

Answer Key – Questions from the Unit Circle Degrees and Radians

Label the function graph you just created on your butcher paper $y = \sin x$.

1. What is the period of the sine curve? That is, what is the wavelength? After how many degrees (or radians) does the graph start to repeat? How do you know it repeats after this point?

360° or 2π radians
This is one rotation around the unit circle. After this it repeats because it is just going around the same unit circle again.

2. What are the zeroes of this function? (Remember: The x -values are measuring angles and zeroes are the x -intercepts.)

$0^\circ, 180^\circ, 360^\circ$
or 0 radians, π radians, and 2π radians

3. What are the x -values at the maxima and minima of this function?

90° and 270°
or $\frac{\pi}{2}$ radians and $\frac{3\pi}{2}$ radians

4. What are the y -values at the maxima and minima?

1 and -1

5. Imagine this function as it continues in both directions. Explain how you can predict the value of the sine of 390° (or $\frac{13\pi}{6}$ radians).

30° or $\frac{\pi}{6}$ radians
Explanations will vary. Students may reason that 390° is 30° past 360° and will therefore be at the same point on the function graph as 30° . Similarly, students may reason that 390° is coterminal to 30° on the unit circle and therefore has the same sine value. A similar explanation can be made in radians.

6. Write 1 paragraph explaining why $\sin 30^\circ = \sin 150^\circ$ (or $\sin \frac{\pi}{6} = \sin \frac{5\pi}{6}$). Refer to both the unit circle and the graph of the sine curve.

Explanations will vary. Students should discuss the related heights on the unit circle and the nature of the curve of the function graph.

You used the length of the vertical leg of a triangle in the unit circle to find the related y-value in the sine curve. Determine what length from the unit circle will give you the y-value for a cosine curve. Using a different color, create the graph on your butcher paper and label it $y = \cos x$.

7. In what ways are the sine and cosine graphs similar? Be sure to include a discussion of intercepts, maxima, minima, and period.

Answers may vary but should include: same overall shape, both have a range from -1 to 1 , both have a period of 360° or 2π radians. Students may include details such as intercepts are 180° or π radians apart and maximum and minimum points are 180° or π radians apart.

8. In what ways are the sine and cosine graphs different? Again, be sure to include a discussion of intercepts, maxima, minima, and period.

Answers may vary but should include: y-intercept is at 0 for sine and at 1 for cosine, intercepts for one occur at maxima or minima for the other.

9. Will sine graphs continue infinitely in either direction? How do you know? Identify the domain and range of $y = \sin x$.

Domain: all real numbers, $(-\infty, \infty)$, or $-\infty < x < \infty$
Range: $(-1, 1)$ or $-1 < y < 1$

10. Will cosine graphs continue infinitely in either direction? How do you know? Identify the domain and range of $y = \cos x$.

Domain: all real numbers, $(-\infty, \infty)$, or $-\infty < x < \infty$
Range: $(-1, 1)$ or $-1 < y < 1$