

## REAL SITUATIONS WITH TRIG FUNCTIONS

- USE A GENERAL PATTERN TO SOLVE REAL SITUATIONS

$$y = a \cos 2\pi \left( \frac{t-s}{P} \right) + m$$

$\nearrow$  AMPLITUDE  
 $\downarrow$  PERIOD  
 $\swarrow$  PHASE SHIFT (VALUE AT 1ST MAX)  
 $\nwarrow$  VERTICAL DISPLACEMENT (MEAN VALUE)

EX - A Ferris wheel of diameter 40m has its centre 21m above the ground and rotates every 30 seconds (starts on the bottom)

- ① FIND THE EQUATION
- ② ESTIMATE THE HEIGHT AFTER 40 SECS.
- ③ How long until 35m ABOVE THE GROUND?

Solve

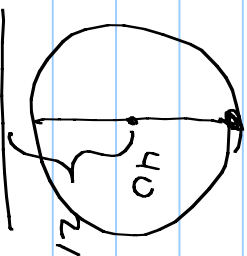
$$a = \frac{41-1}{2} = \frac{40}{2} = 20$$

$$s = 15 \quad p = 30$$

$$m = \frac{41+1}{2} = 21$$

$$\textcircled{1} \quad y = 20 \cos \frac{2\pi}{30} \left( \frac{t-15}{30} \right) + 21$$

$$H(t) = 20 \cos \frac{2\pi}{30} \left( \frac{t-15}{30} \right) + 21$$



$$(2) \quad 20 \cos 2\pi \left( \frac{40-15}{30} \right) + 21 = 31$$

$$(3) \quad 35 = 20 \cos 2\pi \left( \frac{t-15}{30} \right) + 21$$
$$-21$$

$$\frac{14}{20} = \frac{\cancel{20} \cos 2\pi \left( \frac{t-15}{30} \right)}{\cancel{20}}$$

$$.7 = \cos 2\pi \left( \frac{t-15}{30} \right)$$

$$\cos^{-1}(.7) = 2\pi \left( \frac{t-15}{30} \right)$$

$$\frac{\cos^{-1}(0.7) \times 30}{(2\pi)} + 15 = t$$

$$18.8 = t$$

$$t = 15 - 3.8 = 11.2 \text{ s}$$



THE AT HIGH TIDE DEPTH IS 22 m, AT LOW

TIDE DEPTH IS 10m. THE TIDE COMPLETES

ONE CYCLE EVERY 12 HOURS.

(1) FIND THE EQUATION

(2) DEPTH AT 5 AM.

Solve (1)  $a = \frac{22-10}{2} = 6$  P.S. = 6

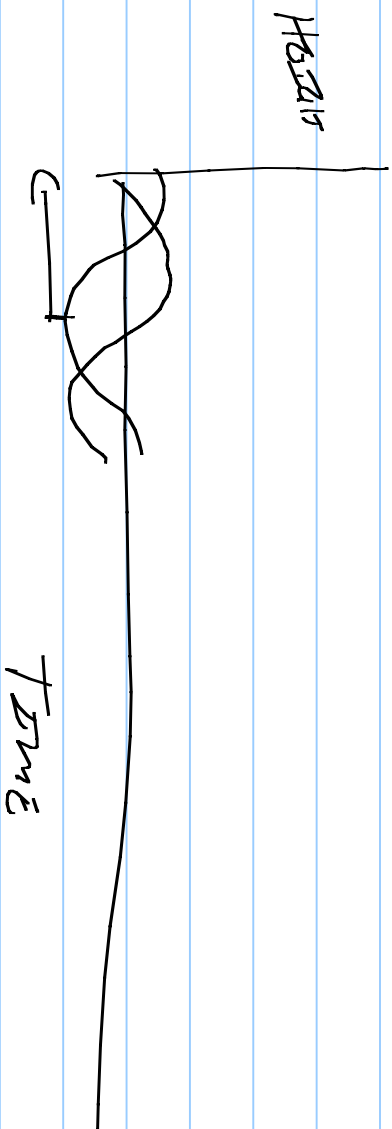
$$p = 12 \quad m = \frac{22+10}{2} = 16$$

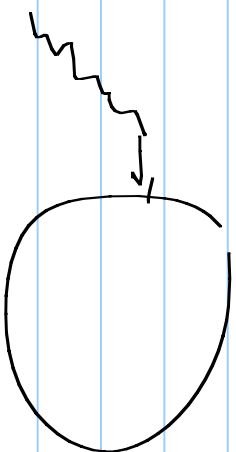
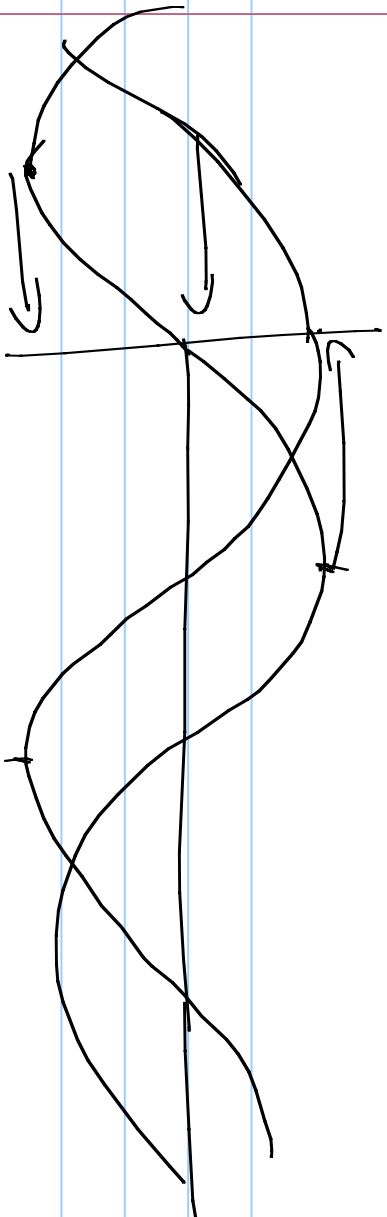
$$H(t) = 6 \cos 2\pi \left( \frac{t-6}{12} \right) + 16$$

(2)  $H(5) = 21.2$

$$y = 20 \cos 2\pi \left( \frac{t - 15}{30} \right) + 21$$

$$y = 20 \sin 2\pi \left( \frac{t - 7.5}{30} \right) + 21$$





B N C      S S      T C  
ALL      SEN      ON      OS

NEG LOS

$$y = 2 \cos \frac{2\pi t}{30} + 21$$

$$y = -20 \cos \frac{2\pi t}{30} + 21$$

$$y = 20 \sin \frac{2\pi t}{30} + 21$$

↓

$$y = 20 \cos \frac{2\pi(t-15)}{30} + 21$$

SENOSSOIDAL

H/W Pg 226 # 1-4, 7, 10