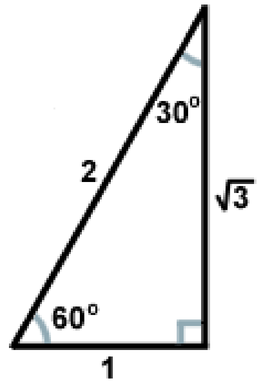
Review:

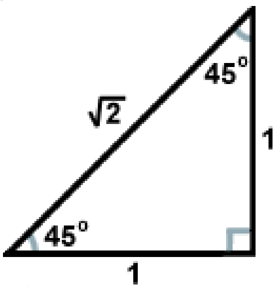
An acute angle is an angle between 0° & 90°



The function value of an angle is equal to the cofunction value of the complement of that angle.

$\sin 45° = 1/\sqrt{2} = \sqrt{2}/2$

$\sec 60° = 2$



$\cos 30° = \sqrt{3}/2$

$\csc 45° = \sqrt{2}$

$\tan 45° = 1$

$\cot 30° = \sqrt{3}$

www.asms.net/brewer/coursenotes/2012-13winter/trig-2012-11-09-245pm-5p2-3trigfunctionsofanyangle.pdf

trig-2012-11-09-245pm-5p2-3trigfunctionsofanyangle.notebook November 09, 2012

5.2 #~~24~~ 21 - The ~~balloon~~ sanddune problem:

$\tan 78.2° = \frac{h}{x}$ $\tan 17.6° = \frac{h}{x+10}$

$x \tan 78.2° = h$

$x = \frac{h}{\tan 78.2°}$

Substitution yields:

$\tan 17.6° = \frac{h}{\frac{h}{\tan 78.2°} + 10}$

When confronted by an equation involving fractions, it is always nice to get rid of the fractions by multiplying both sides by the least common denominator.

$\left(\frac{h}{\tan 78.2°} + 10\right) \cdot \tan 17.6° = \frac{h}{\frac{h}{\tan 78.2°} + 10} \cdot \left(\frac{h}{\tan 78.2°} + 10\right)$

Distribution yields: $h\frac{\tan 17.6°}{\tan 78.2°} + 10 \tan 17.6° = h$

When more than one instance of your variable appears, try to get all instances of the variable on one side and everything else on the other side.

$10 \tan 17.6° = h - \frac{h \tan 17.6°}{\tan 78.2°}$

To get h by itself, factor and then divide.

$10 \tan 17.6° = h\left(1 - \frac{\tan 17.6°}{\tan 78.2°}\right)$

$$\boxed{h = \frac{10 \tan 17.6°}{1 - \frac{\tan 17.6°}{\tan 78.2°}} \approx 3.4 \text{ miles}}$$

$\tan 35° = \frac{h}{x}$

$\tan 20° = \frac{h}{800+x}$

$\tan 20° = \frac{h}{800 + \frac{h}{\tan 35}}$

$h = \frac{800 \tan 20°}{1 - \frac{\tan 20°}{\tan 35°}} \approx 606 \text{ft}$

Reciprocal Identities

$\csc x = \frac{1}{\sin x}$, $\sin x = \frac{1}{\csc x}$, $\sec x = \frac{1}{\cos x}$, $\cos x = \frac{1}{\sec x}$, $\cot x = \frac{1}{\tan x}$, $\tan x = \frac{1}{\cot x}$

Cofunction Identities:

$\sin(90° - \theta) = \cos\theta$, $\cos(90° - \theta) = \sin\theta$
$\tan(90° - \theta) = \cot\theta$, $\cot(90° - \theta) = \tan\theta$
$\csc(90° - \theta) = \sec\theta$, $\sec(90° - \theta) = \csc\theta$

Ratio Identities:

$$\frac{\sin\theta}{\cos\theta} = \frac{\frac{opp}{hyp}}{\left(\frac{adj}{hyp}\right)} = \frac{opp}{\cancel{hyp}} \cdot \frac{\cancel{hyp}}{adj} = \frac{opp}{adj} = \tan\theta$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \quad ; \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

Example Problem 5.~~5~~1 #98

Given that

$\sin 8° \approx 0.1392$ $\csc 8° \approx 7.1853$
$\cos 8° \approx 0.9903$ $\sec 8° \approx 1.0098$
$\tan 8° \approx 0.1405$ $\cot 8° \approx 7.1154$

find the six function vales of 82°.

8° & 82° are compliments

$\sin 82° = \cos 8° = 0.9903$

$\csc 82° = \sec 8° = 1.0098$

$\tan 82° = \cot 8° = 7.1154$

Write in terms of $\sin 40°$ and/or $\cos 40°$.

$\csc 40° = \dfrac{1}{\sin 40°}$

$\csc 50° = \sec 40° = \boxed{\dfrac{1}{\cos 40°}}$

$\cot 40° = \dfrac{\cos 40°}{\sin 40°}$

$\tan 50° = \dfrac{\sin 50°}{\cos 50°} = \boxed{\dfrac{\cos 40°}{\sin 40°}}$

$\cos 50° = \sin 40°$

$\sec 50° = \dfrac{1}{\cos 50°} = \boxed{\dfrac{1}{\sin 40°}}$

How many different ways can you rewrite the expression using ratio, reciprocal, and/or cofunction identities?

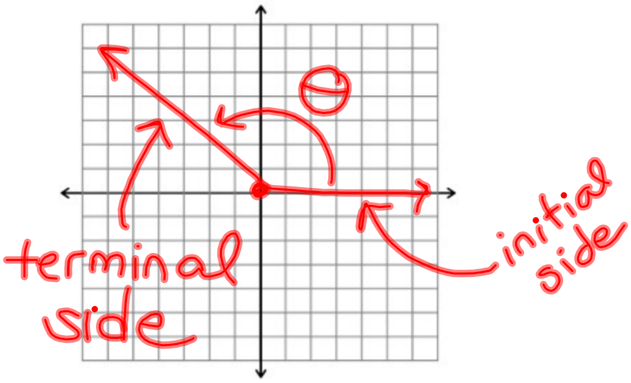
$\sin 32° = \cos(90° - 32°) = \boxed{\cos 58°} = \boxed{\dfrac{1}{\sec 58°}} = \boxed{\dfrac{1}{\csc 32°}}$

$\tan 13° = \cot 77° = \dfrac{1}{\cot 13°} = \dfrac{\sin 13°}{\cos 13°} = \dfrac{1}{\tan 77°}$

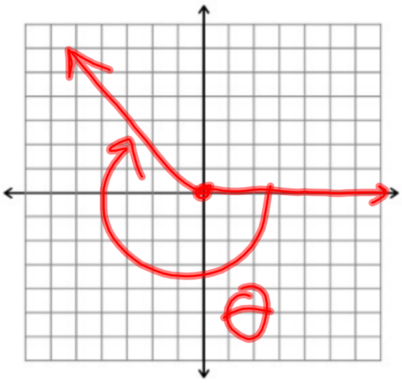
$= \dfrac{\cos 77°}{\sin 77°}$

5.3 Trigonometric Functions of Any Angle

An angle in standard position has its vertex at the origin and initial side on the positive x-axis, and is measured counter-clockwise.

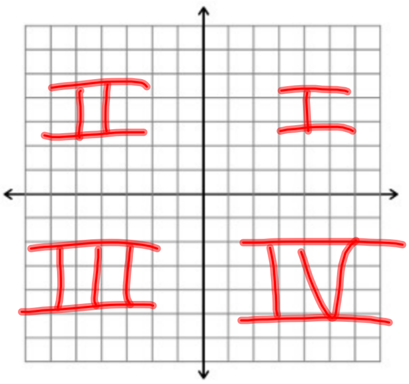


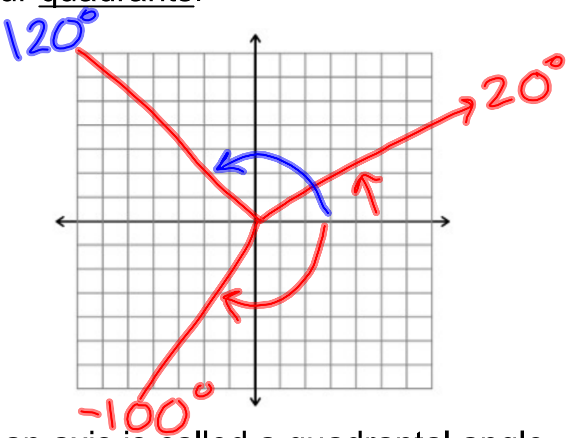
positive angle



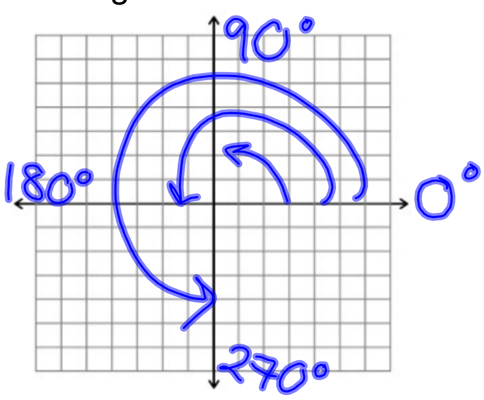
negative angle

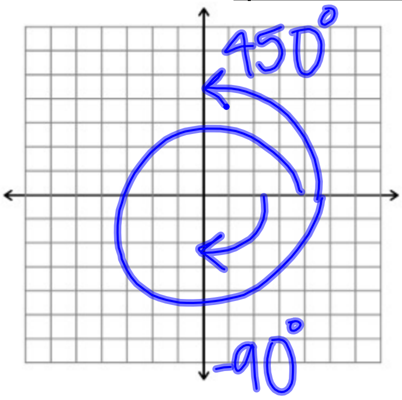
The coordinate plane is divided into four quadrants.



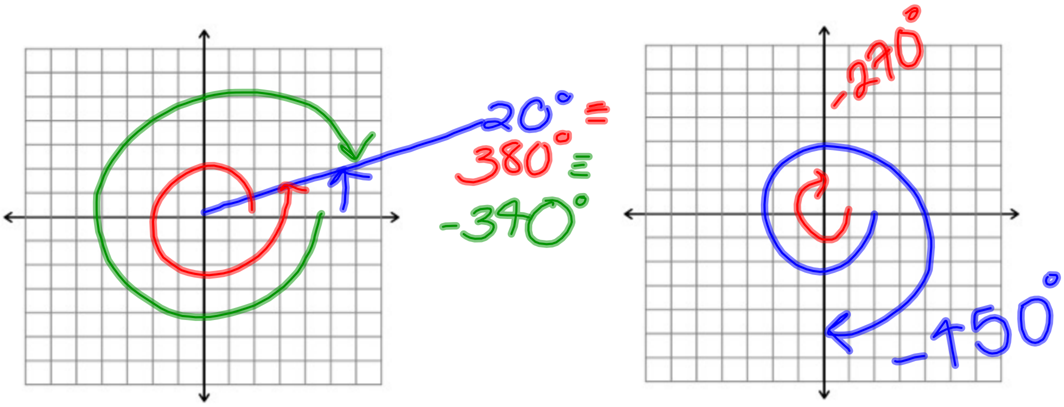


An angle whose terminal side falls on an axis is called a quadrantal angle.





Two angles sharing a terminal side are called <u>coterminal</u> and differ by integer multiples of 360°.



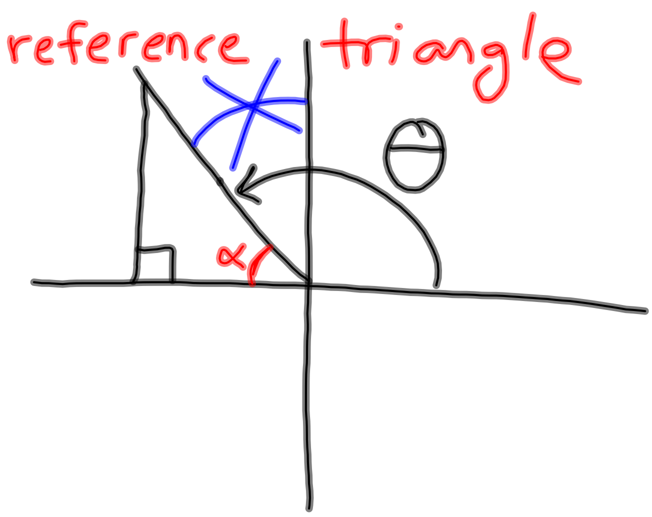
Find two positive and two negative angles that are coterminal with 89°.

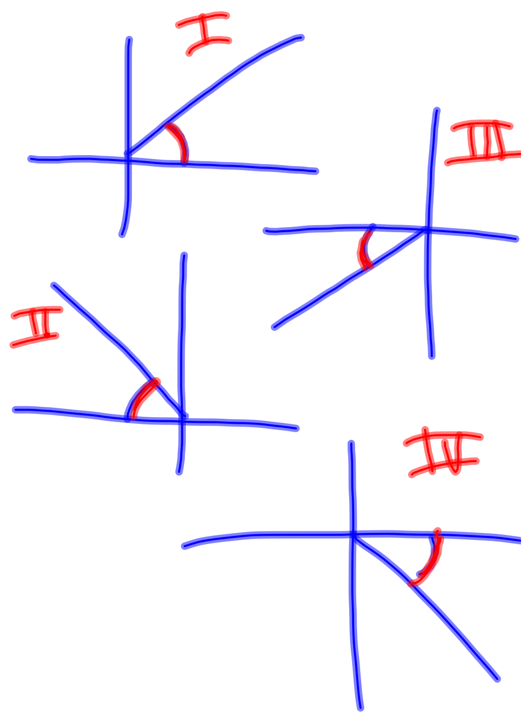
$89° + 360° =$

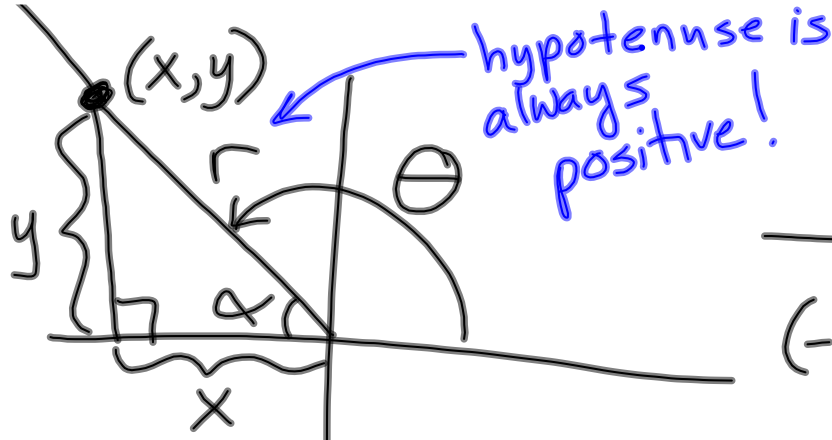
$89° - 360° =$

α

For an angle in standard position, the reference angle is the acute angle between the terminal side of the angle and the x-axis.



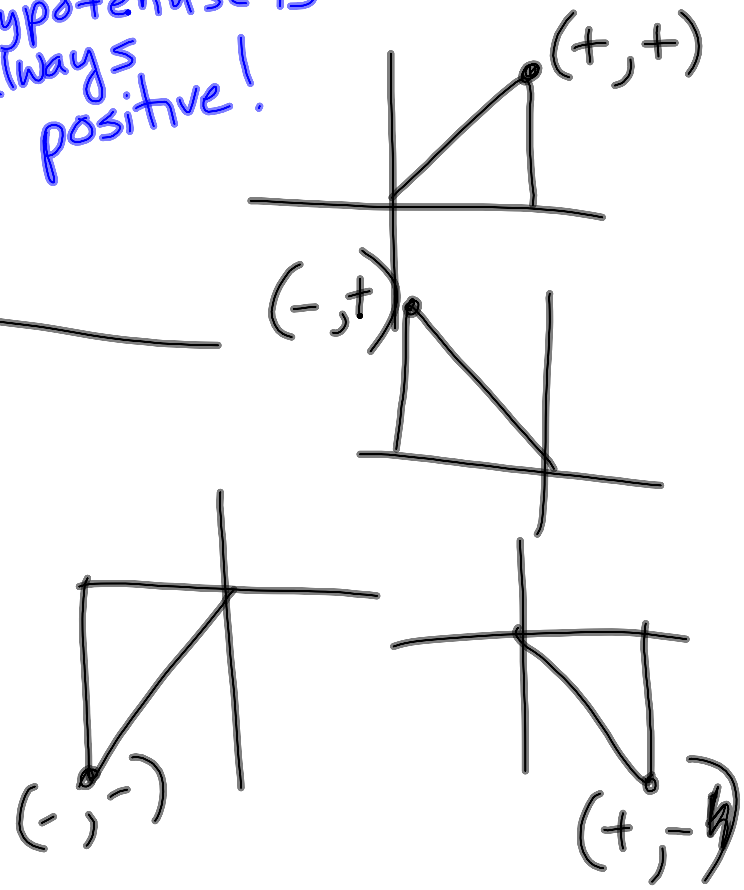




$$\sin\theta = \frac{y}{r}$$

$$\cos\theta = \frac{x}{r}$$

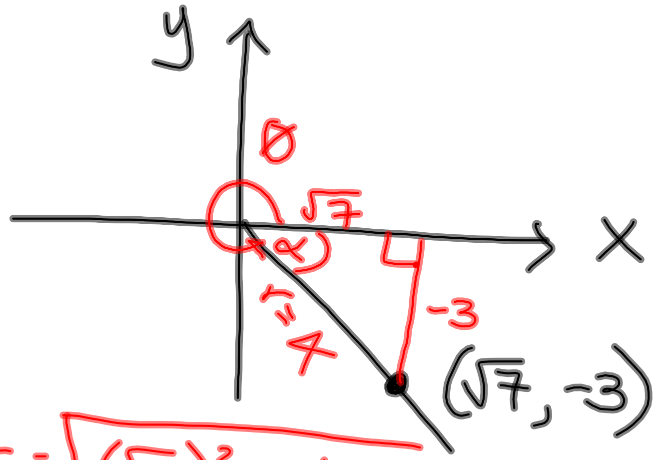
$$\tan\theta = \frac{y}{x}$$



Students	All
Take	Calculus

tells us which functions are positive

5.3 #26



$r = \sqrt{(\sqrt{7})^2 + (-3)^2}$

$r = \sqrt{7+9} = \sqrt{16} = 4$

$\sin\theta = \frac{-3}{4}$

$\tan\theta = \frac{-3}{\sqrt{7}}$

$\sec\theta = \frac{4}{\sqrt{7}}$

Homework:

5.1 #83-97 odd