Name: _____ Date: _____

MORE WORK WITH THE SINE AND COSINE FUNCTIONS
COMMON CORE ALGEBRA II

The sine and cosine functions are the first a student typically encounters that are **non-algebraic**, that is they cannot be thought of as combinations of a finite number of integer powers and/or roots. Since they are defined by using the geometry of a circle they are not all that intuitive. Additional practice will be given in this lesson to simply get used to them.

***Exercise* #1:** Recall the following definitions of the sine and cosine functions. If θ is an angle drawn in standard position whose terminal ray passes through the point (x, y) on the unit circle then …

$\sin(\theta) =$ and $\cos(\theta) =$

***Exercise* #2:** Given the function $f(x) = 6\sin(x)$ which of the following is the value of $f(60^\circ)$?

(1) $4\sqrt{2}$ (3) 3

(2) $3\sqrt{3}$ (4) 0

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***Exercise* #3:** If $g(\alpha) = 4\cos(\alpha) - 2\sin(\alpha)$ then $g(330^\circ) = ?$

(1) $8\sqrt{2} + 3$ (3) $2\sqrt{3} + 1$

(2) $4\sqrt{3} - 2$ (4) $6\sqrt{2} - 4$

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***Exercise* #4:** Which of the following is not equal to one?

(1) $\cos(0^\circ)$ (3) $\sin(90^\circ)$

(2) $\cos(360^\circ)$ (4) $\sin(270^\circ)$

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***Exercise* #5:** For an angle α whose terminal ray lies in the third quadrant it is known that $\cos(\alpha) = -0.96$. Which of the following is the value of $\sin(\alpha)$?

(1) –0.28 (3) 0.04

(2) –0.56 (4) 0.78

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A special relationship exists between the trigonometric values of an angle and those of its reference angle. This important relationship is illustrated in the next exercise.

***Exercise* #6:** In each of the following, an angle and its reference have been given. Using your calculator, in **degree mode**, determine the sine and cosine of **both** the angle and its reference. Round all answers to the nearest *hundredth*.

(a) $\theta = 110^\circ$ and $\theta_r = 70^\circ$ (b) $\theta = 235^\circ$ and $\theta_r = 55^\circ$ (c) $\theta = 282^\circ$ and $\theta_r = 78^\circ$

Clearly the absolute value of the sine and cosine are the same for an angle and its reference. This fact can be exploited to produce sine and cosine values for angles if they are known for their references.

***Exercise* #7:** Given that $\cos(30^\circ) = \sqrt{3}/2$ and $\sin(30^\circ) = 1/2$, determine the following values in exact form.

(a) $\cos(150^\circ)$ (b) $\sin(150^\circ)$ (c) $\cos(210^\circ)$

(d) $\sin(210^\circ)$ (e) $\cos(330^\circ)$ (f) $\sin(330^\circ)$

We should not forget that the trigonometric functions are valid for radians as well as degrees. Practice evaluating these functions for each of the following radian inputs. If needed, convert to degrees.

***Exercise* #8:** Evaluate each of the following trigonometric expressions.

(a) $\sin\left(\frac{\pi}{2}\right)$ (b) $\sin\left(\frac{\pi}{3}\right)$ (c) $\cos\left(\frac{3\pi}{2}\right)$ (d) $\cos\left(\frac{3\pi}{4}\right)$

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MORE WORK WITH THE SINE AND COSINE FUNCTIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. If $f(x)=10\sin(x)-3$ then $f(30^\circ)=?$

   (1) $-\sqrt{3}/2-3$ (3) $-5/2$

   (2) 2 (4) $4/3-\sqrt{3}/2$ _____

2. If $f(x)=2x$ and $g(x)=\cos(x)$ then $g\left(f\left(\frac{\pi}{2}\right)\right)=?$

   (1) 1 (3) 0

   (2) $-\sqrt{2}/2$ (4) -1 _____

3. Which of the following represents a rational number?

   (1) $\sin\left(\frac{\pi}{6}\right)$ (3) $\cos\left(\frac{\pi}{4}\right)$

   (2) $\sin\left(\frac{2\pi}{3}\right)$ (4) $\cos\left(\frac{5\pi}{4}\right)$ _____

4. When drawn in standard position, an angle β has a terminal ray that lies in the third quadrant. It is known that $\cos(\beta)=-\frac{8}{17}$. Which of the following represents the value of $\sin(\beta)$?

   (1) $-\frac{9}{17}$ (3) $-\frac{15}{17}$

   (2) $\frac{8}{9}$ (4) $\frac{7}{9}$ _____

5. Which of the following is equal to $\sin(300^\circ)$?

   (1) $\sin(60^\circ)$ (3) $-\sin(60^\circ)$

   (2) $\sin(30^\circ)$ (4) $-\sin(30^\circ)$ _____

6. For an angle α it is known that its reference angle has a sine value of $\frac{4}{5}$. If the terminal ray of α, when drawn in standard position, falls in the third quadrant then what is the value of $\cos(\alpha)$?

(1) $-\frac{3}{5}$ (3) $-\frac{4}{5}$

(2) $\frac{3}{4}$ (4) $\frac{5}{3}$

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7. The point $E(-7,-24)$ lies on the circle whose equation is $x^2+y^2=625$. If an angle is drawn in standard position and its terminal ray passes through *E*, what is the value of the sine of this angle?

(1) –7 (3) –24

(2) $-\frac{7}{24}$ (4) $-\frac{24}{25}$

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8. If it is known that $\sin\left(\frac{\pi}{3}\right)=\frac{\sqrt{3}}{2}$ and $\cos\left(\frac{\pi}{3}\right)=\frac{1}{2}$ then find the value of each of the following. To begin, first determine in which quadrant each angle's terminal ray lies.

(a) $\sin\left(\frac{2\pi}{3}\right)$ (b) $\cos\left(\frac{4\pi}{3}\right)$ (c) $\sin\left(\frac{5\pi}{3}\right)$ (d) $\cos\left(-\frac{2\pi}{3}\right)$

9. Which of the following could not be the value of $\sin(\theta)$? Explain how you can tell.

(1) $-\frac{11}{13}$ (3) $\frac{\sqrt{34}}{5}$

(2) $-\frac{\sqrt{23}}{5}$ (4) $\frac{1}{2}$

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10. A person on a Ferris wheel sits a distance of 45 feet from the Ferris wheel's center. If they are at an angle of 120°, when measured in standard position, then how high above the center of the wheel are they, to the nearest foot?

(1) 39 feet (3) 23 feet

(2) 12 feet (4) 32 feet

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