Applications of Sinusoidal Functions
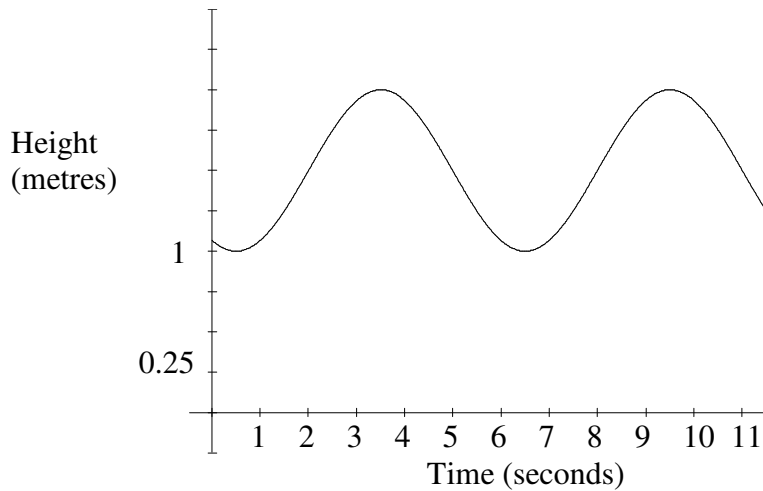
Example:

Alexa is on a raft in a wave pool in Florida. Her height above the pool floor in metres with respect to time in seconds is represented by the graph below.

Height
(metres)

1

0.25

1 2 3 4 5 6 7 8 9 10 11
Time (seconds)

a) What is the amplitude of this function? What does it represent in relation to the wave pool?

b) What is the equation of the sinusoidal axis? What does it represent in relation to the wave pool?

c) What is the period of this function? What does it represent in relation to the wave pool?

d) Find the defining equation of the pool in terms of sine.

e) Use the equation in part d) to calculate Alexa's height at the 27 seconds point.

1. Derrick is riding on a Ferris Wheel. His height above the ground in metres with respect to time in seconds can be represented by the graph below. Determine the equation of the sinusoidal function that expresses Derrick's height above the ground in terms of time. Would Derrick be able to get off the Ferris Wheel safely after 38 seconds?

2. Many people do not realize that skyscrapers actually sway in high-wind conditions. In one particular case, the top floor of a building swayed 50cm to the left and to the right from its starting position. At t = 2s, the building swayed 50 to the right (+50cm) and at t=13s, the building swayed 50cm to the left (-50cm).

   a) What is the equation of the function that describes the motion of the building in terms of sine?

   b) Dampers are often added to the top floors of skyscrapers to reduce the severity of the sway. If a damper is added to this building, it will reduce the sway (not the period) by 70%. What equation would now describe the motion of the building in terms of time?

3. Mathman, a costume crime fighter, is swinging back and forth in front of building. His distance from the building varies sinusoidally with time. At t=2s, he is at one end of his swing and only 5m from the building. At t=6s, he is at the other end of his swing and 17m from the building.

   a) Sketch a graph of this sinusoidal function.

   b) Determine the equation expressing his distance from the building in terms of time.

   c) How far from the building will he be in 13s?