

3.5 Answers

GCSE Mathematics Non-Right Angled Trigonometry

3.5.1 Solution to 3.2 Example

(i)

$$\begin{aligned} V &= 240 \sin(18000t + \alpha) \\ &= 240 \sin(18000 \times 0.0025 + 120) \\ &= 62.1 \text{ volts} \end{aligned}$$

(ii)

$$\begin{aligned} V &= 240 \sin(18000t + \alpha) \\ &= 240 \sin(18000 \times 0.005 + 240) \\ &= -120 \text{ volts} \end{aligned}$$

3.5.2 Solutions to 3.3 Exercise

Answer 1

(i) 5.8 m (ii) 5.97 m

(iii) 5.43 m (iv) 2 am

(v) Here is the A-Level method, but trial and improvement is OK
Low tide occurs when the sine curve has a minimum value

$$\sin(28.8t + 40) = -1$$

$$28.8t + 40 = \arcsin(-1)$$

$$= 270$$

$$28.8t = 230$$

$$= 7.986 \quad \text{That is, low tide is at 8 am}$$

Answer 2

(i) 3.93 m (ii) 2.66 m

(iii) 1.33 m (iv) Just before 19:00

(v) Here is the A-Level method, but trial and improvement is OK

$$2.4 + 2.7 \cos(28.8t - 74) = 1.4$$

$$28.8t - 74 = \arccos\left(-\frac{10}{27}\right)$$

$$28.8t - 74 = 111.7, 248.3, 471.7, 608.3, \dots$$

$$28.8t = 185.7, 322.3, 545.7, 682.3, \dots$$

$$= 6.45, 11.2, 18.9, 23.7, \dots$$

The harbour starts to refill at 23.7

That is, at 23:47 (a little before midnight).

Answer 3

(i) 2.65 m (ii) 2.17 m

(iii) 1.82 m

(iv) when $t = 7.5$ s $H = 1.65$ m

when $t = 8.0$ s $H = 2.43$ m

when $t = 8.5$ s $H = 2.78$ m <=== Highest

when $t = 9.0$ s $H = 2.65$ m

when $t = 9.5$ s $H = 2.17$ m

To the nearest 5 seconds his maximum height is reached at 8.5 seconds

Answer 4

(i) 65 m (ii) 130 m

(iii) 210 m

(iv) when $t = 12$ minutes $H = 275$ m

when $t = 15$ minutes $H = 300$ m <=== Highest

when $t = 18$ minutes $H = 275$ m

To the nearest 3 minutes his maximum height is reached at 15 minutes

(v) As it took 15 minutes (to the nearest 3 minutes) to reach maximum height,
it'll take about 15 minutes to get back down.

That is, it takes 30 minutes to revolve once.

(Some further trial and improvement will confirm this to be correct)

Answer 5

(i) 6.93 cm

(ii) 67.6 cm

(iii) 2.03 cm

You can indeed use 335°

Answer 6

(i) 54.1 cm^2

(ii) 306 cm^2

(iii) 4.67 cm^2

You need to remove a minus sign from the answer if using 335°

Answer 7

(i) It does !

(ii) 296 cm^2

(iii) 769 cm^2

(iv) $a = 0.8$ cm giving an area of 509 cm^2