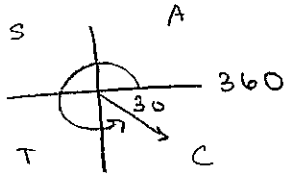
Name: Key Alg2 CC

# 8-2 The Unit Circle CW
## Sin, Cos, Tan

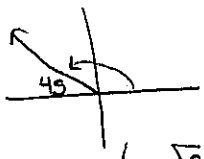
1. Draw a rotation diagram for each of the following angles and then determine the ordered pair that lies on the unit circle for each angle. (Remember, $x = \cos\theta$ *and* $y = \sin\theta$)

(a) $\theta = 330^\circ$



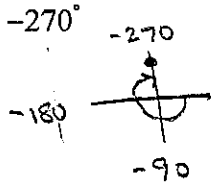

$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

* (b) $\theta = 135^\circ$



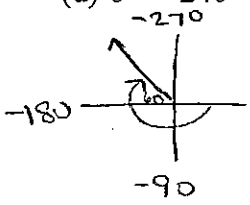

$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

* (c) $\theta = -270^\circ$




$(0, 1)$

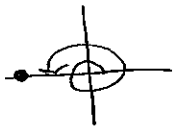
(d) $\theta = -240^\circ$




$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

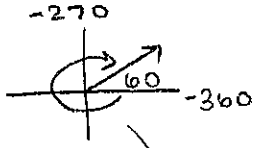
(e) $\theta = 540^\circ$

$\begin{array}{r} 540 \\ -360 \\ \hline 180 \end{array}$



$(-1, 0)$

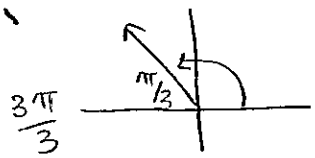
(f) $\theta = -300^\circ$




$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

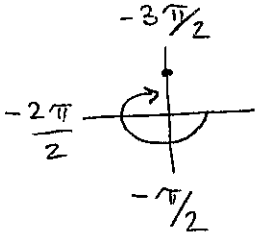
2. Draw a rotation diagram for each of the following radian angles and then determine the ordered pair that lies on the unit circle for each angle.

* (a) $\alpha = \frac{2\pi}{3}$ ref ∠ = 60°



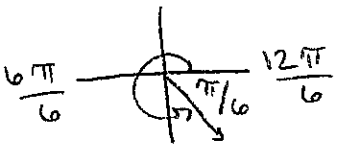

$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

(b) $\alpha = -\frac{3\pi}{2}$



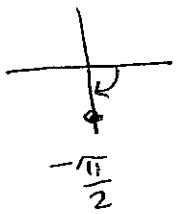

$(0, 1)$

(c) $\alpha = \frac{11\pi}{6}$ ref ∠ = 30°



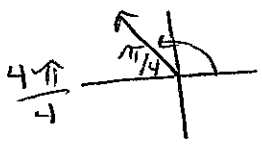

$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

(d) $\alpha = -\frac{\pi}{2}$



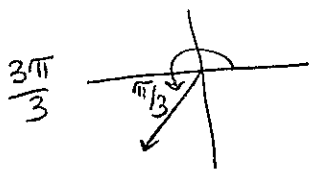

$(0, -1)$

(e) $\alpha = \frac{3\pi}{4}$ ref ∠ = 45°




$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

(f) $\alpha = \frac{4\pi}{3}$ ref ∠ = 60°




$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

3. There are other points on the unit circle besides the ones that we determined in this lesson. Every point, though, must satisfy the equation $x^2 + y^2 = 1$. For each of the following problems, either the $x$ or $y$ coordinate of a point on the unit circle is given. Find all possibilities for the other coordinate for this point using the unit circle equation.

(a) $x = \frac{3}{5}$

$\left(\frac{3}{5}\right)^2 + y^2 = 1$

$\frac{9}{25} + y^2 = \frac{25}{25}$

$\sqrt{y^2} = \sqrt{\frac{16}{25}}$

$y = \pm \frac{4}{5}$

(b) $y = -\frac{5}{13}$

$x^2 + \left(-\frac{5}{13}\right)^2 = 1$

$x^2 + \frac{25}{169} = \frac{169}{169}$

$\sqrt{x^2} = \sqrt{\frac{144}{169}}$

$x = \frac{12}{13}$

(c) $x = \frac{1}{4}$

$\left(\frac{1}{4}\right)^2 + y^2 = 1$

$\frac{1}{16} + y^2 = \frac{16}{16}$

$\sqrt{y^2} = \sqrt{\frac{15}{16}}$

$y = \pm \frac{\sqrt{15}}{4}$

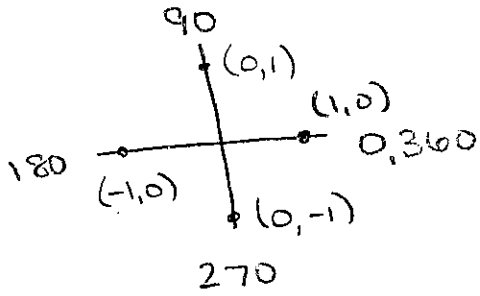
4. Which of the following is not equal to $\sin(270^\circ)$?

(1) $\cos(180^\circ)$ $-1$

(2) $-\cos(0^\circ)$ $-1$

(3) $-\sin(90^\circ)$ $-1$

(4) $\sin(360^\circ)$ $0$




5. The terminal ray of an angle drawn in standard position passes through the point $(0.28, -0.96)$, which lies on the unit circle. Which of the following represents the sine of this angle?

(1) $-0.96$

(2) $-0.68$

(3) $0.28$

(4) $-0.29$

$y$

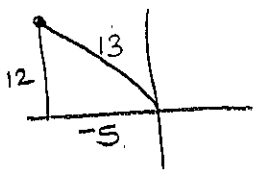
6. The point $A(-5, 12)$ lies on the circle whose equation is $x^2 + y^2 = 169$. $\sqrt{169} = 13$ Which of the following would represent the cosine of an angle drawn in standard position whose terminal rays passes through $A$?

(1) $-5$

(2) $-\frac{5}{12}$

(3) $-\frac{5}{13}$

(4) $12$



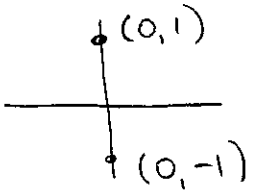

$\cos A = \frac{a}{h}$

$\frac{-5}{13}$

7. Which of the following values cannot be the sine of an angle? Hint, think about the range of $y$-values on the unit circle.

(1) $\frac{7}{13}$ (3) $-\frac{3}{2}$ $-1.5$

(2) $-\frac{\sqrt{5}}{3}$ (4) $\frac{\sqrt{11}}{4}$




* 8. For an angle drawn in standard position, it is known that its cosine is negative and its sine is positive. The terminal ray of this angle must terminate in which quadrant?

(1) I (3) III

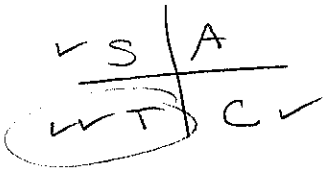
(2) II (4) IV


9. If both the sine and cosine of an angle are less than zero, then when drawn in standard position in which quadrant would the terminal ray fall?

negative

(1) I (3) III

(2) II (4) IV

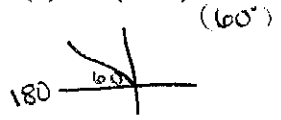



10. Use the hand trick, and the definition of tangent in terms of sine and cosine to find the exact values for each of the following. Don't leave any complex fractions.

(a) tan(30°)

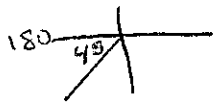
$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$

(b) tan(120°)



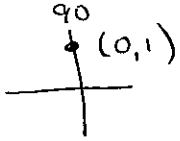

$\frac{\frac{\sqrt{3}}{2}}{-\frac{1}{2}} = -\sqrt{3}$

(c) tan(225°) (45)




$\frac{-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -1$

(d) tan(90°)




$\frac{1}{0}$

undefined

11. The point $(0.28, 0.96)$ (cos, sin) lies on the unit circle. Which of the following is closest to the tangent of an angle drawn in standard position whose terminal ray passes through this point?

(1) 3.43 (3) 0.29

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{.96}{.28} = 3.428$

(2) 1.73 (4) 0.42

12. At which of the following angles is the tangent function undefined? division by 0

(1) $\theta = 180°$ (3) $\theta = 45°$ $\tan\theta = \frac{\sin\theta}{\cos\theta}$ when $\cos\theta = 0$

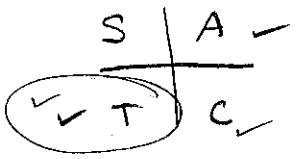
(2) $\theta = -90°$ (4) $\theta = -360°$

positive negative $-90$

* 13. For an angle $\alpha$ it is known that $\tan(\alpha) > 0$ and $\sin(\alpha) < 0$. The terminal ray of $\alpha$ when drawn in standard position must lie in which quadrant?

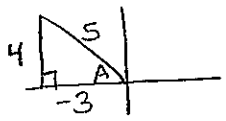
(1) I (3) III

(2) II (4) IV




14. For each of the following problems, the value of either sine or cosine of an angle is given along with the quadrant in which the terminal ray of the angle lies. For each, produce the values of the two missing trigonometric functions. Some of your answers will have radicals (irrational numbers) in them. You should *not* leave complex fractions.

(a) $\cos(A) = \frac{-3}{5}$ and $A$ terminates in quadrant II.




$(-3)^2 + x^2 = 5^2$

$9 + x^2 = 25$

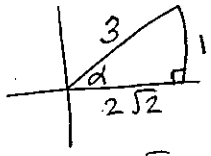
$x^2 = 16$

$x = \pm 4$

$\sin A = \frac{4}{5}$

$\tan A = \frac{-4}{3}$

* (b) $\sin(\alpha) = \frac{1}{3}$ and $\alpha$ terminates in quadrant I.




$1^2 + x^2 = 3^2$

$1 + x^2 = 9$

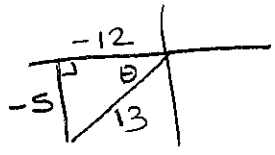
$\sqrt{x^2} = \sqrt{8}$

$x = \pm 2\sqrt{2}$

$\cos\alpha = \frac{2\sqrt{2}}{3}$

$\tan\alpha = \frac{1}{2\sqrt{2}}$

(c) $\sin(\theta) = -\frac{5}{13}$ and $\theta$ terminates in quadrant III.




$(-5)^2 + x^2 = 13^2$

$25 + x^2 = 169$

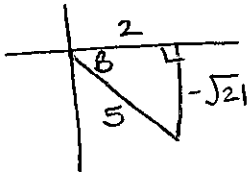
$x^2 = 144$

$x = \pm 12$

$\cos\theta = \frac{-12}{13}$

$\tan\theta = \frac{-5}{-12} = \frac{5}{12}$

(d) $\cos(B) = \frac{2}{5}$ and $B$ terminates in quadrant IV.




$2^2 + x^2 = 5^2$

$4 + x^2 = 25$

$x^2 = 21$

$x = \pm\sqrt{21}$

$\sin B = \frac{-\sqrt{21}}{5}$

$\tan B = \frac{-\sqrt{21}}{2}$