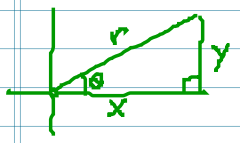
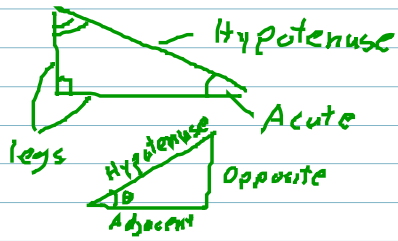
Right Triangle

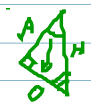




$\sin(\theta) = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{y}{r}$ $\quad \csc(\theta) = \frac{\text{Hypotenuse}}{\text{Opposite}} = \frac{r}{y}$

$\cos(\theta) = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{x}{r}$ $\quad \sec(\theta) = \frac{\text{Hypotenuse}}{\text{Adjacent}} = \frac{r}{x}$

$\tan(\theta) = \frac{\text{Opposite}}{\text{Adjacent}} = \frac{y}{x}$ $\quad \cot(\theta) = \frac{\text{Adjacent}}{\text{Opposite}} = \frac{x}{y}$



SOH CAH TOA

Fundamental Identities

Reciprocal – $\sin(\theta) = \frac{1}{\csc(\theta)}$ $\quad \csc(\theta) = \frac{1}{\sin(\theta)}$

$\cos(\theta) = \frac{1}{\sec(\theta)}$ $\quad \sec(\theta) = \frac{1}{\cos(\theta)}$

$\tan(\theta) = \frac{1}{\cot(\theta)}$ $\quad \cot(\theta) = \frac{1}{\tan(\theta)}$

Quotient – $\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} = \frac{\sec(\theta)}{\csc(\theta)}$ $\quad \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)} = \frac{\csc(\theta)}{\sec(\theta)}$

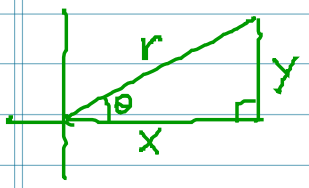
Pythagorean – $(\sin(\theta))^2 = \sin^2(\theta)$ $\quad \sin(\theta)^2$

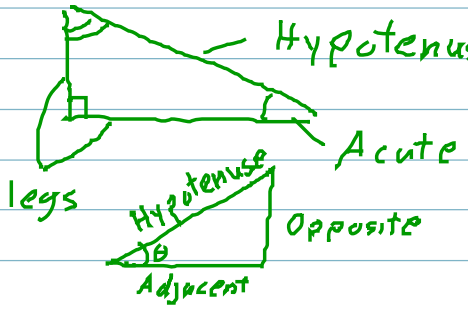
$\rightarrow \frac{x^2}{r^2} + \frac{y^2}{r^2} = \frac{r^2}{r^2} \rightarrow \cos^2(\theta) + \sin^2(\theta) = 1$

$1 + \tan^2(\theta) = \sec^2(\theta)$

$\cot^2(\theta) + 1 = \csc^2(\theta)$

Right Triangle

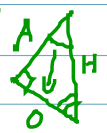




$\sin(\theta) = \frac{\text{Opposite}}{\text{Hypotenuse}} = \frac{y}{r}$ $\quad$ $\csc(\theta) = \frac{\text{Hypotenuse}}{\text{Opposite}} = \frac{r}{y}$

$\cos(\theta) = \frac{\text{Adjacent}}{\text{Hypotenuse}} = \frac{x}{r}$ $\quad$ $\sec(\theta) = \frac{\text{Hypotenuse}}{\text{Adjacent}} = \frac{r}{x}$

$\tan(\theta) = \frac{\text{opposite}}{\text{Adjacent}} = \frac{y}{x}$ $\quad$ $\cot(\theta) = \frac{\text{Adjacent}}{\text{Opposite}} = \frac{x}{y}$



SOH CAH TOA

Fundamental Identities

Reciprocal – $\sin(\theta) = \frac{1}{\csc(\theta)}$ $\quad$ $\csc(\theta) = \frac{1}{\sin(\theta)}$

$\cos(\theta) = \frac{1}{\sec(\theta)}$ $\quad$ $\sec(\theta) = \frac{1}{\cos(\theta)}$

$\tan(\theta) = \frac{1}{\cot(\theta)}$ $\quad$ $\cot(\theta) = \frac{1}{\tan(\theta)}$

Quotient – $\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} = \frac{\sec(\theta)}{\csc(\theta)}$ $\quad$ $\cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)} = \frac{\csc(\theta)}{\sec(\theta)}$

Pythagorean – $(\sin(\theta))^2 = \sin^2(\theta)$ $\quad$ ~~$\sin(\theta)^2$~~

$\rightarrow \frac{x^2}{r^2} + \frac{y^2}{r^2} = \frac{r^2}{r^2}$ $\longrightarrow$ $\cos^2(\theta) + \sin^2(\theta) = 1$

$1 + \tan^2(\theta) = \sec^2(\theta)$

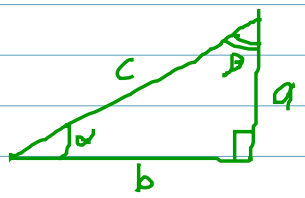
$\cot^2(\theta) + 1 = \csc^2(\theta)$

Complementary Angles – α, β s.t. $\alpha+\beta=90^\circ$ OR $\alpha+\beta=\frac{\pi}{2}$

Supplementary Angles – α, β s.t. $\alpha+\beta=180^\circ$ OR $\alpha+\beta=\pi$

Alpha = α
Beta = β

Cofunctions



$\sin(\alpha)=\frac{a}{c}=\cos(\beta)$
$\sin(\beta)=\frac{b}{c}=\cos(\alpha)$

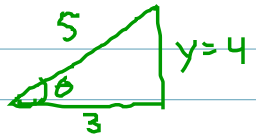
$\alpha+\beta=90^\circ$
$\alpha=90^\circ-\beta$
$\beta=90^\circ-\alpha$

$\sin(\alpha)=\cos(90^\circ-\alpha)=\cos(\frac{\pi}{2}-\alpha)$
$\cos(\alpha)=\sin(90^\circ-\alpha)=\sin(\frac{\pi}{2}-\alpha)$
$\tan(\alpha)=\cot(90^\circ-\alpha)=\cot(\frac{\pi}{2}-\alpha)$
$\cot(\alpha)=\tan(90^\circ-\alpha)=\tan(\frac{\pi}{2}-\alpha)$
$\sec(\alpha)=\csc(90^\circ-\alpha)=\csc(\frac{\pi}{2}-\alpha)$
$\csc(\alpha)=\sec(90^\circ-\alpha)=\sec(\frac{\pi}{2}-\alpha)$

$\sin(\theta)$ $\quad$ $\sin$

Complementary Angle Theorem
cofunctions of complementary angles are =

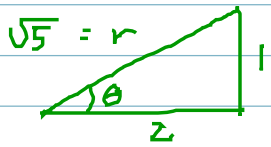
$\cos(\theta)=\frac{3}{5}$



$3^2+y^2=5^2$
$9+y^2=25$
$y^2=16$
$y=\pm4 \rightarrow 4$

$\sin(\theta)=\frac{4}{5}$
$\tan(\theta)=\frac{4}{3}$
$\csc(\theta)=\frac{5}{4}$
$\sec(\theta)=\frac{5}{3}$
$\cot(\theta)=\frac{3}{4}$

$\tan(\theta)=\frac{1}{2}$
$\sin(\theta)=\frac{1}{\sqrt{5}}=\frac{\sqrt{5}}{5}$
$\cos(\theta)=\frac{2}{\sqrt{5}}=\frac{2\sqrt{5}}{5}$
$\csc(\theta)=\sqrt{5}$
$\sec(\theta)=\frac{\sqrt{5}}{2}$
$\cot(\theta)=2$



$1^2+2^2=r^2$
$1+4=$
$5=$
$r=\pm\sqrt{5} \rightarrow \sqrt{5}$