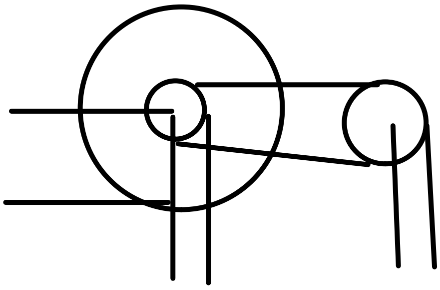
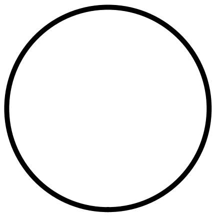
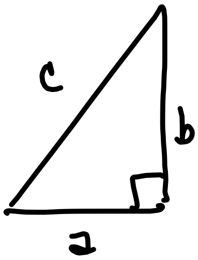






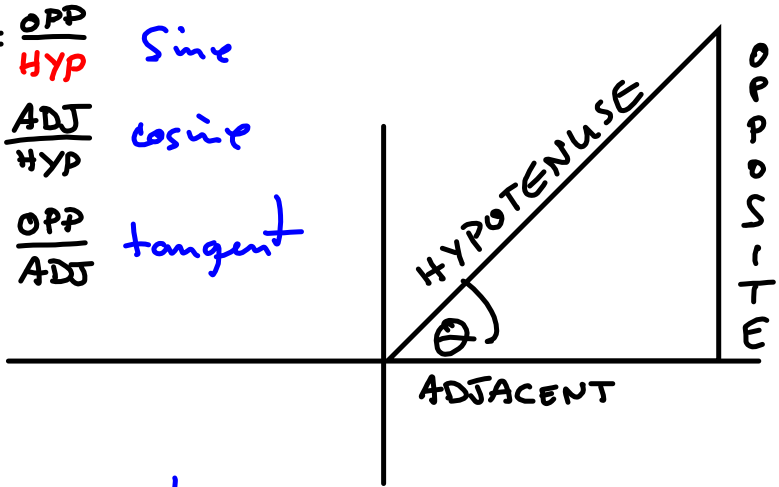
Pythagorus says:
$a^2+b^2=c^2$

SOHCAHTOA

$\sin\theta = \frac{OPP}{HYP}$ Sine

$\cos\theta = \frac{ADJ}{HYP}$ cosine

$\tan\theta = \frac{OPP}{ADJ}$ tangent



$\csc\theta = \frac{1}{\sin\theta}$ cosecant

$\sec\theta = \frac{1}{\cos\theta}$ secant

$\cot\theta = \frac{1}{\tan\theta}$ cotangent

Reciprocal IDentities

$\sin\theta = \frac{OPP}{HYP}$ $\csc\theta = \frac{HYP}{OPP}$

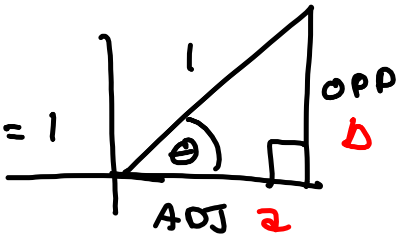
$\cos\theta = \frac{ADJ}{HYP}$ $\sec\theta = \frac{HYP}{ADJ}$

$\tan\theta = \frac{OPP}{ADJ}$ $\cot\theta = \frac{ADJ}{OPP}$

c

Pythagorean Identities.

Suppose the hypotenuse is $c = 1$



$\sin\theta = \frac{OPP}{1} = OPP = b$

$\cos\theta = \frac{ADJ}{1} = ADJ = a$

$a^2 + b^2 = c^2 = 1$

$(\sin\theta)^2 + (\cos\theta)^2 = 1$

$\boxed{(1)\ \sin^2\theta + \cos^2\theta = 1}$

Notation!

$(\sin\theta)^2 = \sin^2\theta$

$(\sin\theta)^3 = \sin^3\theta$

$\frac{1}{\sin\theta} = (\sin\theta)^{-1} = \sin^{-1}\theta,$

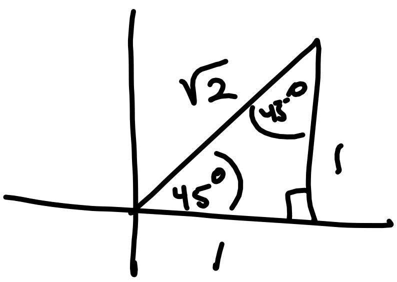
but SOMETIMES

$\sin^{-1}\theta$ means the inverse FUNCTION of sine.

SIN^{-1} on calculator is NOT $\frac{1}{\sin\theta}$

It means "Give me sine, I tell you θ."

who's the silly geese, Millsie?

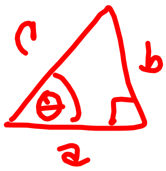


$\sin\theta = \frac{1}{\sqrt{2}}$

SIN^{-1} Key

$SIN^{-1}\left(\frac{1}{\sqrt{2}}\right)$

Derivation of the others!



$$\tan^2\theta + 1 = \frac{\sin^2\theta}{\cos^2\theta} + 1 \qquad \tan\theta = \frac{b}{a} = \frac{\frac{b}{c}}{\frac{a}{c}}$$

$$= \frac{\sin^2\theta}{\cos^2\theta} + \frac{1}{1}\cdot\frac{\cos^2\theta}{\cos^2\theta} = \frac{\sin^2\theta + \cos^2\theta}{\cos^2\theta} \qquad = \frac{\sin\theta}{\cos\theta}$$

$$= \frac{1}{\cos^2\theta} = \frac{1}{\left(\frac{1}{\sec^2\theta}\right)} = \sec^2\theta$$

Summarize:

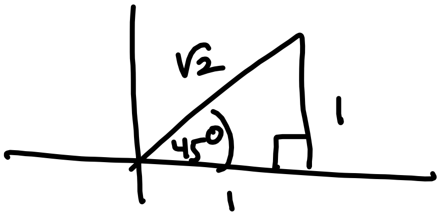
$$\boxed{(2)\ \tan^2\theta + 1 = \sec^2\theta}$$

$$\boxed{(3)\ \cot^2\theta + 1 = \csc^2\theta}$$

$$\left(\frac{\sin\theta}{\cos\theta}\right)^2 = \frac{(\sin\theta)^2}{(\cos\theta)^2} = \frac{\sin^2\theta}{\cos^2\theta}$$

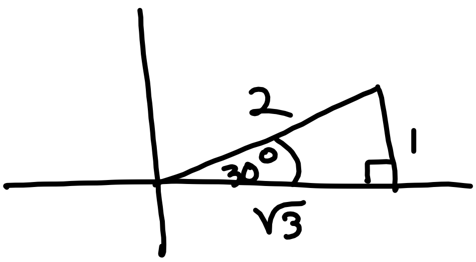
$$\left.\begin{array}{l} \sin^2\theta = 1 - \cos^2\theta \\ \cos^2\theta = 1 - \sin^2\theta \\ \csc^2\theta - 1 = \cot^2\theta \end{array}\right\} \text{Variations flowing from 1-3.}$$

"$1-1-\sqrt{2}$" 45-45 right triangle



"$1-2-\sqrt{3}$" 30-60 (or 60-30)

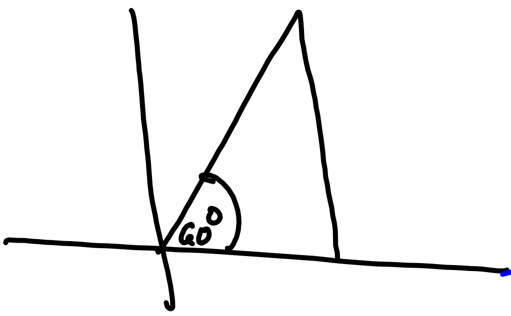
$\sqrt{3} \approx 1.732$

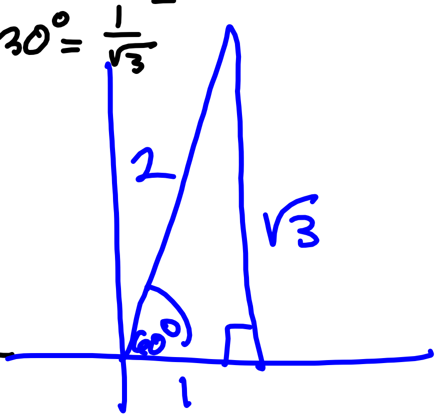


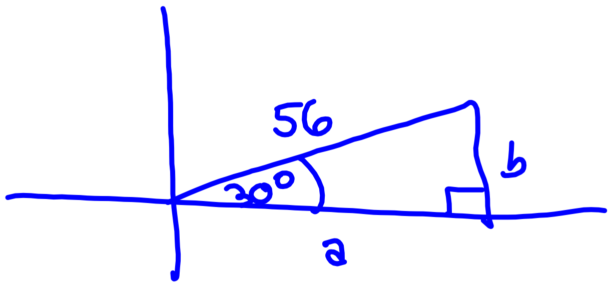
$\sin 30^\circ = \frac{1}{2}$

$\cos 30^\circ = \frac{\sqrt{3}}{2}$

$\tan 30^\circ = \frac{1}{\sqrt{3}}$







Find a & b.

$\sin 30^\circ = \frac{b}{56} = \frac{1}{2}$

$\longrightarrow b = 56 \cdot \frac{1}{2} = \boxed{28 = b}$

$\cos 30^\circ = \frac{a}{56} = \frac{\sqrt{3}}{2}$

$\longrightarrow a = 56 \cdot \frac{\sqrt{3}}{2} = \boxed{28\sqrt{3} = a}$

Quadrantal Angles &
Degenerate triangles