3.4 Homework

GCSE Mathematics

Non-Right Angled Trigonometry

This exercise shows you how to make a sine wave that will predict the tide. It's a crude predictor, as real tidal curves can be (and often are) more complicated. So don't expect perfection, especially in places like (for example) the Solent where the Isle of Wight gives rise to a very interesting currents, and an unusual tidal curve that is more complicated than a simple sine wave.

As a well behaved example we'll look at Conwy on 25th December 2019

From the internet, we can easily get times of the first low and following high tide.

25th December 2019 : Conwy, Wales

Time of LOW tide :	04:35	Height of :	1.4 metres
Time of HIGH tide :	09:59	Height of :	7.7 metres

We're after a formula of the form

$$H = M + A\sin(28.8t + T)$$

Where we have to work out numbers for M, A and T.

$$M = \frac{High\ height + Low\ height}{2}$$

$$M = \frac{7.7 + 1.4}{2} =$$

$$A = \frac{High\ height - Low\ height}{2}$$

$$A = \frac{7.7 - 1.4}{2} =$$

The time 04:35 is $4.\left(\frac{35}{60}\right)$ which is 4.6 hours

$$T = \frac{Decimal\ time\ of\ LOW\ tide \times 360}{28.8} + 90$$

$$T = \frac{4.6 \times 360}{28.8} + 90 =$$

(i) Complete the above calculations to work out M, A and T.

(ii) Write out the formulae for the tide at Conwy on 25th December 2019 with M, A and T replaced with your answers from part (i)

(iii) Insert $t = 4.6$ into your formula, and calculate H.
Did you get what you expected ?

(iv) Use your formula to calculate the height of the tide at hourly intervals starting at 5am.

t	5am	6am	7am	8am	9am	10am	11am	12am
H								

Space for workings...

(v) How close does the formula get to predicting the high tide at 09:59 ?