

Objective: Use reference angles to find the values of Sin, Cos, Tan of any special angle in the unit circle.

1st Q (pink sheet)

Reference Angle (α): An acute angle where $0^\circ < \theta < 90^\circ$ that can be used to find the values of the other special angles in the unit circle.

To find an angle's reference angle, find the angle distance to the x-axis.

Example 1: Find the reference angle for the following:

1. $\theta = 120^\circ$

2. $\theta = 225^\circ$

3. $\theta = 330^\circ$

4. $\theta = 240^\circ$

$\alpha = 60^\circ$

$\alpha = 45^\circ$

$\alpha = 30^\circ$

$\alpha = 60^\circ$

In general, how can we find reference angles in degrees: $\pm 180^\circ$ OR 360°

$\frac{2nd\ Q}{180 - \theta}$ $\frac{3rd\ Q}{\theta - 180^\circ}$ $\frac{4th\ Q}{360 - \theta}$

Example 2: Find the reference angle for the following:

(Think about how the denominators relate when in radians)

1. $\theta = 2\pi/3$

2. $\theta = 7\pi/4$

3. $\theta = 7\pi/6$

4. $\theta = 4\pi/3$

$\alpha = \pi/3$

$\alpha = \pi/4$

$\alpha = \pi/6$

$\alpha = \pi/3$

In general, how can we find reference angles in radians: $\pi/\text{denominator}$

A. List the angles where 30° is the reference angle: $150^\circ, 210^\circ, 330^\circ$
 $180-30, 180+30, 360-30$

B. List the angles where 45° is the reference angle: $135^\circ, 225^\circ, 315^\circ$
 $180-45, 180+45, 360-45$

C. List the angles where 60° is the reference angle: $120^\circ, 240^\circ, 300^\circ$
 $180-60, 180+60, 360-60$

~~D. What is the reference angles for $90^\circ, 180^\circ, 270^\circ, 360^\circ$?~~

Now let's use reference angles to find values of Sin and Cos for angles around the unit circle:

Use only your pink chart to help!

<i>Evaluate θ</i>	<i>Quadrant</i>	<i>(+ or -)</i>	<i>Reference (α)</i>	<i>Answer</i>
1. Sin 120°	<u>II</u>	+	60°	$+\sqrt{3}/2$
2. Cos 225°	<u>III</u>	-	45°	$-\sqrt{2}/2$
3. Cos -60°	<u>IV</u>	+	60°	$+1/2$
4. Sin 90°	y-axis		—	1
5. Cos 315°	<u>IV</u>	+	45°	$+\sqrt{2}/2$
6. Sin $(-5\pi/4)$	<u>II</u>	+	$\pi/4$	$\sqrt{2}/2$
7. Cos π				-1
8. Sin $(11\pi/6)$	<u>IV</u>	-	$\pi/6$	$-1/2$
9. Cos $(-\pi/6)$				
10. Tan <u>135°</u>	<u>II</u>	-	45°	-1
11. Tan $(2\pi/3)$	<u>II</u>	-	$\pi/3$	$-\sqrt{3}$