Name:_____ Date:_____

M12P HW Section 5.5 Application of Trigonometry

1. What is the horizontal distance between a maximum and minimum point of a sine or cosine function? Explain:

2. How do you determine whether if a real-life phenomenon can be modelled using a sinusoidal function? Explain:

3. If we are given a maximum and minimum point of a sine function, how do we find the amplitude, vertical displacement, period, starting point? Explain.

4. Suppose the maximum point is (3, 12) and the next minimum point is (8,6). Find "A", "B", "C", and "D". Write a sine and cosine function.

5. A cosine function has a minimum point at $(\frac{\pi}{3}, -7)$ and the next maximum point at $(\frac{11\pi}{6}, 12)$.
   a. Find the equation of the cosine function

   b. Find the equivalent sine function

6. Given the function $y = 4sin\frac{2\pi}{9}(x-3)+11$.
   a) What is the period of this function

   b) Write an equivalent cosine function

7. Given the function $h = 4sin\frac{2\pi}{9}(t-3)+11$, where "h" is measure in meters and "t" is measure in seconds,
   a) At which points will this function have a height of 13? Find all the points for $0 < t < 30s$

   b) Provide a general formula for all the points with a height of 13meters

   c) For $0 < t < 30s$, how many seconds was the height greater than 13meters?

   d) Where are the maximum and minimum points of this function? Provide a general formula for all the Max and Min points.

8. The London Eye is a large Ferris wheel with a height of 135m. Passengers board the attraction in one of the 32 capsules on a platform 15m above ground. One revolution takes about 30minutes.
   a. Write a sine and cosine function for the height of a passenger above ground (meters) as a function of time(minutes) after boarding the ride.

   b. How high above ground will a passenger be after 13 minutes?

   c. After how many minutes after boarding the ride will a passenger reach of a height of 100meters above ground?

   d. When a passenger is near the top, at a height of at least 120m, they can see a building that is 40km away. For how many minutes on the ride can they see this building?

9. During high tide, the depth of water levels at the coast is around 4.8 meters deep. During low tide, the water levels can drop down to 0.5 meters deep. "Low Low" tide on Jan 4, 2023 is at 10:30pm and the next "low low" tide is on Jan 5, 2023 at 11:00pm.
    a. Write a sine and cosine function for the depth of water levels (meters) as a function of time (minutes) after 10:30pm of Jan 4, 2023.

    b. What is the depth of water levels at 4:00am of Jan 5, 2023

    c. Boating and fishing is best during high tide. Suppose you want to go fishing when tide levels are at least 4 meters, what time should you go boating?

10. The earth is closest to the sun on December 21 at approximately 147.2 million km. On June 21, the earth is the farthest to the sun at approximately 152.2 million km.
    a. Write a sine and cosine function for the distance "D" in million of km from the Earth to the sun as a function of the days in a year (T)

    b. Use your function to estimate the distance between the sun and Earth on February 28

    c. On which days is the distance between sun and Earth atleast 150 milllion km away?

11. The wavelength of light is about 700 nanometers [$7 \times 10^{-10} meters$], this is the distance between two crests or two troughs. Frequency is the speed at which a wave travels and is measure in Hertz. One Hertz means that the wave will travel one cycle through a point per second. Ie: 300Hz means that the wave will travel 300 cycles per second. Frequency of visible light is 800THz [800 Trillion Hertz]. Use this information to calculate the speed of light.

12. A Ferris wheel has a radius of 30m and its center is 33m above the ground. It rotates once every 240s. Suppose you get on at the bottom when t=0.
    a. Write a sine function and cosine function that describes your height above ground as a function of time

    b. Suppose a passenger will pass out if once they are over a height of 60m. After how many seconds will this passenger pass out?

    c. How high will you be after 10s?

    d. For what range in time will your height be above 55m?

    e. Suppose the Ferris stopped and everyone had to jump off while on the ride. Statistically, a person has a good survival rate jumping from 10meters high. Anything higher would be dangerous. What percentage of riders would expect to survive?