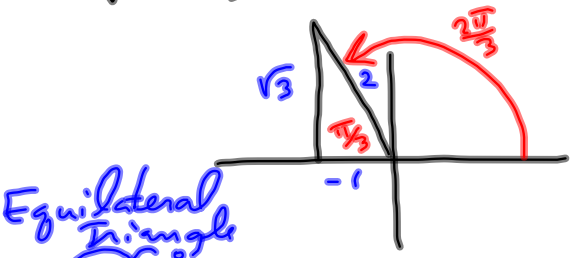
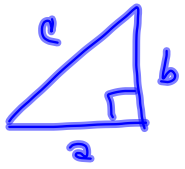
§1.3 #s 1-4, 7, 10, 13, ..., 73

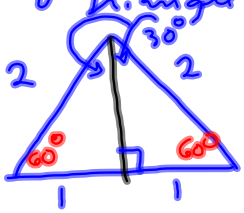
Right-angle trig.





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

Equilateral Triangle



$1^2 + 1^2 = c^2$

$2 = c^2$

$1^2 + b^2 = 2^2$

$b^2 = 4 - 1 = 3$

$\sqrt{b^2} = \sqrt{3}$

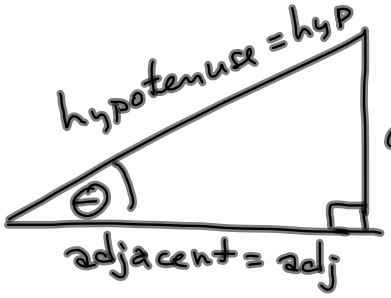
$|b| = \sqrt{3}$

$b = \pm\sqrt{3}$

60°

$\sqrt{(-3)^2} = 3 = |-3| = -(-3)$

$\sqrt{3^2} = 3 = |3|$



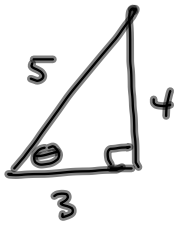
sine, cosine, tangent
sin , cos , tan
cosecant, secant, cotangent
csc , sec , cot

$\sin(\theta) = \frac{opp}{hyp}$ $\cos(\theta) = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$ = slope

$\csc\theta = \frac{1}{\sin\theta} = \frac{hyp}{opp}$ $\sec\theta = \frac{1}{\cos\theta} = \frac{hyp}{adj}$ $\cot\theta = \frac{1}{\tan\theta} = \frac{adj}{opp}$

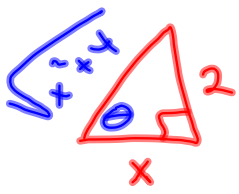
Find the values of the 6 trig functions for this triangle:

$3^2+4^2 = 9+16 = 25 = c^2 \Rightarrow c = 5$



$\sin\theta = \frac{4}{5}$ $\cos\theta = \frac{3}{5}$ $\tan\theta = \frac{4}{3}$

$\csc\theta = \frac{5}{4}$ $\sec\theta = \frac{5}{3}$ $\cot\theta = \frac{3}{4}$



$\sin\theta = \frac{2}{\sqrt{x^2+4}}$

Much easier when the divisor is an integer.

$$2\overline{)1.4142} \quad .7071$$
$$1.4$$

$$1.4142\overline{)2.00000} \quad 1$$
$$-\ 1.4142$$

$$\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

after rationalizing the denominator.

$$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

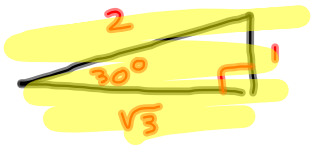
$$\sin\frac{\pi}{4} = \frac{\sqrt{2}}{2} \qquad \cos\frac{\pi}{4} = \frac{\sqrt{2}}{2} \qquad \tan\frac{\pi}{4} = 1$$

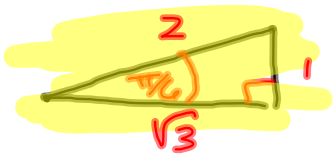
$$\csc\frac{\pi}{4} = \sqrt{2} \qquad \sec\frac{\pi}{4} = \sqrt{2} \qquad \cot\frac{\pi}{4} = 1$$

"$1, 2, \sqrt{3}$"

"$1, 1, \sqrt{2}$"

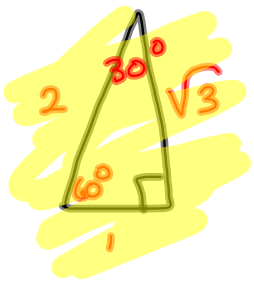
Equilateral Triangle

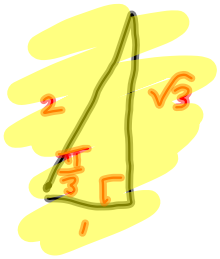




$\sin\frac{\pi}{6} = \frac{1}{2}$ $\cos\frac{\pi}{6} = \frac{\sqrt{3}}{2}$ $\tan\frac{\pi}{6} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

$\csc\frac{\pi}{6} = 2$ $\sec\frac{\pi}{6} = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$ $\cot\frac{\pi}{6} = \sqrt{3}$





$\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$, $\cos\frac{\pi}{3} = \frac{1}{2}$, $\tan\frac{\pi}{3} = \sqrt{3}$ etc.

FACT: $\sin(90^\circ - \theta) = \cos\theta$

sine & cosine are 90° "out-of-phase"

$\sin\left(\frac{\pi}{2} - \frac{\pi}{3}\right)$

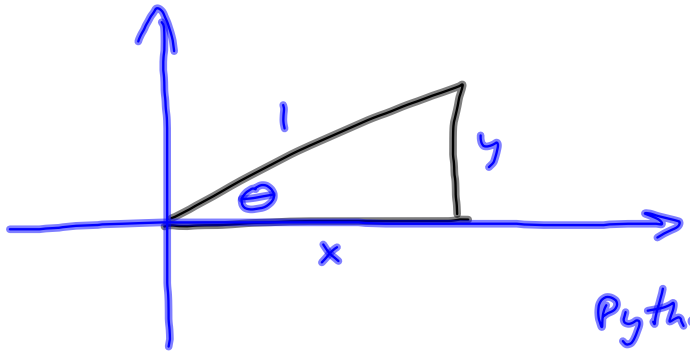
$= \sin\left(\frac{\pi}{6}\right) = \cos\frac{\pi}{3}$

$\sin(90^\circ - 30^\circ) = \cos(60^\circ)$

"Cofunctions of complementary angles are equal"

↳ $\theta_1 + \theta_2 = 90^\circ$

$90^\circ - \theta_1 = \theta_2$



$\sin\theta = y$

$\cos\theta = x$

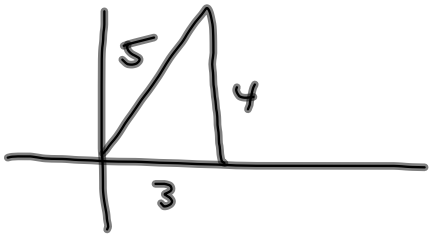
Pythagorus says:

$x^2 + y^2 = 1$

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

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

IDENTITY !



$\sin\theta = \frac{4}{5}$

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

$\sin^2\theta + \cos^2\theta = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2$

$= \frac{16}{25} + \frac{9}{25} = \frac{25}{25} = 1$