Day 9 Trig Word Problems

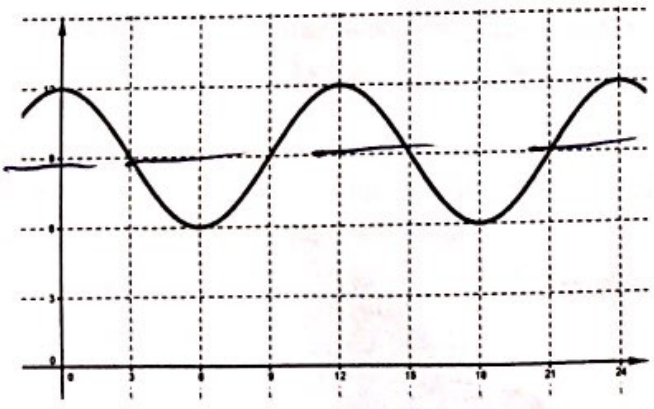
1. The initial behavior of the vibrations of the note E above middle C can be modeled by $y = 0.5 \sin 660\pi t$.
   a. What is the amplitude of this model? $\frac{1}{2}$
   b. What is the period of this mode? $\frac{2\pi}{660\pi} = \frac{1}{330}$

2. If the equilibrium point is $y = 0$, then $y = -4\cos(\frac{\pi}{6}t)$ models a buoy bobbing up and down in the water.
   a. What is the period of the function? $\frac{2\pi}{\pi/6} = \frac{2\pi}{1} \cdot \frac{6}{\pi} = 12$
   b. What is the location of the buoy at $t = 10$. $= -2$

3. A rodeo performer spins a lasso in a circle perpendicular to the ground. The height of the knot from the ground is modeled by $y = -3\cos(\frac{5\pi}{3}t) + 3.5$, where t is the time measured in seconds.
   a. What is the highest point reached by the knot? $3.5+3 = 6.5$ ft
   b. What is the lowest point reached by the knot? $3.5-3 = .5$ ft
   c. What is the period of the model? $2\pi/5\pi/3 = \frac{2\pi}{1} \cdot \frac{3}{5\pi} = 6/5$ sec
   d. According to the model, find the height of the knot after 25 seconds. 2 ft

4. The function $y = 25\sin(\frac{\pi}{6}t) + 60$, where t is in months and $t = 0$ corresponds to April 15, models the average high temperature in degrees Fahrenheit in Centerville.
   a. Find the period of the function. $\frac{2\pi}{\pi/6} = \frac{2\pi}{1} \cdot \frac{6}{\pi} = 12$ months
   b. What does the period **represent**? Avg Temp repeats every year
   c. What is the maximum high temperature? 85°F
   d. **When** does the maximum occur? $x = 3 \rightarrow$ July 15

5. The figure shows the depth of water at the end of a boat dock. The depth is 6 feet at low tide and 12 feet at high tide. On a certain day, low tide occurs at 6 A.M. and high tide occurs at noon. If y represents the depth of the water x hours after midnight, use a **cosine function** of the form $y = A\cos Bx + D$ to model the water's depth.



$y = 3\cos(\frac{\pi}{6}x) + 9$

$a = 3$

$p = 12$

$b = \frac{2\pi}{12} = \pi/6$

6. An average seated adult breathes in and out every 4 seconds. The average minimum amount of air in the lungs is 0.08 cubic liters, and the average maximum amount of air in the lunges is 0.82 cubic liters. Suppose the lunges have a minimum amount of air at $t = 0$, where t is the time in seconds.

$a = \frac{1}{2}(.82 - .08) = .37$

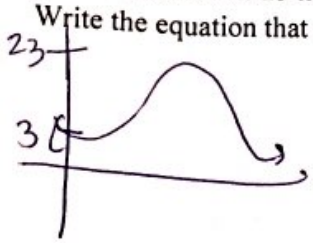
a. Write a function that models the amount of air in the lungs.

$y = .37\cos\left(\frac{\pi}{2}x\right) + .45$ $P = 4$ $\frac{2\pi}{4} = b = \pi/2$

b. Determine the amount of air in the lungs at 5.5 seconds.

.7116 cubic liters

7. A Ferris wheel at an amusement park has riders get on **at position A**, which is 3 m above the ground. The highest point of the ride is 23 meters above the ground. The ride takes 40 seconds for one complete revolution. Write the equation that models the height of the Ferris wheel over time.

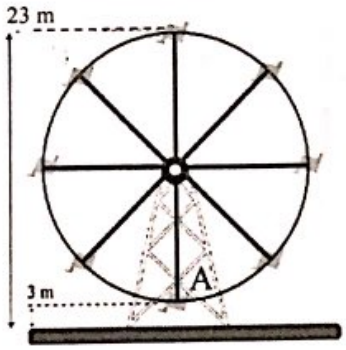


$a = \frac{1}{2}(23-3) = 10$

$y = -10\cos\left(\frac{\pi}{20}x\right) + 13$

$P = 40$ sec

$b = \frac{2\pi}{40} = \frac{\pi}{20}$



8. A Ferris wheel has a diameter of 80 feet. Riders enter the Ferris wheel at its lowest point, 6 feet above the ground at time t = 0 seconds. One complete rotation takes 67 seconds. Write a function modeling a riders height, h(t), at t seconds.

$a = \frac{1}{2}(86) = 40$ $P = 67$

$y = -40\cos\left(\frac{2\pi}{67}x\right) + 46$

9. **Sam and Dan are being dared to ride the Ferris wheel The height h (in feet) above the ground at any time t (in seconds) can be modeled by:** $y = 40\cos\left(\frac{\pi}{20}t + \frac{\pi}{2}\right) + 50$

a. Find the amplitude and period. ↳ 40 ↳ $\frac{2\pi}{\pi/20} = \frac{2\pi}{1} \cdot \frac{20}{\pi} = 40$ sec

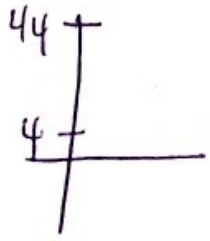
b. The Ferris wheel turns for 160 seconds before it stops to let Sam and Dan get off. How many times will they go around? 40, 40, 40, 40 → 4 times

c. What are the minimum and maximum heights for Sam and Dan?

↳ 10 ft ↳ 90 ft

10. Suppose a Ferris wheel has a radius of 20 feet and operates at a speed of 3 revolutions per minute. The bottom car is 4 feet above the ground. Write a model for the height of a person above the ground whose height when t = 0 is the minimum.

$P = 3$ min



$a = \frac{1}{2}(44-4) = 20$

$y = -20\cos\left(\frac{2\pi}{3}x\right) + 24$