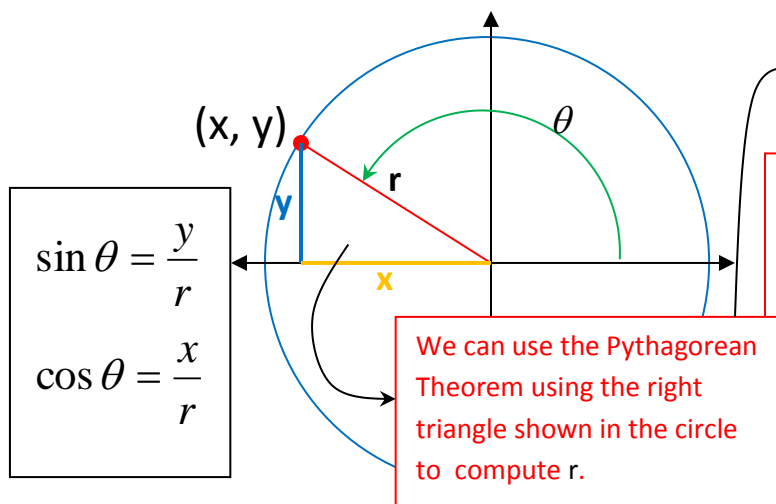
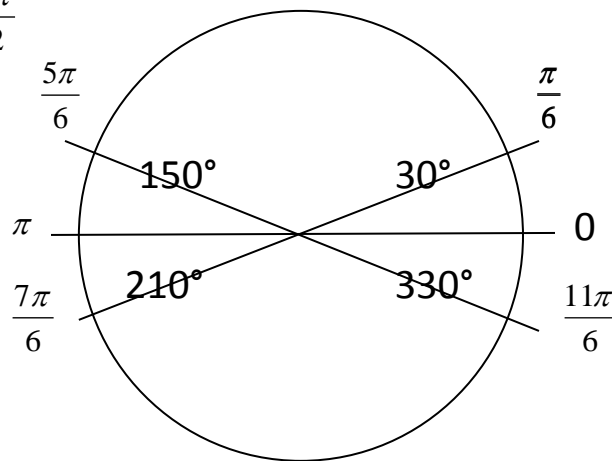
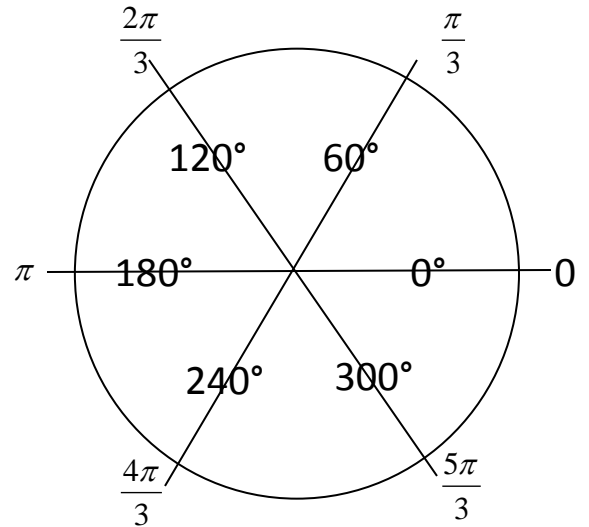
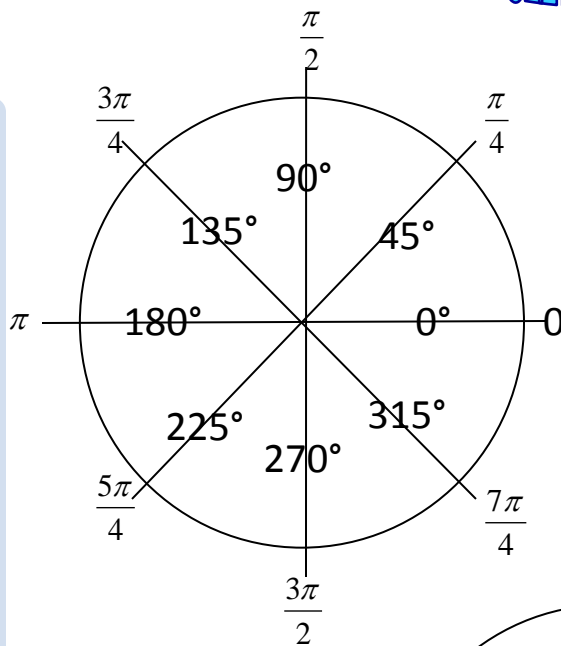


The Sine and Cosine Functions

Degrees
vs. Radians
in the unit
circle



EXAMPLES: Find $\sin\theta$ and $\cos\theta$...

1) If $(x, y) = (-3, 2)$

$$\begin{aligned} x^2 + y^2 &= r^2 \\ (-3)^2 + 2^2 &= r^2 \\ 9 + 4 &= r^2 \\ 13 &= r^2 \\ \sqrt{13} &= r \end{aligned}$$

Using the sin & cos formulas:

$$\begin{aligned} \sin\theta &= \frac{2}{\sqrt{13}} & \cos\theta &= \frac{-3}{\sqrt{13}} \\ \sin\theta &= \frac{2\sqrt{13}}{13} & \cos\theta &= \frac{-3\sqrt{13}}{13} \end{aligned}$$

(rationalize the denominator)

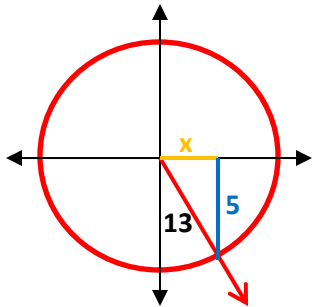
2) if $(x, y) = (4, -1)$

$$\begin{aligned} 4^2 + (-1)^2 &= r^2 & \sin\theta &= \frac{-1}{\sqrt{17}} & \cos\theta &= \frac{4}{\sqrt{17}} \\ 16 + 1 &= r^2 & \sin\theta &= \frac{-\sqrt{17}}{17} & \cos\theta &= \frac{4\sqrt{17}}{17} \\ 17 &= r^2 \\ \sqrt{17} &= r \end{aligned}$$

Missing a coordinate?

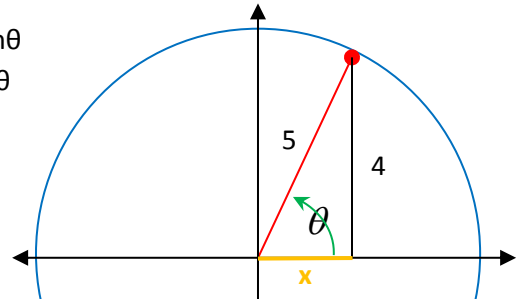
3) If θ is a fourth quadrant angle and $\sin\theta = -\frac{5}{13}$,

find $\cos\theta$



$$\begin{aligned} x^2 + 5^2 &= 13^2 \\ x^2 + 25 &= 169 \\ x^2 &= 144 \\ x &= \pm 12 \\ \text{Use } +12 &\text{ since the } x\text{-value in quadrant IV} \\ &\text{is positive.} \\ \cos\theta &= \frac{12}{13} \end{aligned}$$

4) Find $\sin\theta$ and $\cos\theta$



$$\begin{aligned} x^2 + 4^2 &= 5^2 & \sin\theta &= \frac{4}{5} \\ x^2 + 16 &= 25 \\ x^2 &= 9 & \cos\theta &= \frac{3}{5} \\ x &= +3 \text{ (quad I)} \end{aligned}$$

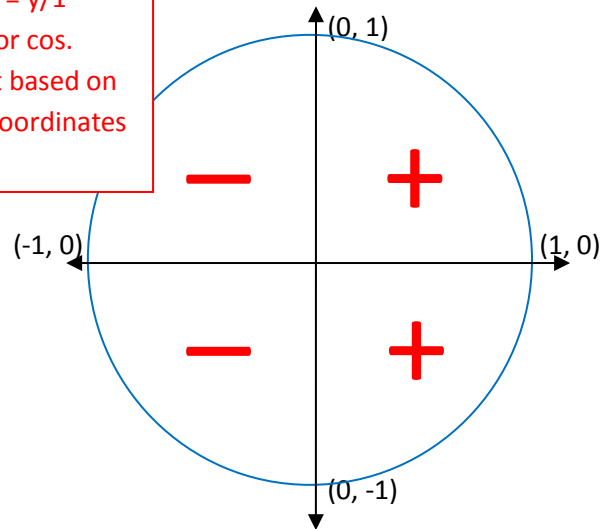
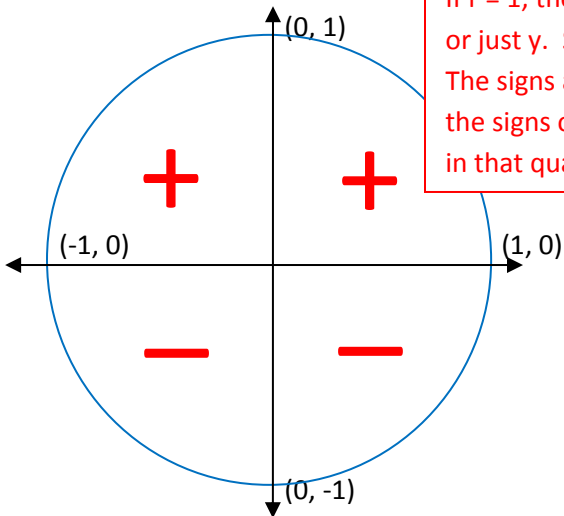
THE VALUES OF SIN & COS... POSITIVE OR NEGATIVE

The unit circle – any circle whose radius = 1

$\sin\theta = y$

$\cos\theta = x$

Using the formula: y/r
If $r = 1$, then $\sin\theta = y/1$ or just y . Same for \cos .
The signs are just based on the signs of the coordinates in that quadrant.



Examples: State whether each expression is positive or negative or (zero, +1 or -1). Use page 259

5) $\sin 182^\circ$

6) $\cos 50^\circ$

7) $\cos (-63.5^\circ)$

8) $\sin \frac{\pi}{3}$

See next page.

9) $\cos \frac{3\pi}{2}$

10) $\sin \frac{5\pi}{6}$

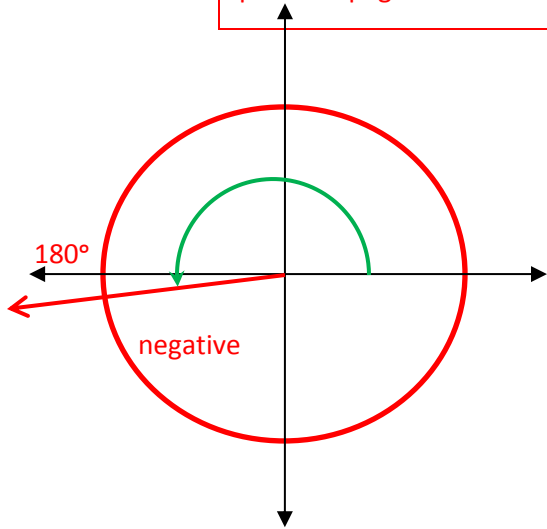
11) $\sin (-270^\circ)$

12) $\cos\left(-\frac{3\pi}{4}\right)$

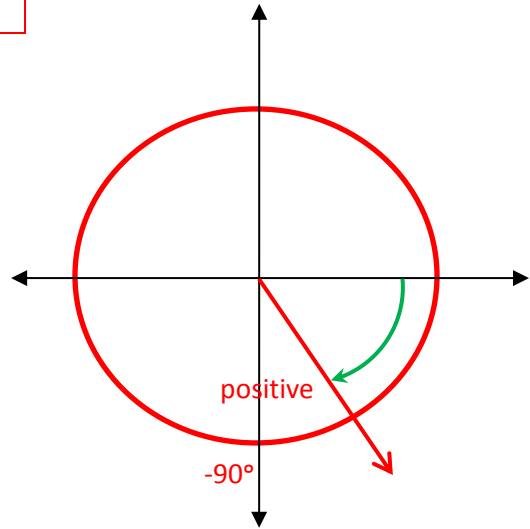
13) $\sin 270^\circ$

5) $\sin 182^\circ$

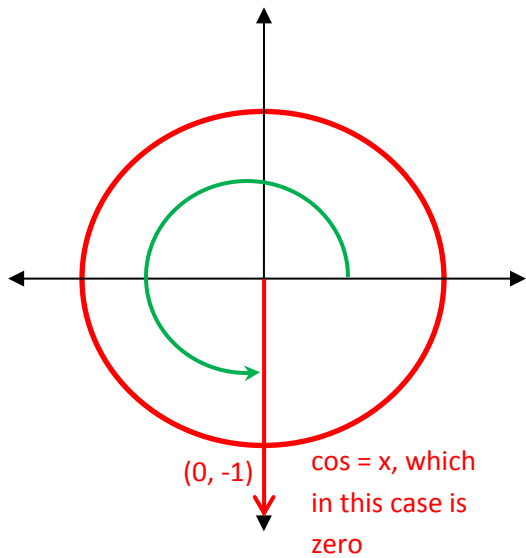
Simply locate the angle on the unit circle, then consult the sin & cos charts from the previous page to determine its sign.



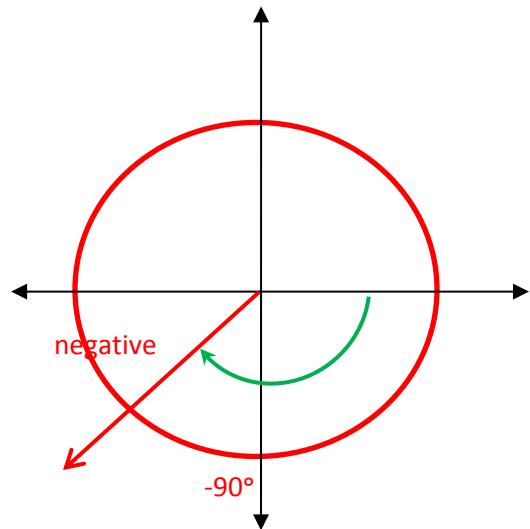
7) $\cos (-63.5^\circ)$



9) $\cos \frac{3\pi}{2}$



12) $\cos \left(-\frac{3\pi}{4}\right)$



The reasoning is the same for the other examples.