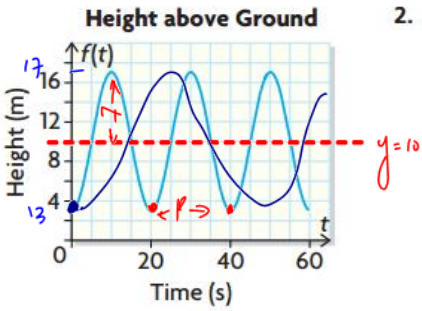
Chapter 6 – Sinusoidal Functions

6.7 – Problem Solving with Sinusoidal Functions

We can use the sinusoidal properties of Period, Central Axis, Amplitude and Phase Shift to describe and solve "real world" problems.

Example 6.7.1 (*From the text: Pg. 398 #2*)



2. Don Quixote, a fictional character in a Spanish novel, attacked windmills because he thought they were giants. At one point, he got snagged by one of the blades and was hoisted into the air. The graph shows his height above ground in terms of time.
   a) What is the equation of the axis of the function, and what does it represent in this situation?
   b) What is the amplitude of the function, and what does it represent in this situation?
   c) What is the period of the function, and what does it represent in this situation?
   d) If Don Quixote remains snagged for seven complete cycles, determine the domain and range of the function.
   e) Determine the equation of the sinusoidal function.
   f) If the wind speed decreased, how would that affect the graph of the sinusoidal function?

central axis

period increases!

a) C.A. $y = \frac{max + min}{2} = \frac{17+3}{2} = 10$

The central axis represents the axel of the windmill

d) $R: \{f(t) \in \mathbb{R} \mid 3 \le f(t) \le 17\}$

$D: \{t \in \mathbb{R} \mid 0 \le t \le 140\}$

b) $a = \frac{max - min}{2} = \frac{17-3}{2} = 7$

The amplitude represents the radius of the windmill (length of a blade)

c) $P = 20$ seconds – This represents one rotation of the windmill.

$f(t) = a\cos(k(t-d)) + c$

starting at a min.

Class/Homework: Pg 398 – 401 #4 – 6, 8, 10 (a question of beauty)

e) $k = \frac{360}{P} = \frac{360}{20} = 18$

we want to use a "negative cos"

$f(t) = -7\cos(18t) + 10$