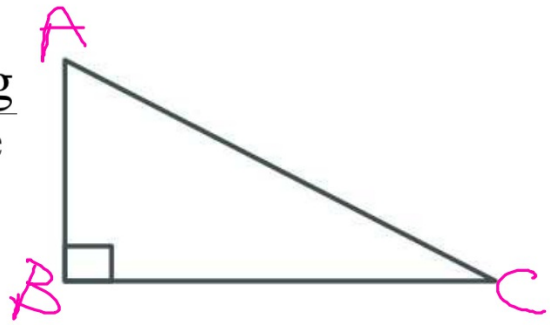
- Example:

$\sin \angle A = \frac{BC}{AC}$

$\sin \angle C = \frac{AB}{AC}$

Cosine of θ

- Cosine $\theta = \dfrac{\text{adjacent leg}}{\text{hypotenuse}}$



- Example:

$\cos\angle A = \dfrac{AB}{AC}$

$\cos\angle C = \dfrac{BC}{AC}$

From previous slide we know that:

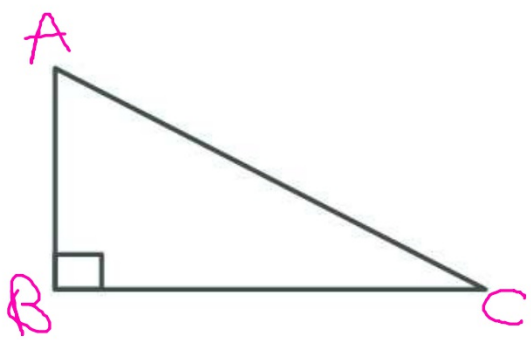
$\sin\angle A = \dfrac{BC}{AC}$

$\sin\angle C = \dfrac{AB}{AC}$

What do you notice????

Tangent of θ

- Tangent $\theta = \dfrac{\text{opposite leg}}{\text{adjacent leg}}$



- Example:

$\tan\angle A = \dfrac{BC}{AB}$

$\tan\angle C = \dfrac{AB}{BC}$

What do you notice?????? → Reciprocal

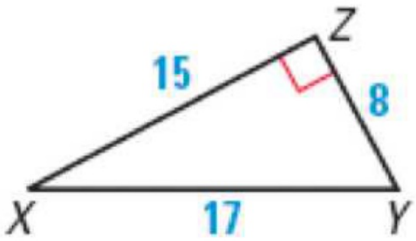
SOHCAHTOA
SOH-CAH-TOA

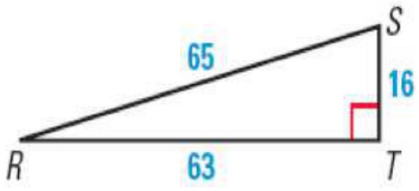
Finish the chart.....

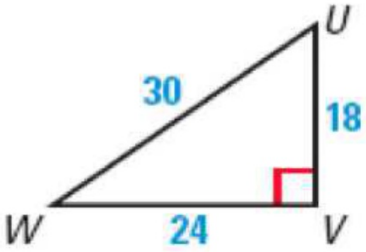
Sine	Cosine	Tangent

More examples: FAST!

1.

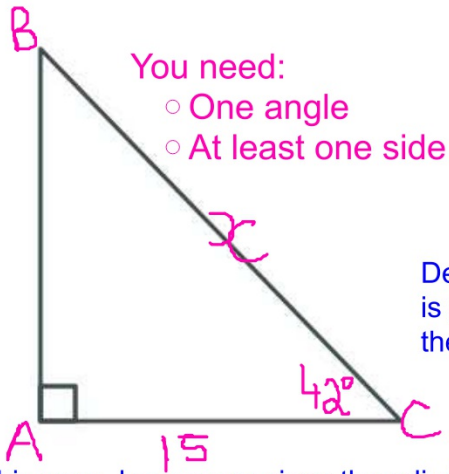






Applications of trigonometry: Take a guess!

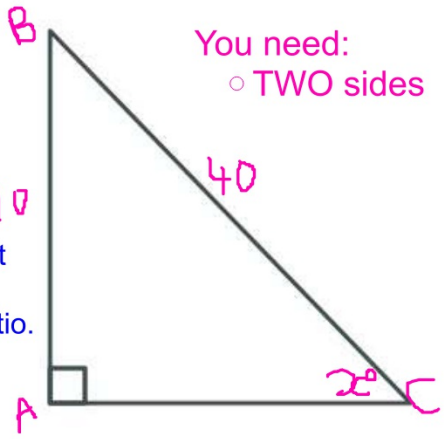
- To find sides.



You need:
- One angle
- At least one side

In this case, bc you are given the adj side, and bc you need to solve for hypotenuse, you must use COSINE.

- To find angles.



You need:
- TWO sides

In this case, bc you are given the opp. leg and the hypotenuse you must use SINE

Depending on what is given, you use the "appropiate" ratio.

Example

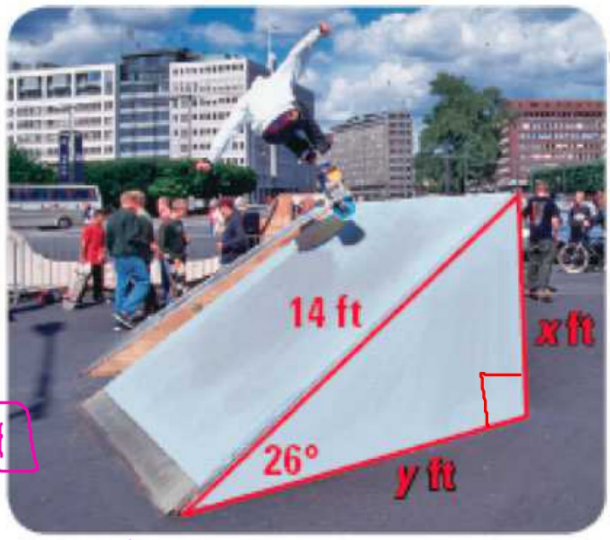
Solve for x:

$\sin 26° = \frac{x}{14}$

$x = 14 \sin 26$

$x = 6.13719...$

$x = 6.14$



Solve for "y"

You can now use many methods

The best one is to use

$\cos 26 = \frac{y}{14} \Rightarrow y = 14 \cos 26$

$= 12.5831166...$

$y = 12.6$

What are the other methods you can use?

- Pythagoras

$$14^2 = (6.14)^2 + y^2$$
$$y = \sqrt{196 - (6.14)^2}$$
$$y = 12.58817487\ldots$$
$$\boxed{y = 12.6}$$

- Right Δ trig (SOHCAHTOA) using the tangent ratio.

$$\tan 26^\circ = \frac{6.14}{y}$$
$$y = \frac{6.14}{\tan 26^\circ}$$
$$y = 12.5888656\ldots$$
$$\boxed{y = 12.6}$$

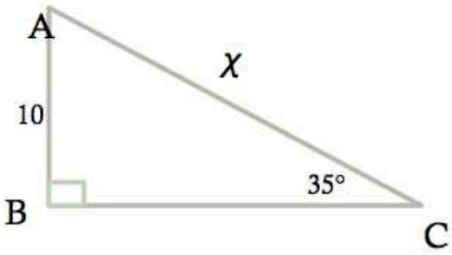
Note: there are two issues with these two methods:

1. you are using the value of x found in previous question. If you did something wrong in finding x, now your y will also be wrong. AVOID using previous answers.
2. Remember, you previous answer was a rounded answer, hence it is not exact and it carries a bit of an error.

This little Δ you have used in physics, it may be helpful to solve equations with trig ratios

$$V = \frac{D}{t}$$
$$t(V) = \left(\frac{D}{t}\right)t$$
$$\frac{Vt}{V} = \frac{D}{V}$$
$$t = \frac{D}{V}$$

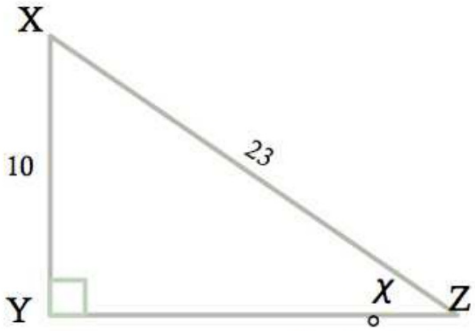
Examples



$$\sin 35 = \frac{10}{x}$$

$$x = \frac{10}{\sin 35}$$

$$x = 17.3$$



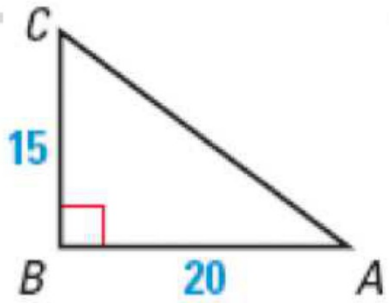
Use fraction (exact), not rounded decimal 0.435

$$\sin X = \frac{10}{23}$$

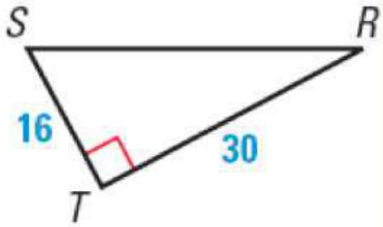
$$\therefore \quad X = \sin^{-1}\left(\frac{10}{23}\right)$$

$$X = 25.8°$$

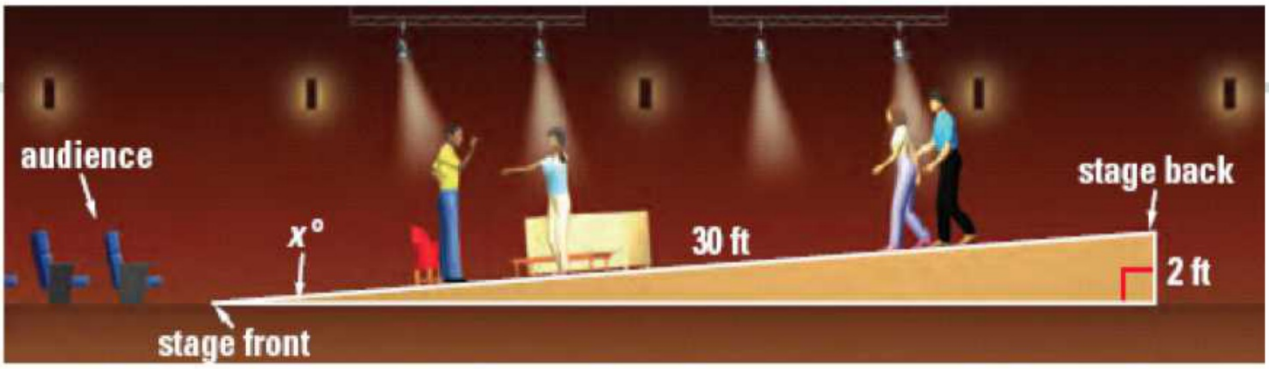
More Examples: FAST!



4.



Example Finding angles



Because you are given opp. leg and hypotenuse, you must use sine

$\sin x^\circ = \frac{2}{30}$

$\therefore x = \sin^{-1}\left(\frac{2}{30}\right)$

use 2/30 do not use 0.067

$x = 3.82255\ldots$

$x = 3.82^\circ$