PCFU H9&H10: Coordinates on a Circle & Applications Name:_____

Answers with explanations

1. Al Jabra is riding on a Ferris wheel with an entry point similar to the unit circle. The Ferris wheel has a radius of 4 meters. Al has rotated counterclockwise $\frac{5\pi}{6}$ radians when the Ferris wheel stops to load other passengers. What are the coordinates of Al's position when he stops? Explain how you obtained your answer.

   I know that to find the coordinates for Al's position I will need to use my unit circle. Once I find the coordinates that correspond to the angle that measures $\frac{5\pi}{6}$ radians on the unit circle, I will need to multiply each by the radius of the actual Ferris wheel. On the unit circle I found $\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right)$ as the coordinate for $\frac{5\pi}{6}$ radians which is in quadrant II. So Al's location would be found by $\left(4 \cdot \frac{-\sqrt{3}}{2}, 4 \cdot \frac{1}{2}\right)$ which equals $\left(\frac{-4\sqrt{3}}{2}, \frac{4}{2}\right)$. This reduces to $(-2\sqrt{3}, 2)$.

2. The average monthly temperature at RDU Airport from 1970 to 2010 can be modeled by this equation:

$$y = 18\sin\left(\frac{\pi}{6}x\right) + 64$$

   a) What is the period of this function? The period is 12. I found this by dividing 2π by the coefficient, b. That is $2\pi \div \frac{\pi}{6} = 2\pi \cdot \frac{6}{\pi} = 12$.

   b) What does it mean in the context of this problem? It means that the pattern will complete and repeat after 12 units. The units will be months since we are talking about average monthly temperature.

   c) What is the amplitude of this function? The amplitude is 18. The amplitude is the vertical stretch which is multiplied in the front of the function.

   d) What does it mean in the context of this problem? In this case, the amplitude would represent the temperature fluctuating up dand down. With the midline at 64, the average temperature would range from 64+18 = 82 down to 64-18=48.

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Additional Practice

1. Mary Goround got a thumbtack stuck in the 26-inch tire of her bicycle. When she discovered the tack, the tire had already rotated $\frac{5\pi}{4}$ radians FROM THE GROUND. What are the coordinates of the thumbtack when Mary discovered it? Hint: Get your unit circle! Find the angle where the thumbtack was discovered. Recall, any coordinate on the circle can be found by $(radius \cdot cos\theta, radius \cdot sin\theta)$.

2. The height of the water in Boston Harbor can be modeled by the following equation: $H(t) = 4.8\sin\left(\frac{\pi}{3}t\right) + 5.1$, where t represents time in hours.
   a) What is the midline of this function?
   b) What does it mean in the context of the problem?

   c) What is the amplitude of the function?
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   e) What is the period of the function?

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