Algebra III: B.5.3 Unit Circle Name Key Date ____________

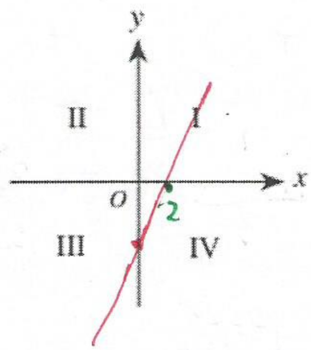
Bell Work: ACT Practice Items. Work each item. Show ***sufficient*** work. Bubble your answers.

1.	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
2.	Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
3.	Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ

1. What are the quadrants of the standard (x,y) coordinate plane below that contain points on the graph of the equation $4x - 2y = 8$?

x	y
2	0
0	-4

quadrants of the standard (x,y) coordinate plane



A. I and III only
~~**B.**~~ I, II, and III only
~~**C.**~~ I, II, and IV only
D. I, III, and IV only
~~**E.**~~ II, III, and IV only

2. The graph of $y = -5x^2 + 9$ passes through $(1,2a)$ in the standard (x,y) coordinate plane. What is the value of a ?

F. 2
G. 4
H. 7
J. -1
K. -8

$2a = -5 + 9$

$2a = 4$

$a = 2$

3. Jerome, Kevin, and Seth shared a submarine sandwich. Jerome ate $\frac{1}{2}$ of the sandwich, Kevin ate $\frac{1}{3}$ of the sandwich, and Seth ate the rest. What is the ratio of Jerome's share to Kevin's share to Seth's share?

A. 2:3:6
B. 2:6:3
C. 3:1:2
D. 3:2:1
E. 6:3:2

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

$\frac{6}{6} - \frac{3}{6} - \frac{2}{6} = \frac{1}{6}$

$\frac{3}{6}$ to $\frac{2}{6}$ to $\frac{1}{6}$

3 to 2 to 1

Section 5.3 Exercises

$\cos\theta = x$

$\sin\theta = y$

1. Find the quadrant in which the terminal point determined by t lies if
   a. $\sin(t) < 0$ and $\cos(t) < 0$ III (negative) b. $\sin(t) > 0$ and $\cos(t) < 0$ II

2. Find the quadrant in which the terminal point determined by t lies if
   a. $\sin(t) < 0$ and $\cos(t) > 0$ $(+,-)$ IV b. $\sin(t) > 0$ and $\cos(t) > 0$ $+$ $+$ $(+,+)$ I

3. The point P is on the unit circle. If the y-coordinate of P is $\frac{3}{5}$, and P is in quadrant II, find the x coordinate.

   $x = -\frac{4}{5}$

   $a^2 + \left(\frac{3}{5}\right)^2 = 1^2$ $a^2 + \frac{9}{25} = \frac{25}{25}$ $a^2 = \frac{16}{25}$ $a = \pm\frac{4}{5}$

4. The point P is on the unit circle. If the x-coordinate of P is $\frac{1}{5}$, and P is in quadrant IV, find the y coordinate.

   $\left(\frac{1}{5}\right)^2 + y^2 = 1$ $\frac{1}{25} + y^2 = \frac{25}{24}$ $y = \sqrt{\frac{24}{25}}$ $-\frac{2\sqrt{6}}{5}$

5. If $\cos(\theta) = \frac{1}{7}$ and θ is in the 4th quadrant, find $\sin(\theta)$.

   $x = \frac{1}{7}$ $y = ?$ $\left(\frac{1}{7}\right)^2 + y^2 = 1$ $y^2 = \frac{49}{49} - \frac{1}{49}$ $y = \sqrt{\frac{48}{49}} = -\frac{4\sqrt{3}}{7}$

6. If $\cos(\theta) = \frac{2}{9}$ and θ is in the 1st quadrant, find $\sin(\theta)$.

   $\left(\frac{2}{9}\right)^2 + y^2 = 1$ $y = \sqrt{\frac{81}{81} - \frac{4}{81}} = \frac{\sqrt{77}}{9}$

7. If $\sin(\theta) = \frac{3}{8}$ and θ is in the 2nd quadrant, find $\cos(\theta)$. < 0

   $x^2 + \left(\frac{3}{8}\right)^2 = 1 \rightarrow x^2 = \frac{64}{64} - \frac{9}{64}$ $x = -\frac{\sqrt{55}}{8}$

8. If $\sin(\theta) = -\frac{1}{4}$ and θ is in the 3rd quadrant, find $\cos(\theta)$.

   $x^2 + \left(-\frac{1}{4}\right)^2 = 1$ $x^2 = \frac{16}{16} - \frac{1}{16}$ $x = -\frac{\sqrt{15}}{4}$

9. For each of the following angles, find the reference angle and which quadrant the angle lies in. Then compute sine and cosine of the angle.
   a. 225° III b. 300° IV c. 135° II d. 210° III

   $\sin 225 = \cos 225 = -\frac{\sqrt{2}}{2}$

   b. $\sin 300° = -\frac{\sqrt{3}}{2}$ $\cos 300° = \frac{1}{2}$

   c. $\sin 135° = \frac{\sqrt{2}}{2}$ $\cos 135° = -\frac{\sqrt{2}}{2}$

   d. $\sin 210° = -\frac{1}{2}$ $\cos 210° = -\frac{\sqrt{3}}{2}$

10. For each of the following angles, find the reference angle and which quadrant the angle lies in. Then compute sine and cosine of the angle.
   a. 120° II b. 315° IV ~~c. 250°~~ d. 150° II

   $\sin 120° = +\frac{\sqrt{3}}{2}$ $\cos 120° = -\frac{1}{2}$

   $\sin 315° = -\frac{\sqrt{2}}{2}$ $\cos 315° = \frac{\sqrt{2}}{2}$

   $\cos 150° = -\frac{\sqrt{3}}{2}$ $\sin 150° = \frac{1}{2}$

11. For each of the following angles, find the reference angle and which quadrant the angle lies in. Then compute sine and cosine of the angle.

a. $\frac{5\pi}{4}$ III b. $\frac{7\pi}{6}$ III c. $\frac{5\pi}{3}$ IV d. $\frac{3\pi}{4}$ II

a. $\sin\frac{5\pi}{4} = \cos\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

b. $\sin\frac{7\pi}{6} = -\frac{1}{2}$ $\cos\frac{7\pi}{6} = -\frac{\sqrt{3}}{2}$

c. $\sin\frac{5\pi}{3} = -\frac{\sqrt{3}}{2}$ $\cos\frac{5\pi}{3} = \frac{1}{2}$

d. $\sin\frac{3\pi}{4} = \frac{\sqrt{2}}{2}$ $\cos\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$

$\frac{4\pi}{4}$, $\frac{5\pi}{4}$, 45 $\frac{6\pi}{6}$, $\frac{7\pi}{6}$, 30 $\frac{6\pi}{3}$, $\frac{5\pi}{3}$, 60° 45

12. For each of the following angles, find the reference angle and which quadrant the angle lies in. Then compute sine and cosine of the angle.

a. $\frac{4\pi}{3}$ III b. $\frac{2\pi}{3}$ II c. $\frac{5\pi}{6}$ II d. $\frac{7\pi}{4}$ IV

$\sin\frac{4\pi}{3} = -\frac{\sqrt{3}}{2}$ $\sin\frac{2\pi}{3} = \frac{\sqrt{3}}{2}$ $\sin\frac{5\pi}{6} = \frac{1}{2}$ $\sin\frac{7\pi}{4} = -\frac{\sqrt{2}}{2}$

$\cos\frac{4\pi}{3} = -\frac{1}{2}$ $\cos\frac{2\pi}{3} = -\frac{1}{2}$ $\cos\frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$ $\cos\frac{7\pi}{4} = \frac{\sqrt{2}}{2}$

13. Give exact values for $\sin(\theta)$ and $\cos(\theta)$ for each of these angles.

a. $-\frac{3\pi}{4}$ b. $\frac{23\pi}{6} = \frac{11\pi}{6}$ c. $-\frac{\pi}{2}$ d. $5\pi = \pi$ $(-1,0)$

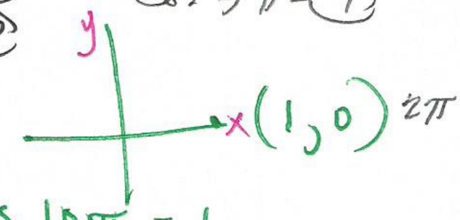
$\sin -\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$ $\sin\frac{11\pi}{6} = -\frac{1}{2}$ $(0,-1)$ $\sin -\frac{\pi}{2} = -1$ $\sin 5\pi = 0$

$= \cos -\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$ $\cos\frac{11\pi}{6} = \frac{\sqrt{3}}{2}$ $\cos -\frac{\pi}{2} = 0$ $\cos 5\pi = -1$

$\cos -\frac{2}{3}\pi = -\frac{1}{2}$

14. Give exact values for $\sin(\theta)$ and $\cos(\theta)$ for each of these angles.

a. $-\frac{2\pi}{3}$ b. $\frac{17\pi}{4}$ $\cos\frac{17\pi}{4} = \frac{\sqrt{2}}{2}$ c. $-\frac{\pi}{6}$ d. $10\pi \leftarrow 2\pi$



$\sin -\frac{2}{3}\pi = -\frac{\sqrt{3}}{2}$ $\sin\frac{17\pi}{4} = \frac{\sqrt{2}}{2}$ $\cos -\frac{\pi}{6} = \frac{\sqrt{3}}{2}$ $\cos 10\pi = 1$

$\sin -\pi/6 = -\frac{1}{2}$ $\sin 10\pi = 0$

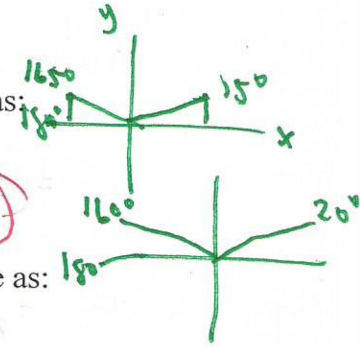
15. Find an angle θ with $0 < \theta < 360°$ or $0 < \theta < 2\pi$ that has the same sine value as:

a. $\frac{\pi}{3}$ $\frac{2\pi}{3}$ b. 80° 100° c. 140° 40° d. $\frac{4\pi}{3}$ $\frac{5\pi}{3}$ e. 305° 235°

16. Find an angle θ with $0 < \theta < 360°$ or $0 < \theta < 2\pi$ that has the same sine value as:

$\frac{3\pi}{4}$

a. $\frac{\pi}{4}$ b. 15° 165° c. 160° 20° d. $\frac{7\pi}{6}$ $\frac{11\pi}{6}$ e. 340° 200°

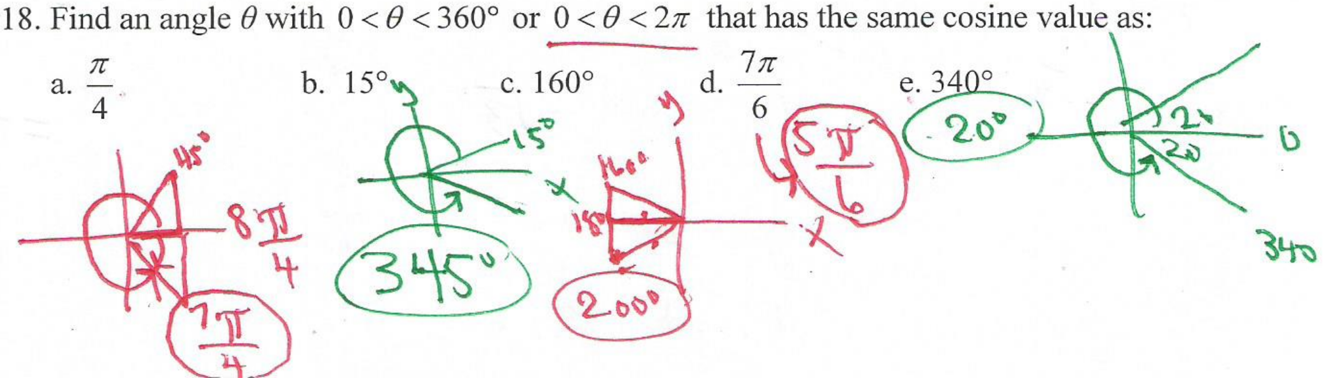


17. Find an angle θ with $0 < \theta < 360°$ or $0 < \theta < 2\pi$ that has the same cosine value as:

a. $\frac{\pi}{3}$ $\frac{5\pi}{3}$ b. 80° 280° c. 140° 220° d. $\frac{4\pi}{3}$ $\frac{2\pi}{3}$ e. 305° 55°

18. Find an angle θ with $0 < \theta < 360°$ or $0 < \theta < 2\pi$ that has the same cosine value as:

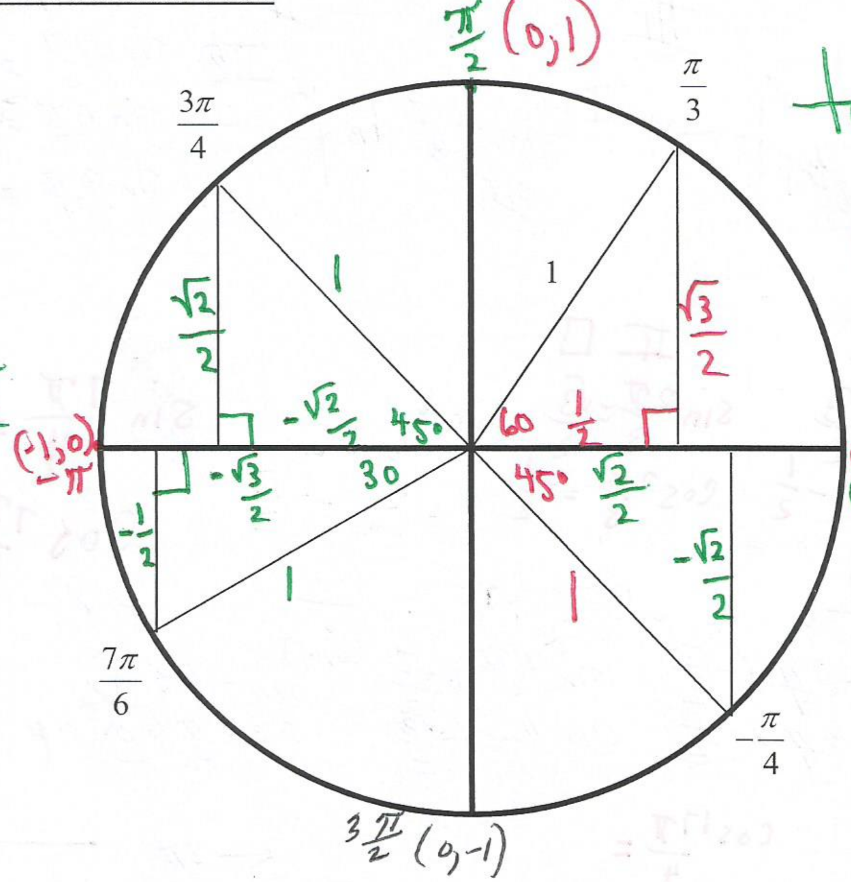
a. $\frac{\pi}{4}$ b. 15° c. 160° d. $\frac{7\pi}{6}$ $\frac{5\pi}{6}$ e. 340° 20°



19. Label the triangles (<u>sides</u> and <u>angles</u>). Label the ***ordered pairs*** and ***radians*** on the axes in the unit circle, and then use the unit circle to find the trigonometric ratios below. Write all ratios in ***simplest radical form***. **<u>Show sufficient work.</u>**

$\frac{2}{-\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$-\frac{\cancel{2}\sqrt{2}}{\cancel{2}}$



$\tan\theta = \frac{\sin\theta}{\cos\theta}$

$\sec\theta = \frac{1}{\cos\theta}$

$\csc\theta = \frac{1}{\sin\theta}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{\cos\theta}{\sin\theta}$

a. $\cos\frac{\pi}{2} = 0$

b. $\tan\frac{3\pi}{4} = -1$

c. $\sec\frac{\pi}{3} = 2$

d. $\sec\frac{3\pi}{4} = -\sqrt{2}$

e. $\sec(-\pi) = -1$

f. $\csc\frac{-\pi}{4} = -\sqrt{2}$

g. $\tan 0 = 0$

h. $\csc\frac{7\pi}{6} = -2$

i. $\cot\frac{\pi}{2} = 0$

j. $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

k. $\cot\frac{-\pi}{4} = -1$

l. $\sin\frac{-\pi}{4} = -\frac{\sqrt{2}}{2}$

m. $\cot\frac{7\pi}{6} = \sqrt{3}$

n. $\sin\frac{3\pi}{4} = \frac{\sqrt{2}}{2}$

o. $\cos\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$

p. $\csc\frac{3\pi}{2} = -1$

q. $\cos\frac{\pi}{3} = \frac{1}{2}$

r. $\tan\frac{-\pi}{4} = -1$

s. $\cos\frac{7\pi}{6} = -\frac{\sqrt{3}}{2}$

t. $\tan\frac{\pi}{3} = \sqrt{3}$

u. $\sec\frac{7\pi}{6} = -\frac{2\sqrt{3}}{3}$