Trig Word Problems

1. A Ferris wheel has a radius of 20 ft and its center is 25 ft above the ground. A rider starts at the lowest point. Write a sine function for the rider's height after t seconds if one revolution takes 40 seconds. Find the height after 10 seconds.

Solution:

- Amplitude = 20
- Midline = 25
- Period = 40 $\rightarrow B = \frac{2\pi}{40} = \frac{\pi}{20}$

Equation: $h(t) = 25 - 20\cos\left(\frac{\pi}{20}t\right)$

At $t = 10$ $h(10) = 25 - 20\cos\left(\frac{\pi}{2}\right) = 25$

Answer: 25 ft

2. The depth of water is modeled by $d(t) = 6 + 4\sin\left(\frac{\pi}{6}t\right)$ where t is hours. Find the maximum and minimum depths.

` **Solution:**

- Midline = 6
- Amplitude = 4

Max: $6 + 4 = 10$
Min: $6 - 4 = 2$

Answer: Max = 10 ft, Min = 2 ft

3. The temperature varies as $T(t) = 70 + 10\cos\left(\frac{\pi}{12}(t-3)\right)$. Find the temperature at $t = 3$.

Solution: $T(3) = 70 + 10\cos(0) = 70 + 10 = 80$

Answer: 80°F

4. A sound wave is modeled by $y = 3\sin(2x)$Find the amplitude and period.

Solution:

- Amplitude = 3
- Period = $\frac{2\pi}{2} = \pi$

Answer: Amplitude = 3, Period = π

5. A lighthouse beam rotates once every 12 seconds. Write a cosine function for the light intensity if the maximum intensity is 5.

Solution:

- Amplitude = 5
- Period = 12 $\rightarrow B = \frac{2\pi}{12} = \frac{\pi}{6}$

Answer: $I(t) = 5\cos\left(\frac{\pi}{6}t\right)$

6. A pendulum swings with amplitude 8 cm and period 4 seconds. Write a sine function.

Solution:

Answer: $y = 8\sin\left(\frac{\pi}{2}t\right)$

7. Daylight varies between 10 and 14 hours over a year. Find the midline and amplitude.

Solution:
*Midline: $\frac{14+10}{2} = 12$
*Amplitude: $\frac{14-10}{2} = 2$

Answer: Midline = 12, Amplitude = 2

8. A point moves in a circle of radius 6. Write the vertical position as a sine function.

Solution:

Answer: $y = 6\sin(t)$

9. A heartbeat graph is modeled by $y = 2 + \sin(3t)$. Find the midline and period.

Solution:

- Midline = 2
- Period = $\frac{2\pi}{3}$

Answer: Midline = 2, Period = $\frac{2\pi}{3}$

10. A water wheel rotates every 8 seconds with radius 5 ft. Write a cosine function for height if the center is 7 ft above water.

Solution:

Answer: $h(t) = 7 + 5\cos\left(\frac{\pi}{4}t\right)$