

### *Trig Applications -- Worksheet*

1. The depth of water off a pier at high tide (12pm) is 8m. After 6h the depth of water is 4m. Assume a 12 hour cycle.
  - a) Find the equation for the depth of water, with respect to its average depth, in terms of the time,  $t$  hours, since high tide.
  - b) Find the depth of water at 8am.
  - c) At what time(s) is the depth 6.3m?
  
2. A Ferris wheel has a 40 m diameter and rotates once every 36s. The lowest seat is 2m off the ground.
  - a) Find a **sine function and cosine function** for the graph of the height vs time based on starting at the lowest point on the wheel.
  - b) Using either equation in (a) determine the height after 3s.
  - c) Using either equation in (a) determine at what time(s) is the height 28m?
  
3. A Ferris wheel at an amusement park has a radius of 10 m and rotates at the rate of one revolution every 48 seconds. At the bottom of the ride, the passenger is 3 m above the ground. You start your ride from the bottom of the wheel.
  - a) Determine a **sine function and cosine function** that represents your height,  $h$ , above the ground at any time,  $t$ .
  - b) Using one of the equations in (a) determine your height above the ground after 2.5 min.
  - c) Using one of the equations in (a), determine what time(s) your height is 9 m above the ground
  
4. An object suspended from a spring is oscillating up and down. The distance from the high point to the low point is 30cm, and the object takes 4 seconds to complete 5 cycles. For the first few cycles, the distance from the middle position,  $d(t)$  cm, with respect to time,  $t$  seconds is modelled by a **sine** function. Write an equation that describes the distance of the object from its middle position as a function of time.
  
5. A mass on a spring bounces up and down relative to a marked spot on the wall. The mass gets to a max height of 10 cm above the spot and a min of 2 cm below the spot and it takes 2s to complete 4 cycles.
  - a) Draw a graph of the height vs. time assuming the start is at a midpoint between the high and low.
  - b) Create an equation for your graph.

**Answers:**

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|--|----------|-------------------|
| 1a) $y = 2\cos(30t) + 6$                                     | b) 5m    | c) 2:42pm, 9:18pm |
| 2a) $h = -20\cos(10t) + 22$ or $h = 20\sin(10(t-9)) + 22$    | b) 4.7 m | c) 10.7 s, 25.3 s |
| 3a) $h = -10\cos(7.5t) + 13$ or $h = 10\sin(7.5(t-12)) + 13$ | b) 5.9 m | c) 8.9 s, 39.1 s  |
| 4. $d(t) = 15\sin(450t) + 15$                                |          |                   |
| 5. $h = 4\sin 720t + 6$                                      |          |                   |