Section 3.3 **The Unit Circle and Circular Functions**

Recall that we previously defined the trigonometric functions as

$\sin\theta = \frac{y}{r}$ $\cos\theta = \frac{x}{r}$ $\tan\theta = \frac{y}{x}$

The unit circle is a circle with a radius of 1.

On the unit circle, r = 1, so the definitions simplify to be:

Circular Function Definitions

For any real number ***s*** represented by a directed arc on the unit circle,

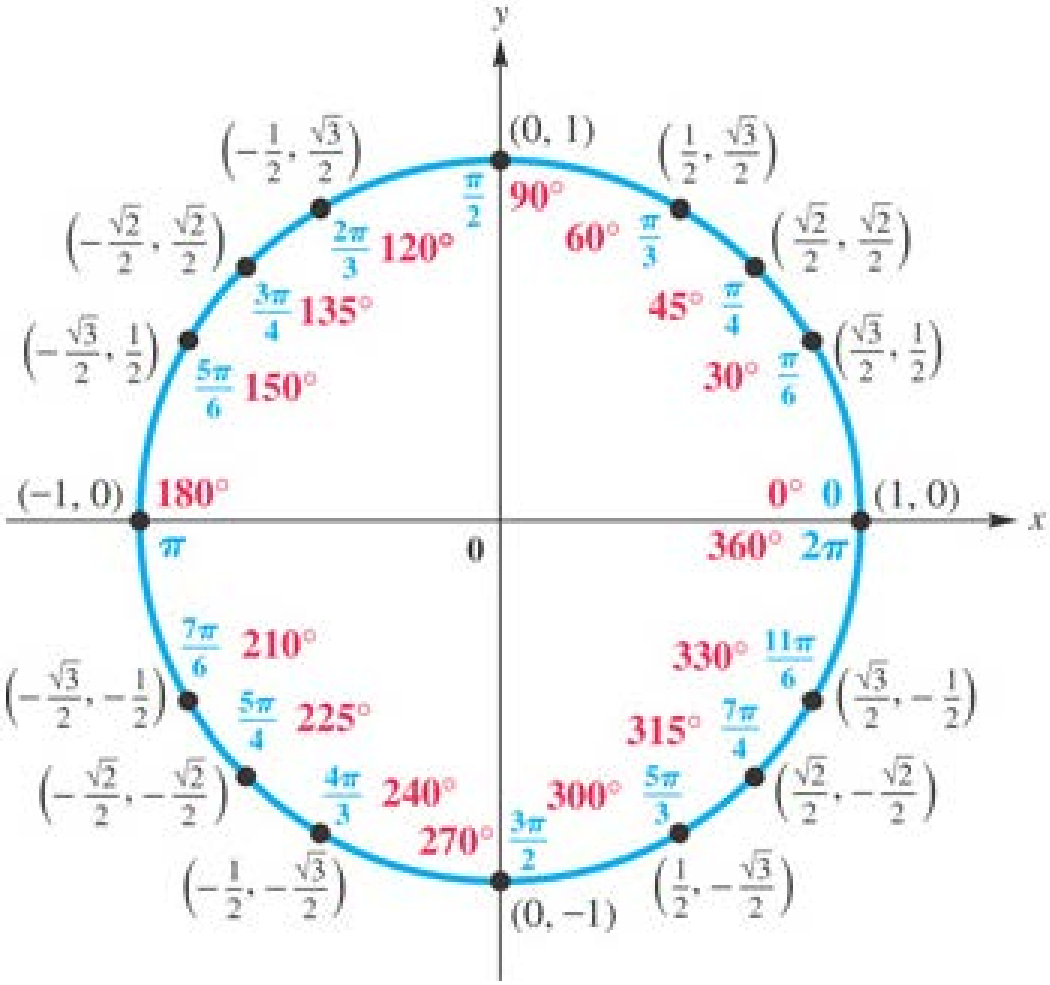
$\sin s = y$ $\cos s = x$ $\tan s = \frac{y}{x}$

$\csc s = \frac{1}{y}$ $\sec s = \frac{1}{x}$ $\cot s = \frac{x}{y}$

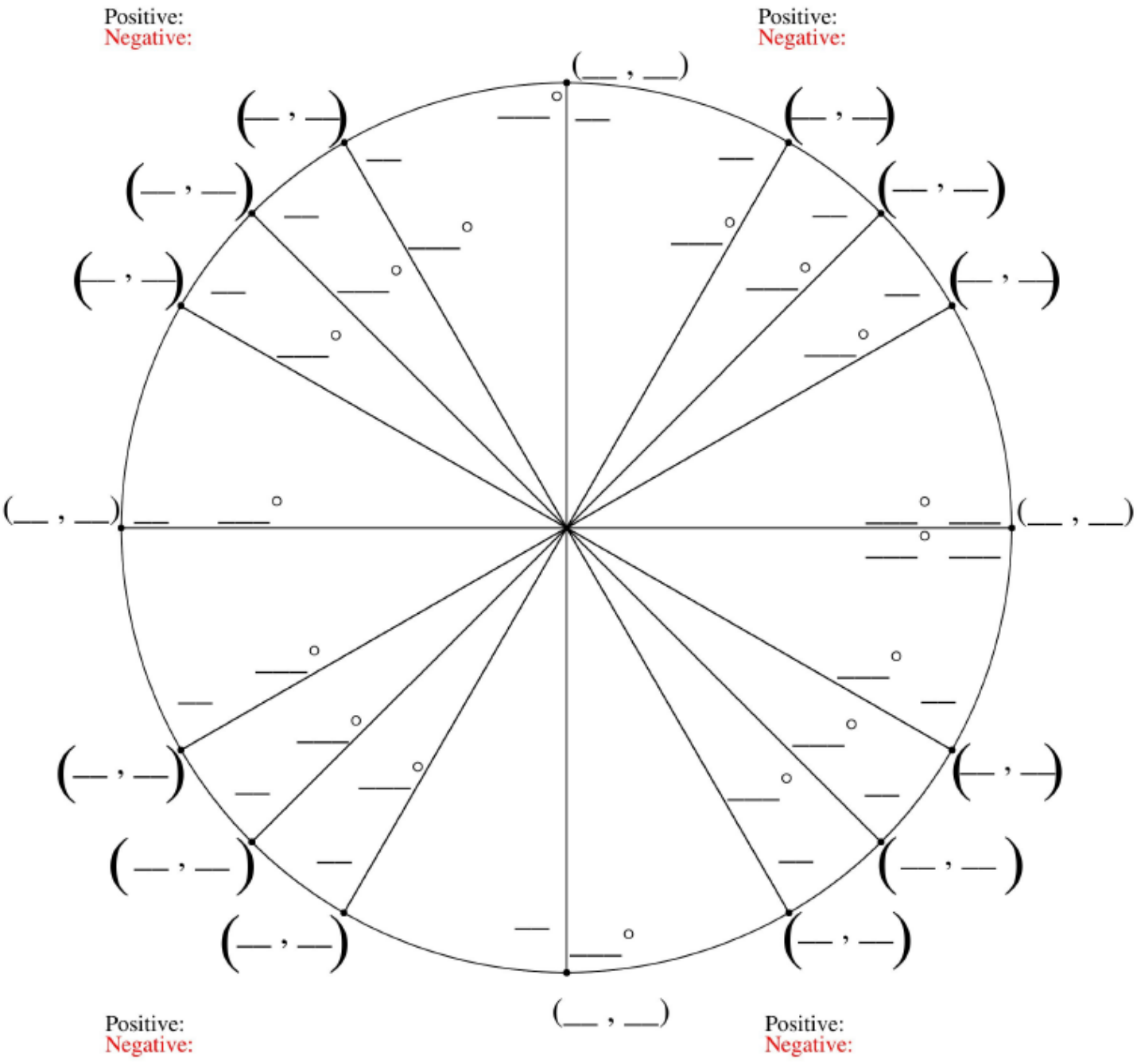
Recall that $s = r\theta$.

If $r = 1$, then the **arclength $s = \theta$ radians.**

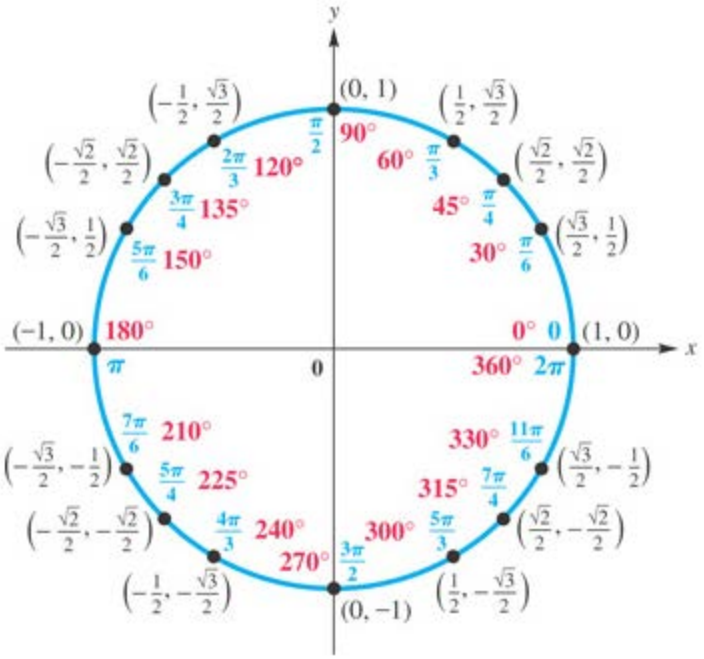
(s is a real number)



Practice Labeling the Degrees, radians, and points on the unit circle from memory.



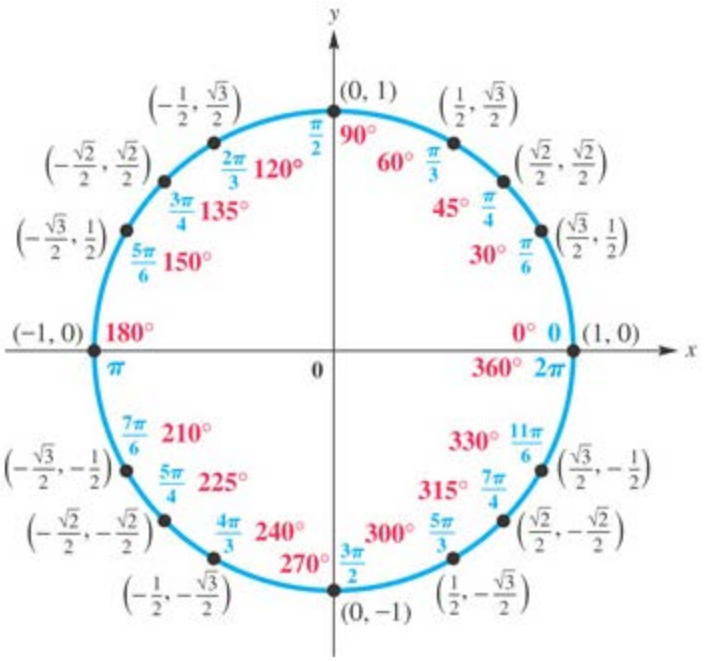
Can you label all of these values from memory in 5 minutes? Time yourself.



Example 1: Given that real number $s = -\frac{3\pi}{2}$,

find a) sin *s*, b) cos *s*, c) tan *s*.

Example 2: Find the exact circular function values for each of the following.



a) $\sin\frac{7\pi}{4}$

b) $\cos\frac{11\pi}{6}$

c) $\tan\frac{13\pi}{3}$

Example 3: Find a calculator approximation for each circular function value. *Use RADIAN mode

a) $\sin 0.6109$ b) $\cos(-1.1519)$ c) $\sec 2.8440$

Example 4: Find the value of s in the interval $[0, \frac{\pi}{2}]$ that makes each statement true. *Use RADIAN mode

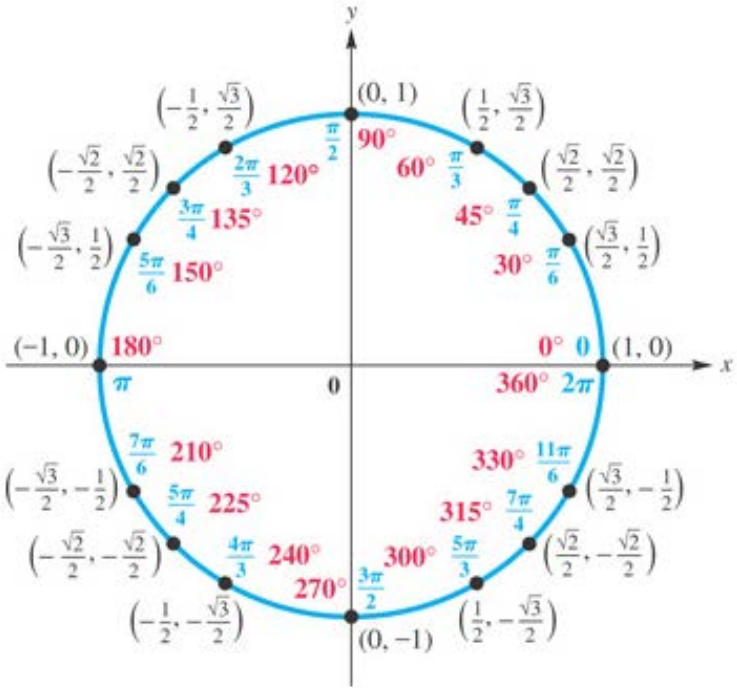
a) $\tan s = 0.2126$ b) $\csc s = 1.0219$

Example 5: Find the exact value of s in the given interval that has the given circular function value. Do not use a calculator.

a) $\left[\frac{\pi}{2}, \pi\right]$; $\cos s = -\frac{1}{2}$

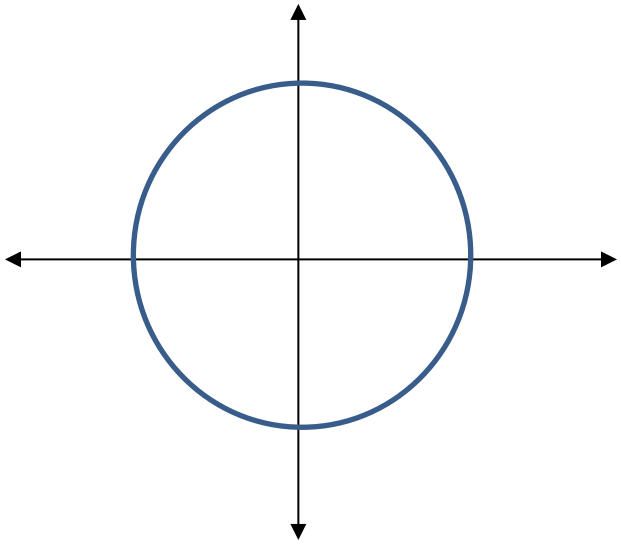
b) $\left[\pi, \frac{3\pi}{2}\right]$; $\tan s = \frac{\sqrt{3}}{3}$

c) $\left[\frac{3\pi}{2}, 2\pi\right]$; $\sin s = -\frac{\sqrt{2}}{2}$

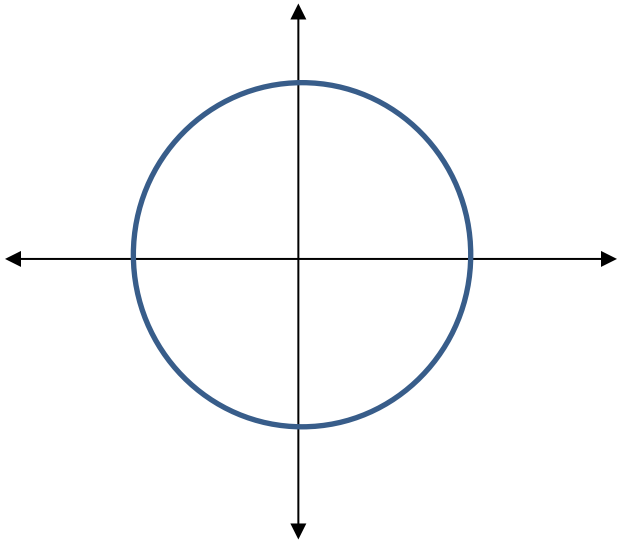


Example 6: Find the exact value of s in the given interval that has the given circular function value. Do not use a calculator.

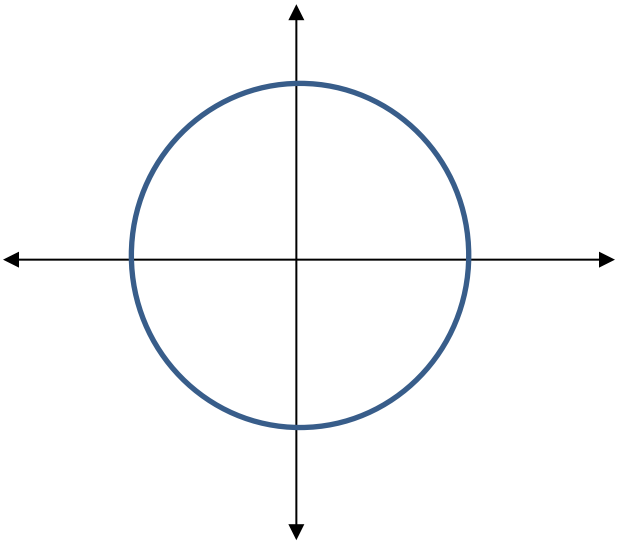
a) $[0, 2\pi)$; $\sin s = -\frac{\sqrt{3}}{2}$



b) $[0, 2\pi)$; $\cos^2 s = \frac{1}{2}$

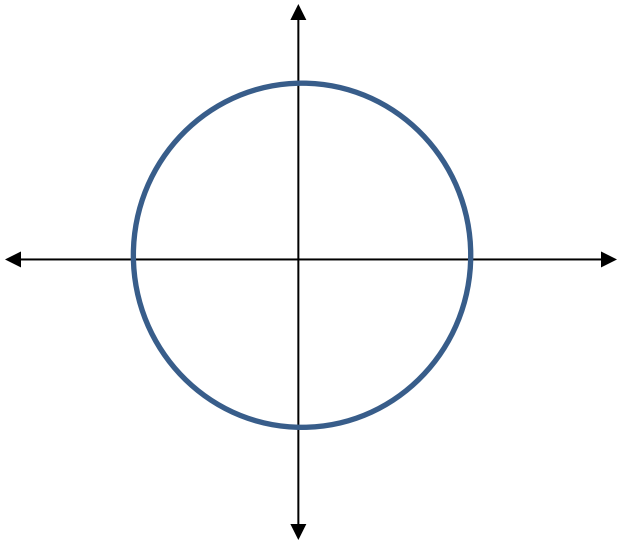


c) $[0, 2\pi)$; $\tan^2 s = 3$

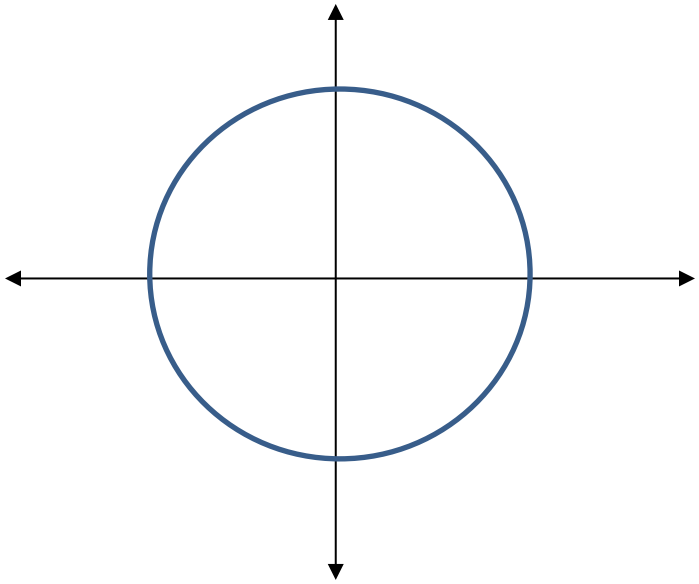


Example 7: Find the approximate value of s in the given interval that has the given circular function value. Use a calculator.

d) $[0, 2\pi)$; $\sin s = 0.82639$



e) $[0, 2\pi)$; $\cos s = 0.42378$



f) $[0, 2\pi)$; $\tan s = 2.75$