2.1- 2.5 Trigonometry

RECALL: Pythagorean Theorem : $a^2 + b^2 = c^2$
Theorem that relates all the sides of a right triangle together.

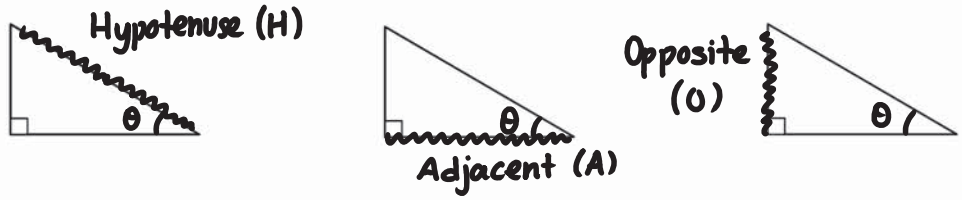
This theorem allows us to calculate the unknown side length in a right triangle (when the lengths of the other two sides are known).

TRIGONOMETRY : The study of the relationships between the angles and the side lengths of a triangle (for us, we will only look at right triangles).

The sides of a right triangle are labeled based on one of the two acute angles (θ).

- ***O***pposite (to the identified angle, θ); use the symbol ***O***
- ***A***djacent (to the identified angle, θ); use the symbol ***A***
- and the ***H***ypotenuse; use the symbol ***H***

θ = "theta"



We use upper-case letters to indentify angles and lower-case letters to indentify sides.

There are three trigonometric ratios that relate two side lengths and the identified angle (θ) together.

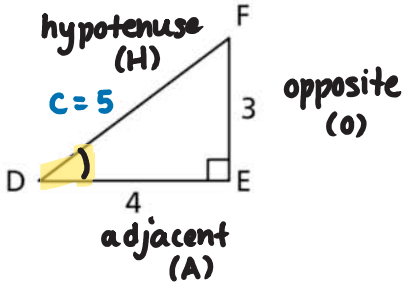
SINE	COSINE	TANGENT
$\sin\theta = \dfrac{\text{opposite side}}{\text{hypotenuse}}$	$\cos\theta = \dfrac{\text{adjacent side}}{\text{hypotenuse}}$	$\tan\theta = \dfrac{\text{opposite side}}{\text{adjacent side}}$
$\sin\theta = \dfrac{O}{H}$	$\cos\theta = \dfrac{A}{H}$	$\tan\theta = \dfrac{O}{A}$
SOH $S\frac{O}{H}$	CAH $C\frac{A}{H}$	TOA $T\frac{O}{A}$

★ calculator must be in degree mode SOH CAH TOA

EXAMPLE 1: Find and use the trigonometric ratios.

★ we need lengths of all 3 sides

a) Write the following trigonometric ratios for angle D: $\sin D$, $\cos D$, and $\tan D$



$4^2 + 3^2 = c^2$

$16 + 9 = c^2$

$\sqrt{25} = \sqrt{c^2}$

$5 = c$

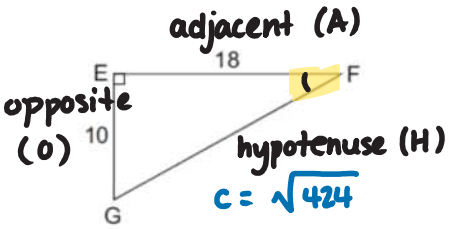
$\sin D = \frac{O}{H} = \frac{3}{5}$

$\cos D = \frac{A}{H} = \frac{4}{5}$

$\tan D = \frac{O}{A} = \frac{3}{4}$

Final answer (leave as a fraction)

b) Write the following trigonometric ratios for angle F: $\sin F$, $\cos F$, et $\tan F$



$10^2 + 18^2 = c^2$

$100 + 324 = c^2$

$\sqrt{424} = \sqrt{c^2}$

$\sqrt{424} = c$

(leave in this form)

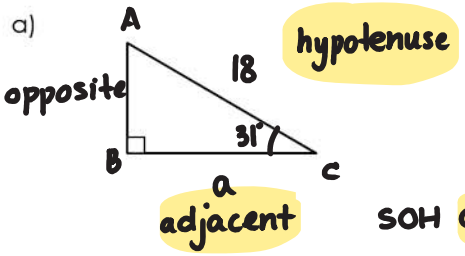
$\sin F = \frac{O}{H} = \frac{10}{\sqrt{424}}$

$\cos F = \frac{A}{H} = \frac{18}{\sqrt{424}}$

$\tan F = \frac{O}{A} = \frac{10 \div 2}{18 \div 2} = \frac{5}{9}$

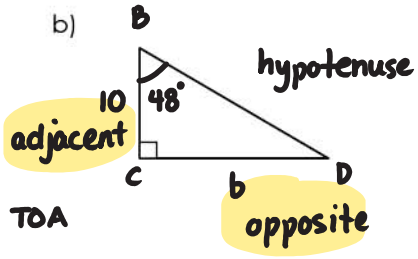
EXAMPLE 2: Choose sine, cosine or tangent to find the length of the missing side indicated.

a)



SOH CAH TOA

b)



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

$\frac{\cos 31°}{\div 1} = \frac{a}{18}$ (× 18)

$a = \frac{(18)(\cos 31°)}{1}$ ← evaluate with calculator

$a = \frac{(18)(0.8572)}{1}$

$a = 15.4$

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

$\frac{\tan 48°}{\div 1} = \frac{b}{10}$ (× 10)

$b = \frac{(10)(\tan 48°)}{1}$

$b = \frac{(10)(1.1106)}{1}$

$b = 11.1$

Practice: p.75 #3, 6, 9a ; p.82 #3ab ; p.95 #9 ; p.101 #3ab, 4ac

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