

Name: \_\_\_\_\_

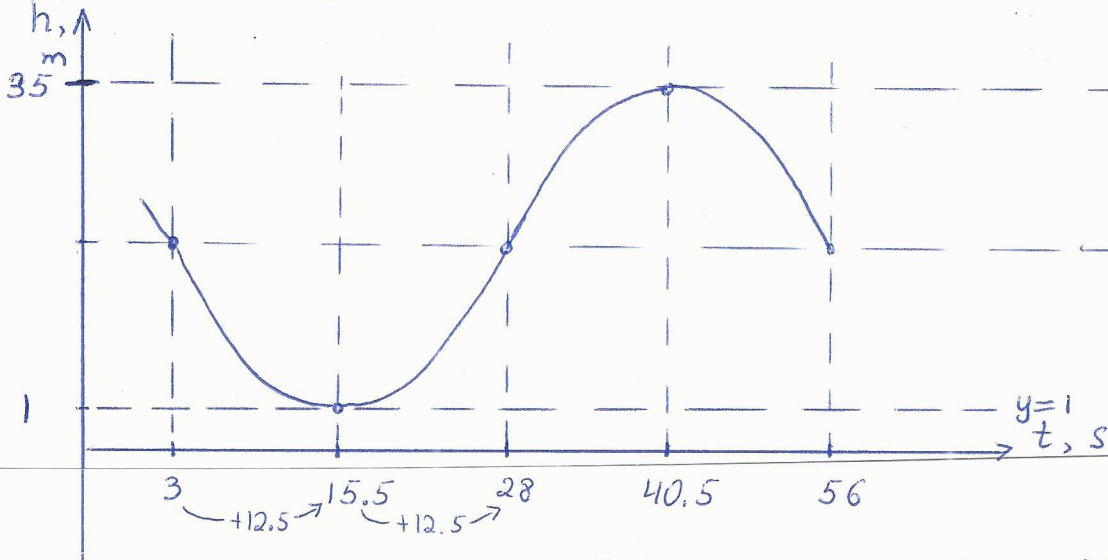
Bob is riding a Ferris wheel. The top of the ride is 35 m above the ground level, and the lowest point of the ride is 1 m above the ground level. It takes 50 seconds for the wheel to make one complete revolution. The ride starts once all the passengers have boarded. At the start of the ride, Bob's height above the ground is decreasing and he reaches a height of 18 m at 3 s.

- (a) Determine the equation that models Bob's height above the ground at time  $t$  seconds into the ride.  
 (b) How long does it take for Bob to reach the bottom?  
 (c) How high is Bob at 40 seconds?  
 (d) In the first 3 minutes of the ride, when is Bob at a height of 21 m?

$3 \text{ min} = 180 \text{ s}$   
 period = 50s

(a) Draw a graph to visualize motion

What is 18m?



Determine the  
 midline!  
 $y = \frac{35+1}{2}$ ,  $y = 18$   
 Diagram not  
 to scale.

$$\frac{\text{period}}{4} = 12.5 \text{ s}; \text{ amp} = \frac{35-1}{2} = 17, \quad \kappa = \frac{2\pi}{\text{period}} = \frac{2\pi}{50} = \frac{\pi}{25}$$

using 3 as phase shift

$$h(t) = -17 \sin\left[\frac{\pi}{25}(t-3)\right] + 18$$

(b) From graph we see it is 15.5s  
 (Another advantage of drawing the graph!)

OR  $t = 3 + \frac{\text{Period}}{4} = 3 + 12.5 = 15.5$  or solve  $1 = -17 \sin\left[\frac{\pi}{25}(t-3)\right] + 18$

(c)  $h(40) = -17 \sin\left[\frac{\pi}{25}(40-3)\right] + 18 \doteq 34.966$  or 34.97m

(d) Set  $h=21$ ,  $21 = -17 \sin\left[\frac{\pi}{25}(t-3)\right] + 18$ ,  $3 = -17 \sin\left[\frac{\pi}{25}(t-3)\right]$

$\sin\left[\frac{\pi}{25}(t-3)\right] = -\frac{3}{17} < 0$ ,  $\sin x < 0$ ,  $x \in \text{Q III}$  or  $x \in \text{Q IV}$

RAA =  $\sin^{-1}\left(\frac{3}{17}\right) \doteq 0.177$ ,  $x \doteq \pi + 0.177$  or  $x \doteq 2\pi - 0.177$   
 $x \doteq 3.319$  or  $x \doteq 6.106$

$\frac{\pi}{25}(t-3) = 3.319$  or  $\frac{\pi}{25}(t-3) = 6.106$   
 $\hookrightarrow t = 29.41 \text{ s}$  or  $\hookrightarrow t = 51.59 \text{ s}$   
 Add/Subtract 50s (until 180s)  
 Answer: 29.41s, 51.59s, 79.41s, 101.59s, 129.41s, 151.59s, 179.41s.