1 . A Ferris wheel has a diameter of 15 m , and starts 1 m above the ground . It takes 3 minutes to complete one revolution .

a) Sketch the graph of the height of a rider versus the time in minutes .

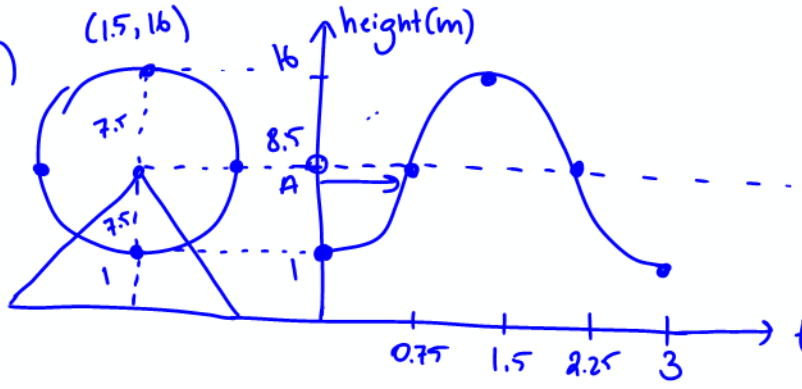
b) Determine the period , amplitude and axis of the curve .

c) Use the period , amplitude , axis of the curve , and phase shift (from the graph) to determine an equation to model the height of the rider given time , t .

d) Use your equation to determine the height of the rider at each of the following times :

i . 4 minutes ii . 6 minutes iii . 7 . 5 minutes iv . 12 minutes

a)



b) Period $\Rightarrow$ $3 = \frac{360^\circ}{k}$ $k = \frac{360}{3} = 120^\circ/\text{min}$

amp $\Rightarrow$ $a = \frac{16-1}{2} = 7.5$ m (radius)

axis $\Rightarrow$ $y = \frac{16+1}{2} = 8.5$ $\boxed{c = 8.5}$

c) $\boxed{d = 0.75}$ right b/c sin graph starts from origin.

$y = 7.5 \sin[120(x - 0.75)] + 8.5$

d) $f(x) = 7.5 \sin[120(x-0.75)] + 8.5$

i) $f(4) = 7.5 \sin[120(4-0.75)] + 8.5$

$f(4) = 12.25$

ii) $f(6) = 7.5 \sin[120(6-0.75)] + 8.5$

$f(6) = 1$

iii) $f(7.5) = 7.5 \sin[120(7.5-0.75)] + 8.5$

$= 16$ m

iv) $f(12) = 7.5 \sin[120(12-0.75)] + 8.5$

$= 1$

2. The Double Scoop Ice Cream Company tracked its mean monthly production of ice cream over the last two years.

Ice Cream Production in Thousand of Litres

Month	J	F	M	A	M	J	J	A	S	O	N	D
Year 1	168	181	219	222	246	276	264	252	219	204	181	174
Year 2	169	180	220	221	245	274	265	251	219	203	180	175

a) Explain why it is reasonable to expect ice cream production to be periodic.

b) Determine a trigonometric model that best represents the data.

max = 276

min = 168

$c = \frac{276+168}{2} = 222$

$a = \frac{276-168}{2} = 54$

$P = \frac{360}{k}$

$12 = \frac{360}{k}$

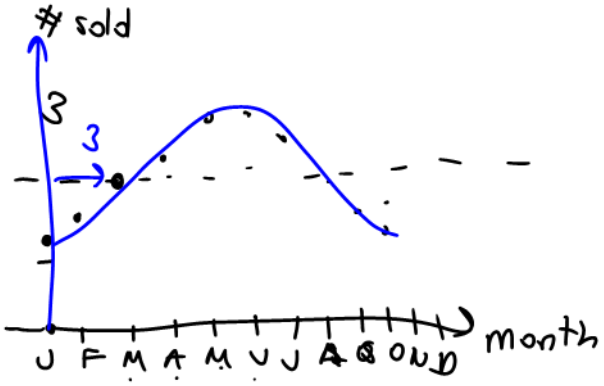
$\boxed{k = 30}$

$y = a \sin[k(x-d)] + c$

$a = 3$ for sin

$d = 6$ for cos

$y = 54 \sin[30(x-3)] + 222$

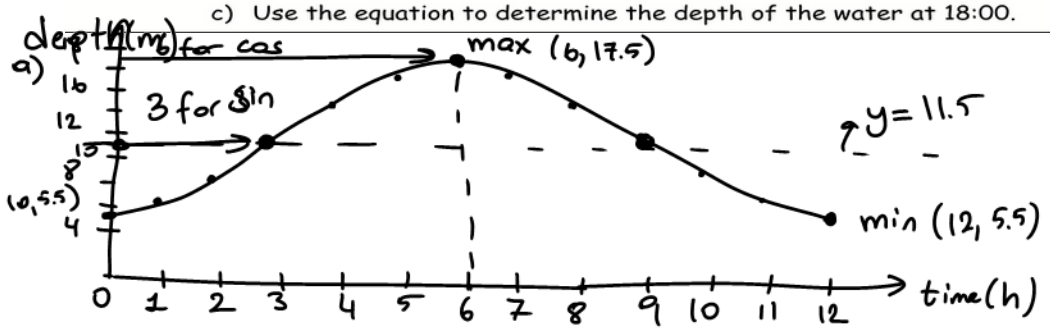


3. The depth of water in a harbour on the Bay of Fundy that faces the ocean changes each hour, as shown.

Time(h)	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	10:00	11:00	12:00
Depth(m)	5.5	6.3	8.5	11.5	14.5	16.7	17.5	16.7	14.5	11.5	8.5	6.3	5.5

a) Graph the data and determine an equation that models the situation.
b) Use the equation to determine the depth of the water at 10:30.
c) Use the equation to determine the depth of the water at 18:00.

a)



axis of the curve

$c = \frac{max + min}{2} = \frac{17.5 + 5.5}{2} = 11.5$

$c = 11.5$

amplitude

$a = \frac{max - min}{2} = \frac{17.5 - 5.5}{2} = 6$

$a = 6$

Period $= \frac{360}{k}$

$12 = \frac{360}{k}$

$k = \frac{360}{12}$

$k = 30$

$d_1 = 3$ RIGHT for sine
$d_2 = 6$ RIGHT for cos

$y = 6 \sin[30(x-3)] + 11.5$
$y = 6 \cos[30(x-6)] + 11.5$

b) 10:30 is 10.5 hours.

$y = 6 \sin[30(10.5-3)] + 11.5$

$y \doteq 7.3$m.

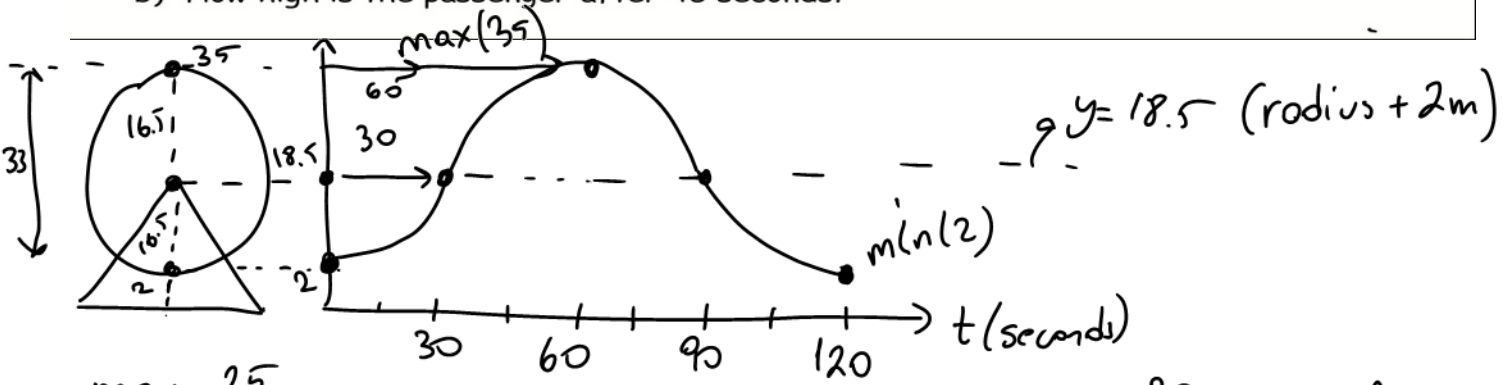
c) 18:00 is 18 hours

$y = 6 \sin[30(18-3)] + 11.5$

$y = 17.5$ m

4 The maximum height of a Ferris wheel is 35 m. The wheel takes 2 min to make one revolution. Passengers board the Ferris wheel 2 m above the ground at the bottom of its rotation.

a) Write an equation to represent the position of a passenger at any time, t, in seconds.
b) How high is the passenger after 45 seconds?



max = 35
min = 2

axis

$\frac{35+2}{2} = 18.5$

$c = 18.5$

amp

$\frac{35-2}{2} = 16.5$

$a = 16.5$

Period $= \frac{360}{k}$

$120 = \frac{360}{k}$

$k = 3$

$d_1 = 30$ RIGHT for sin
$d_2 = 60$ right for cos

$y = 16.5 \sin[3(x-30)] + 18.5$
$y = 16.5 \cos[3(x-60)] + 18.5$

b) $y = 16.5 \sin[3(45-30)] + 18.5$

$y \doteq 30.2$m.