

(Key)

6.5 The Unit Circle

- I can identify angles on the unit circle and can find values of their sine, cosine and tangent
- I can find angles with a given sine, cosine or tangent

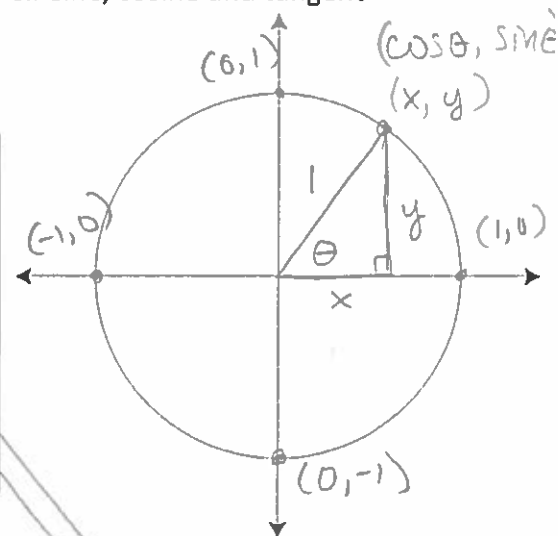
VOCABULARY

Unit Circle – A circle centered at $(0,0)$ with a radius of 1 .

The x-coordinate of a point on the unit circle \rightarrow cosine θ

The y-coordinate of a point on the unit circle \rightarrow sine θ

Tangent = $\frac{\text{opp}}{\text{adj}} = \frac{y}{x}$



Quadrant	x-coordinate	y-coordinate	$\sin \theta$ opp	$\cos \theta$ adj	$\tan \theta$ (y/x)
I	+	+	+	+	+
II	-	+	-	+	-
III	-	-	-	-	+
IV	+	-	+	-	-

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{x}{1} = x$$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{y}{1} = y$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{y}{x}$$



Label the coordinates of the point for 0° , 90° , 180° and 270° on the unit circle above.

Ex 1: Find the given value without your calculator.

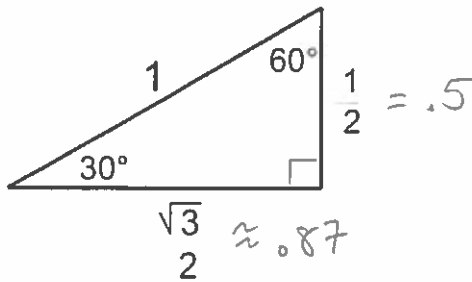
a. $\sin 90^\circ = 1$ b. $\cos 270^\circ = 0$ c. $\tan 180^\circ = \frac{0}{-1} = 0$ d. $\sin -90^\circ = -1$

Ex 2: Find the value(s) of θ , for $0^\circ \leq \theta < 360^\circ$, that have the given function value.

a. $\sin \theta = 0$ $0^\circ, 180^\circ$ b. $\cos \theta = -1$ 180° c. $\tan \theta$ is undefined $90^\circ, 270^\circ$
 $\frac{y}{x}$

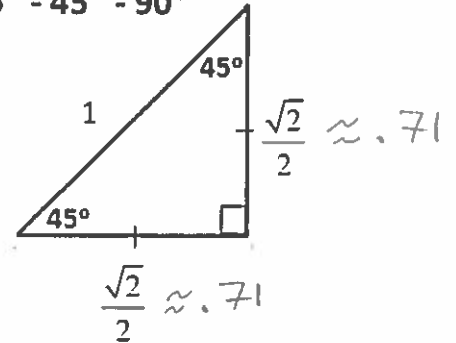
Let's consider other angles. Remember the special right triangles?

$30^\circ - 60^\circ - 90^\circ$

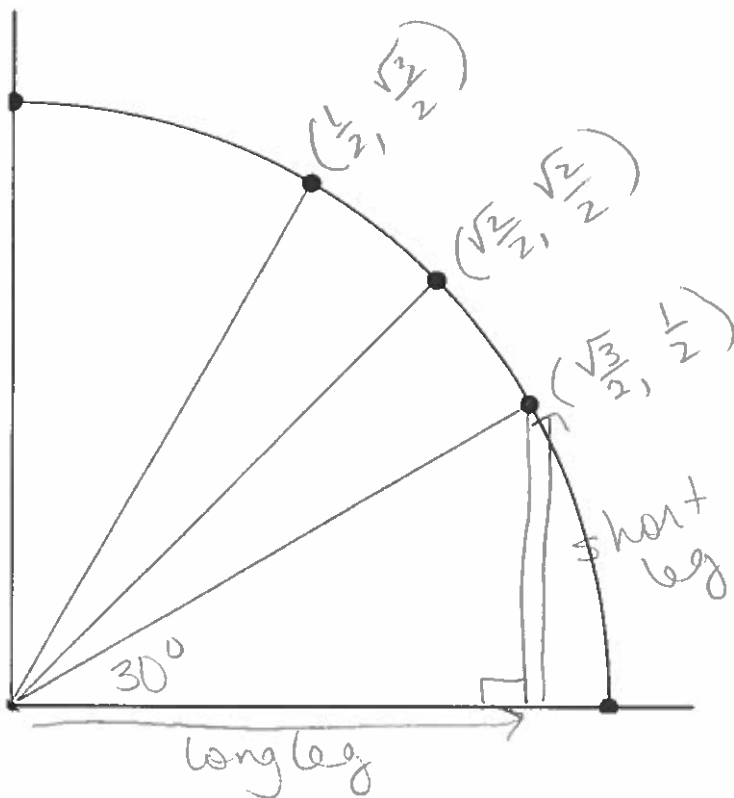


This triangle is scalene.
It has a short leg and a long leg.

$45^\circ - 45^\circ - 90^\circ$



This triangle is isosceles.
The legs are the same length.



Use the side lengths of the special right triangles to find the coordinates of these points in the first quadrant.

Now use these angles as reference angles to find sine and cosine of angles in the other three quadrants.
Write them on your unit circle sheet.

Find the exact values. You may not use a calculator. For now, you may use your unit circle sheet, but we will be working to be able to determine these values without the filled in sheet.

Ex 3: Angles in Degrees

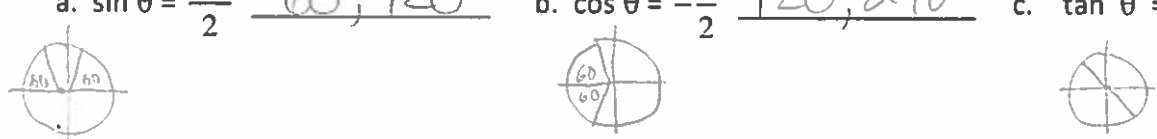
a. $\cos 120^\circ = -\frac{1}{2}$ b. $\cos -300^\circ = \frac{1}{2}$ c. $\sin 225^\circ = \frac{-\sqrt{2}}{2}$
 d. $\tan 225^\circ = 1$ e. $\sin -180^\circ = 0$ f. $\tan 300^\circ = \frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}} = -\sqrt{3}$
 g. $\cos 540^\circ = -1$ h. $\sin -240^\circ = \frac{\sqrt{3}}{2}$ i. $\sin 270^\circ = -1$
 j. $\sin 330^\circ = -\frac{1}{2}$ k. $\cos 240^\circ = -\frac{1}{2}$ l. $\sin 135^\circ = \frac{\sqrt{2}}{2}$

Ex 4: Angles in Radians

a. $\sin \frac{\pi}{4} = \frac{\sqrt{2}}{2}$ b. $\cos -\frac{\pi}{2} = 0$ c. $\sin \frac{5\pi}{4} = \frac{-\sqrt{2}}{2}$
 d. $\tan \frac{7\pi}{4} = -1$ e. $\sin \frac{5\pi}{6} = \frac{1}{2}$ f. $\tan -\frac{3\pi}{2} = \frac{1}{0} = \text{undefined}$
 g. $\cos \frac{\pi}{3} = \frac{1}{2}$ h. $\sin \frac{11\pi}{6} = -\frac{1}{2}$ i. $\sin \frac{4\pi}{3} = \frac{-\sqrt{3}}{2}$
 j. $\sin -\frac{5\pi}{4} = \frac{\sqrt{2}}{2}$ k. $\cos -\pi = -1$ l. $\sin 3\pi = 0$

Ex 5: Find the value(s) of θ , for $0^\circ \leq \theta < 360^\circ$, that have the given function value.

a. $\sin \theta = \frac{\sqrt{3}}{2}$ $60^\circ, 120^\circ$ b. $\cos \theta = -\frac{1}{2}$ $120^\circ, 240^\circ$ c. $\tan \theta = -1$ $135^\circ, 315^\circ$



* what angle has that trig ratio?
- Consider the quadrants

Ex 6: Find the value(s) of θ , for $0 \leq \theta < 2\pi$, that have the given function value.

a. $\sin \theta = -\frac{\sqrt{2}}{2}$ $\frac{5\pi}{4}, \frac{7\pi}{4}$ b. $\cos \theta = -\frac{\sqrt{3}}{2}$ $\frac{5\pi}{6}, \frac{7\pi}{6}$ c. $\tan \theta = \sqrt{3}$ $\frac{\pi}{3}, \frac{4\pi}{3}$

