

1.2 Trig Ratios

Monday, June 13, 2022 10:10 AM

1.2 Trigonometric Ratios

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

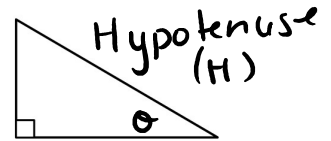
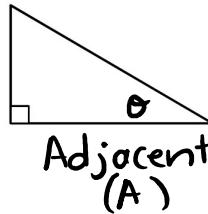
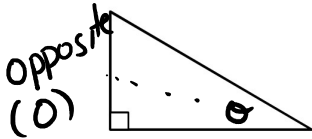
This theorem allows us to calculate the unknown side length in a right triangle (when the lengths of the other two sides are known).

TRIGONOMETRY : The study of the relationships between the angles and the sides 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).

- **Opposite** (to the identified angle, θ); use the symbol **O**
- **Adjacent** (to the identified angle, θ); use the symbol **A**
- and the **Hypotenuse**; use the symbol **H**

theta
 θ



We use upper-case letters to identify Angles and lower-case letters to identify sides.

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

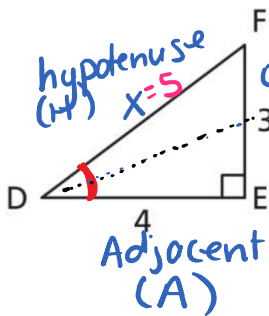
Fraction

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

SOH CAH TOA

EXAMPLE 1: Find and use the trigonometric ratios.

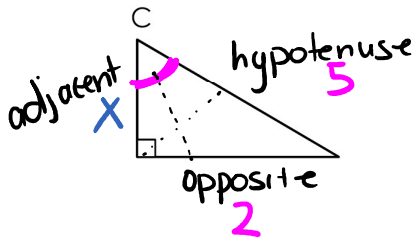
a) Write the following trigonometric ratios for angle D: $\sin D$, $\cos D$, and $\tan D$



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 3^2 + 4^2 &= x^2 \\ 9 + 16 &= x^2 \\ 25 &= x^2 \\ \sqrt{25} &= x \\ 5 &= x \end{aligned}$$

$$\begin{aligned} \sin D &= \frac{O}{H} & \sin D &= \frac{3}{5} \\ \cos D &= \frac{A}{H} & \cos D &= \frac{4}{5} \\ \tan D &= \frac{O}{A} & \tan D &= \frac{3}{4} \end{aligned}$$

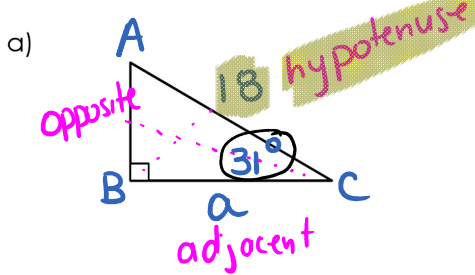
EXAMPLE 2: Find the sides of a triangle that has $\sin C = \frac{2}{5}$



$$\begin{aligned} \sin C &= \frac{O}{H} \\ \sin C &= \frac{2}{5} \\ \text{Opposite} &= 2 \\ \text{Hypotenuse} &= 5 \end{aligned}$$

$$\begin{aligned} a^2 + b^2 &= c^2 \\ x^2 + 2^2 &= 5^2 \\ x^2 + 4 &= 25 \\ x^2 &= 21 \\ x &= \sqrt{21} \\ x &= 4.58 \end{aligned}$$

EXAMPLE 3: Choose sine, cosine or tangent to find the length of the missing side indicated.

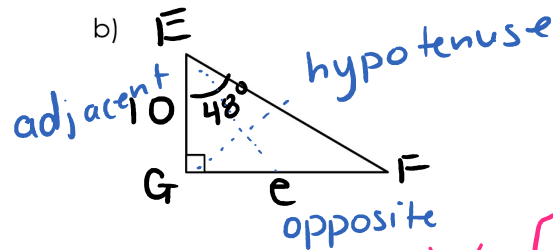


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$$\cos \theta = \frac{A}{H} \begin{matrix} \text{Adjacent} \\ \text{Hypotenuse} \end{matrix}$$

$$\begin{aligned} \cos 31^\circ &= \frac{a}{18} \\ 18 (\cos 31^\circ) &= \frac{a}{18} \end{aligned}$$

$$\begin{aligned} 18 (\cos 31^\circ) &= a \\ 18 (0.8572) &= a \\ 15.43 &= a \end{aligned}$$



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$$\tan \theta = \frac{O}{A} \begin{matrix} \text{opposite} \\ \text{Adjacent} \end{matrix}$$

$$\begin{aligned} \tan 48^\circ &= \frac{e}{10} \\ 10 (\tan 48^\circ) &= \frac{e}{10} \\ 10 (1.1106) &= e \\ 11.11 &= e \end{aligned}$$