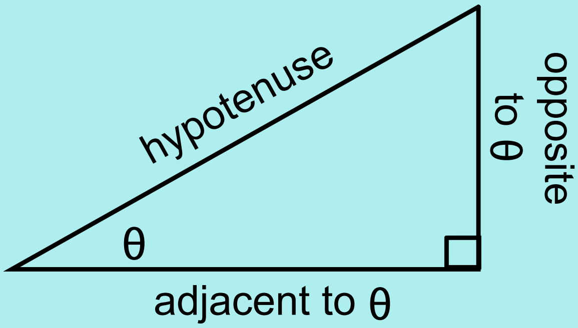
Recall:

For any angle of interest (θ), there are three (3) primary trigonometric ratios.

$$\text{sine of } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{cosine of } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

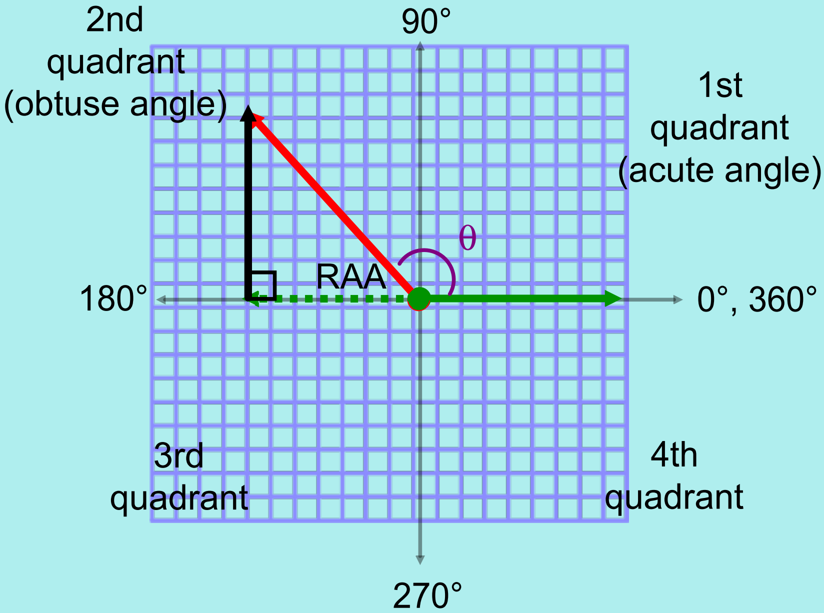
$$\text{tangent of } \theta = \frac{\text{opposite}}{\text{adjacent}}$$



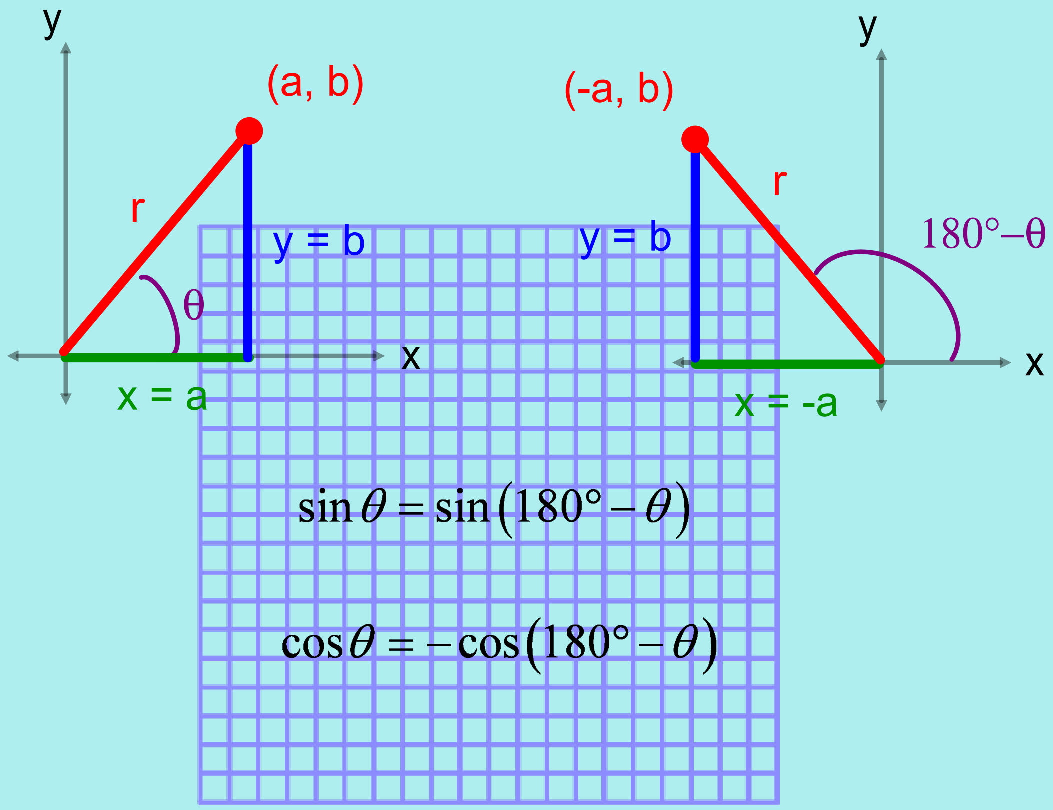
S o h C a h T o a

Apr 25-9:54 PM

To work with angles greater than 90°, we form a right-triangle using the terminal arm and the related acute angle.



Apr 19-9:19 PM



$$\sin\theta = \sin(180° - \theta)$$

$$\cos\theta = -\cos(180° - \theta)$$

Apr 25-10:27 PM

Trigonometry of Any Angle: The CAST Rule

May 2/2012

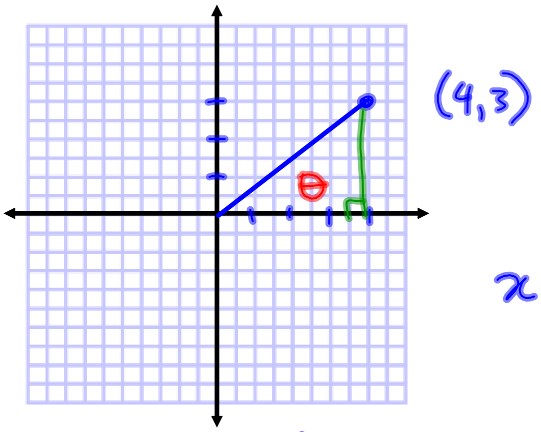
Any angle in standard position has a related acute angle. A right-triangle can always be drawn using this RAA.

Therefore any angle can be associated with the primary trig ratios.

The quadrant will determine the sign of the ratio.

Apr 19-9:13 PM

Ex.1 Consider P(4, 3)



$r = \sqrt{4^2 + 3^2}$

$r = \sqrt{25}$

$r = 5$

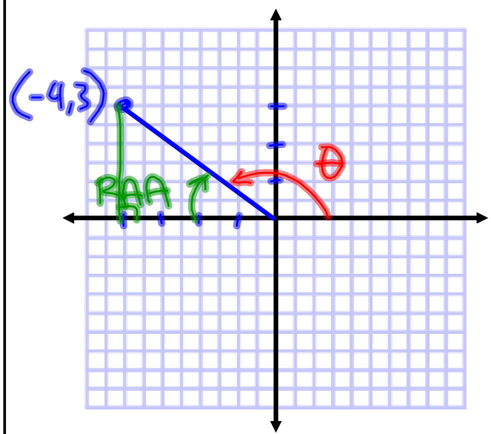
$x = 4,\ y = 3,\ r = 5$

$\sin\theta = \frac{y}{r} = \frac{3}{5}$ $\quad\cos\theta = \frac{x}{r} = \frac{4}{5}$ $\quad\tan\theta = \frac{y}{x} = \frac{3}{4}$

Q1 : $+$ $\quad + \quad +$

Apr 19-9:13 PM

Ex.2 Consider P(-4, 3)



$r = \sqrt{(-4)^2 + (3)^2}$

$r = 5$

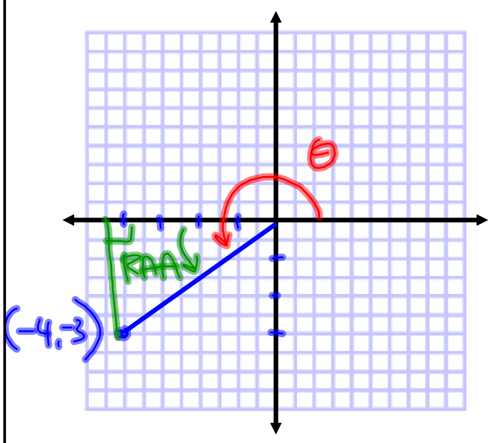
$x = -4,\ y = 3,\ r = 5$

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

Q2: $+$ $\quad - \quad -$

Apr 19-9:13 PM

Ex.3 Consider P(-4, -3)



$r=\sqrt{(-4)^2+(-3)^2}$

$r=5$

$x=-4,\ y=-3,\ r=5$

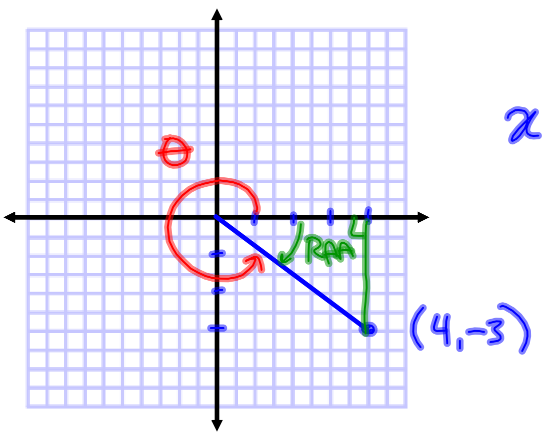
$\sin\theta=-\frac{3}{5}\quad \cos\theta=-\frac{4}{5}\quad \tan\theta=\frac{3}{4}$

Q3: $-\quad -\quad +$

Apr 19-9:13 PM

Ex.4 Consider P(4, -3)

$r=5$



$x=4,\ y=-3,\ r=5$

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

Q4: $-\quad +\quad -$

Apr 19-9:13 PM

The CAST rule allows us to quickly determine the sign of each trig ratio for any quadrant.

sin + cos - tan -	sin + cos + tan +
sin - cos - tan +	sin - cos + tan -

S	A
T	C

May 3-9:19 AM

Ex.5 Predict the sign of each value (verify with calculator)

(a) tan 135°

$135^\circ \rightarrow Q2$

$Q2 \rightarrow$ tan negative

(b) cos 240°

$240^\circ \rightarrow Q3$

$Q3 \rightarrow$ cos negative

(c) sin 430°

$430^\circ \rightarrow 360^\circ + 70^\circ$

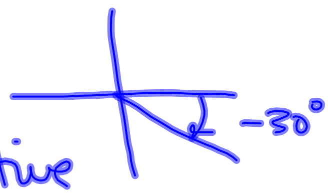
$70^\circ \rightarrow Q1$

$Q1 \rightarrow$ all positive

(d) tan(-30°)

$-30^\circ \rightarrow Q4$

$Q4 \rightarrow$ tan negative



S	A
T	C

May 3-9:22 AM

Ex.6 For $\tan\theta = -\frac{5}{24}$, where $0° \le \theta \le 360°$

(a) where (quadrant) is θ?

tan θ is negative → Q2 or Q4

(b) determine the primary trig ratios (exact values only)

Q2

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

$x = -24,\ y = 5$

$r = \sqrt{(-24)^2 + (5)^2}$

$r = \sqrt{601}$

$\sin\theta = \frac{y}{r} = \frac{5}{\sqrt{601}}$ $\quad \cos\theta = \frac{x}{r} = -\frac{24}{\sqrt{601}}$

Q4

$x = 24,\ y = -5,\ r = \sqrt{601}$

$\sin\theta = -\frac{5}{\sqrt{601}}$

$\cos\theta = \frac{24}{\sqrt{601}}$

S | A
T | C

May 3-9:24 AM

Ex.6 For $\tan\theta = -\frac{5}{24}$, where $0° \le \theta \le 360°$

(c) determine the value of θ to the nearest degree

① $\tan(RAA) = \left|-\frac{5}{24}\right|$ ← absolute value (always positive)

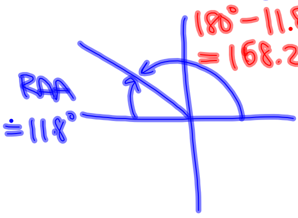
$\tan(RAA) = \frac{5}{24}$

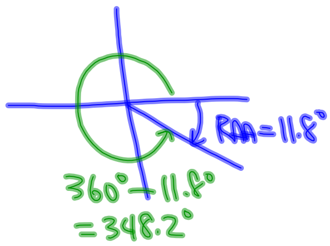
$RAA = \tan^{-1}\left(\frac{5}{24}\right)$

$RAA \doteq 11.8°$

S | A
T | C

② tan θ is negative in Q2 and Q4





∴ θ is 168.2° or 348.2°

May 3-9:24 AM

Assigned Work:

WS # 1- 4

Apr 21-12:17 AM