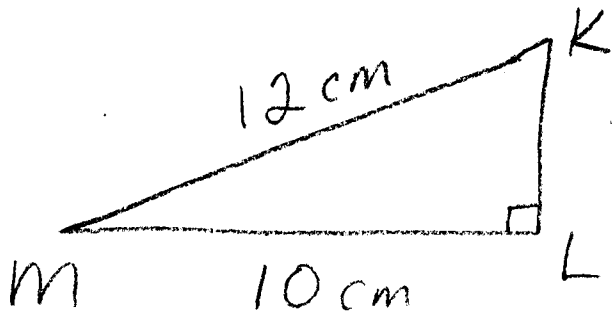
BE-Precalc | Monday 10-19-09

ACT 2009 2010 Sample Test

① Simplify $(3x^3)^3$

② What is the $\sin \angle M$?



ANS

① $(3x^3)^3 = 3^3x^9 = \boxed{81x^9}$

② $\overline{KL}^2 = 12^2 - 10^2 = 144 - 100$

$\overline{KL} = \sqrt{44}$

$\boxed{\sin M = \frac{\sqrt{44}}{12}}$ or $\frac{\sqrt{4}\sqrt{11}}{12} = \frac{2\sqrt{11}}{12} = \boxed{\frac{\sqrt{11}}{6}}$

WE HAVE USED THE trig. FUNCTIONS TO find the MISSING side of A Right triangle — how about finding A MISSING ANGLE? (ONE ACUTE ANGLE immediately gives you the other, θ, $90-\theta$)

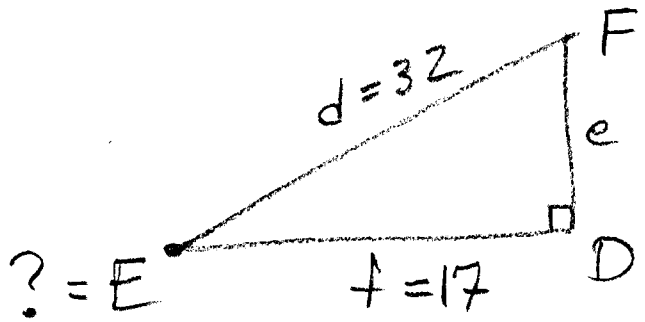
INVERSE TRIG. FUNCTIONS

$\sin\theta = \frac{o}{h}$ $\quad \sin^{-1}\left(\frac{o}{h}\right) = \theta$ OR $\arcsin\left(\frac{o}{h}\right) = \theta$

$\cos\theta = \frac{a}{h}$ $\quad \cos^{-1}\left(\frac{a}{h}\right) = \theta$ or $\arccos\left(\frac{a}{h}\right) = \theta$

$\tan\theta = \frac{o}{a}$ $\quad \tan^{-1}\left(\frac{o}{a}\right) = \theta$ or $\arctan\left(\frac{o}{a}\right) = \theta$

EX 3 PG. 307 $\quad f = 7 \quad d = 32$ find E



$\cos E = \frac{17}{32} \quad \therefore \cos^{-1}\left(\frac{17}{32}\right) = E$

$\cos^{-1}(.5313) \cong E \cong 57.9°$

EXAMPLES ⇒ Pg 307-308 Ch 5-5 Solving Right Triangles

① (A) $\sin X = \frac{\sqrt{3}}{2}$ ∴ $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right) = X$

this must be $\frac{O}{H}$

$\sin^{-1}(.8660) = X$ ∴ $\boxed{X = 60^\circ}$

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② (A) $\tan\left(\tan^{-1}\frac{6}{11}\right)$ $\tan^{-1}(.5455) = 28.61^\circ$

↑ FIND THIS ANGLE θ $\tan 28.61^\circ \cong .5454$!

THEN FIND TAN θ

By definition, the tangent of the angle whose tangent is $\frac{6}{11}$, is $\frac{6}{11}$!

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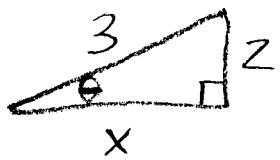
② (b) $\cos\left(\arcsin\frac{2}{3}\right)$ $\arcsin\frac{2}{3}$ or $\sin^{-1}\left(\frac{2}{3}\right)$

↑ FIND θ ⇒ $\arcsin .6 \cong 41.81^\circ$

THEN $\cos\theta$ ∴ $\boxed{\cos(41.81^\circ) \cong .7453}$

OR USING PYTHAGOREAN THEOREM

$\sin^{-1}\left(\frac{2}{3}\right) = \sin^{-1}\left(\frac{O}{H}\right)$



$3^2 - 2^2 = x^2$

$5^2 = x^2$

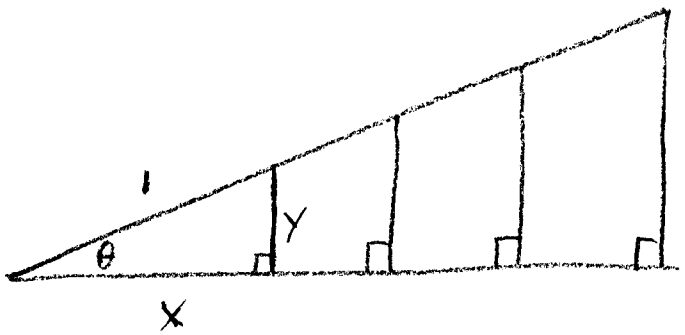
$\sqrt{5} = x$

∴ $\cos\theta = \frac{\sqrt{5}}{3} \cong .7453$ ✓

We have looked at the trig. functions for angles θ where $0° \leq \theta \leq 90°$. What about angles $> 90°$? Do negative angles have a sin, cos or tan? What is a negative angle?

With apologies to the Army, lets look at the real "power of one."

Can the fact that all right triangles that have the same acute angles are similar be used to advantage? Suppose the hypotenuse is 1?



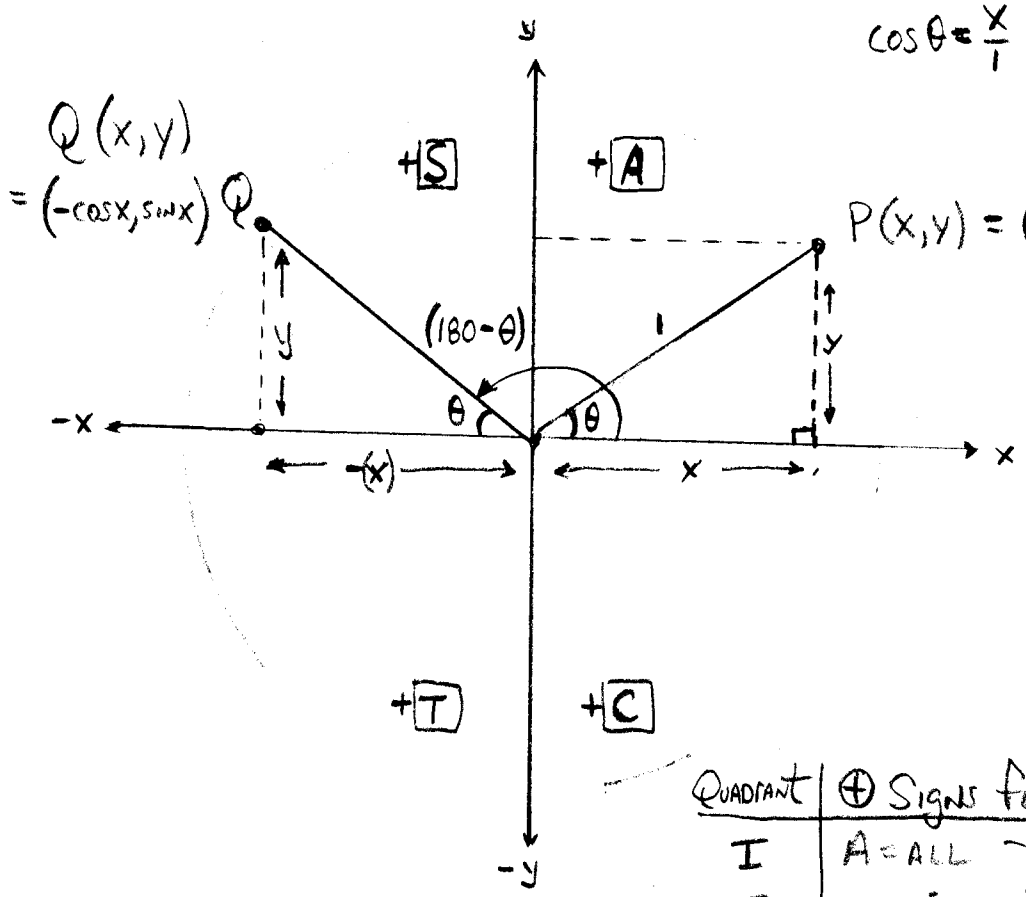
$$\sin\theta = \frac{Y}{1} \Rightarrow \sin\theta = Y$$

$$\cos\theta = \frac{X}{1} \Rightarrow \cos\theta = X$$

Lets use the "power of ONE" AND A circle of radius ONE ON the X-y Coordinate plane to define SIN, COS, & TAN for any angle.

Because of similar right triangles, WHAT IS true for any particular angle AT A radius of 1, is true for any right triangle WITH that ANGLE. NOTE: Circle of radius = 1 = "UNit circle"

$\cos\theta = \frac{x}{1}$ $\sin\theta = \frac{y}{1}$

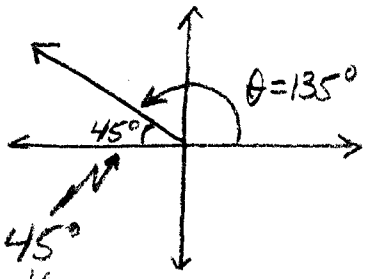


EXAMPLES

$\tan 30^\circ = .5774$	$\sin 150^\circ = .5$
$\cos 30^\circ = .8660$	$\cos 150^\circ = -.8660$
$\sin 30^\circ = .5$	$\tan 150^\circ = -.5774$

QUADRANT	⊕ SIGNS FOR SIN, COS, TAN	
I	A = ALL	A Smart
II	S = SIN	Trig Class
III	T = TAN	
IV	C = COS	

EX 3 Pg 293 Find SIN, COS, TAN of 135° angle



45° IS CALLED the "reference" angle

SIN is only positive of SIN, COS, TAN in Quadrant II

SINCE $\sin 45 = .707 = \frac{\sqrt{2}}{2}$

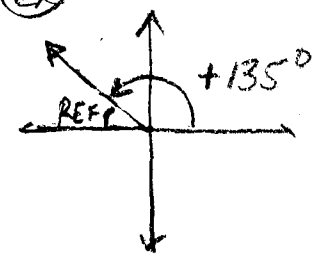
$\cos 45 = .707$

$\tan 45 = 1$

$\sin 135° = +.707$	$\cos 135° = -.707$	$\tan 135° = -1$

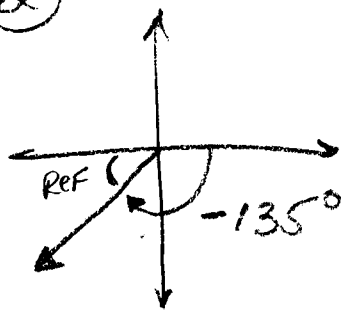
POSITIVE ANGLES ↺ CCW

EX

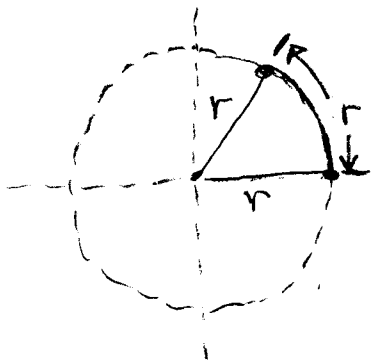


NEGATIVE ANGLES ↻ CW

EX



The trig. functions Repeat every $360° = 2\pi$ radians AND are called circular functions.



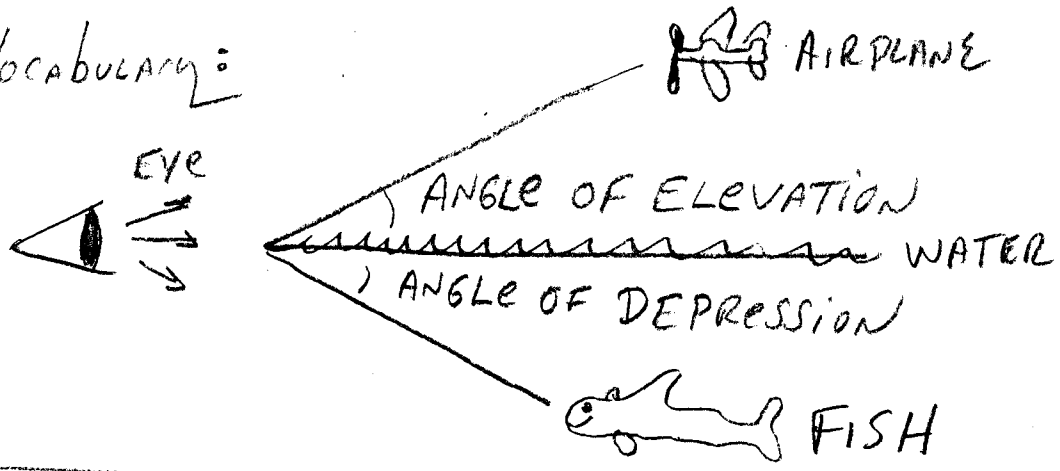
r = radius

AN "ARC" length of r makes AN Angle of 1 radian, it is ≈ 57°

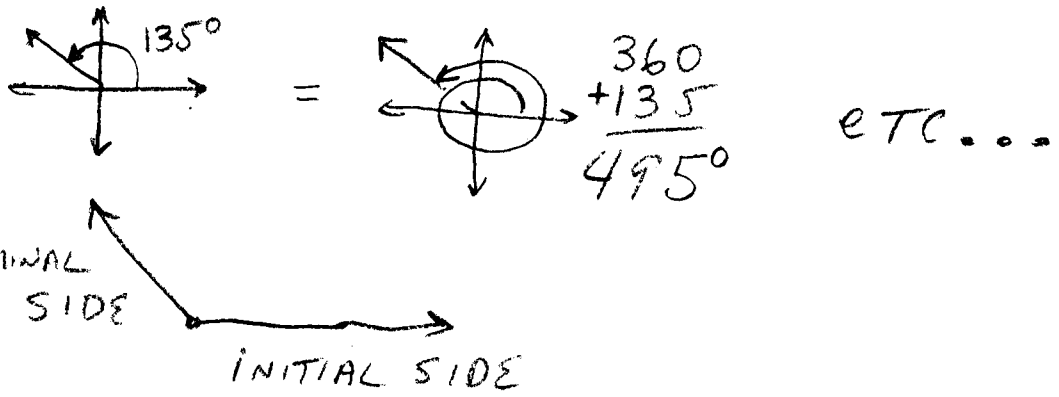
$C = 2\pi r$
$C = 360$

$\frac{360}{2\pi} = \frac{2\pi r}{2\pi}$ ∴ $\frac{360}{2\pi} \approx 57.296...$

Vocabulary:



Ch. 5-1 Angle and Degree Measure



Ch. 5-2 Trig. Ratios in Right Triangles

SOH CAH TOA

Ch 5-3 Trig. Functions on the Unit Circle

(for any θ)

A Smart Trig Class

* Ch 5-4 Applying Trig. Functions
* Ch 5-5 Solving Right Triangles

} Find missing sides or angles

Homework: Pg 296-297 # 5, 7, 8, 14-16, 23.
Pg 303 # 25, 26
Pg 310 # 47