

Question	Scheme	Marks	AOs
8 (a)	$D = 5 + 2 \sin(30 \times 6.5)^\circ = \text{awrt } 4.48 \text{ m}$ with units	B1	3.4
		(1)	
(b)	$3.8 = 5 + 2 \sin(30t)^\circ \Rightarrow \sin(30t)^\circ = -0.6$	M1	1.1b
		A1	1.1b
	$t = 10.77$	dM1	3.1a
	10:46 a.m. or 10:47 a.m.	A1	3.2a
		(4)	

(5 marks)

Notes:

(a)

B1: Scored for using the model ie. substituting $t = 6.5$ into $D = 5 + 2 \sin(30t)^\circ$ and stating $D = \text{awrt } 4.48 \text{ m}$. The units must be seen somewhere in (a). So allow when $D = 4.482.. = 4.5 \text{ m}$
Allow the mark for a correct answer without any working.

(b)

M1: For using $D = 3.8$ and proceeding to $\sin(30t)^\circ = k$, $|k| \leq 1$

A1: $\sin(30t)^\circ = -0.6$ This may be implied by any correct answer for t such as $t = 7.2$

If the A1 implied, the calculation must be performed in degrees.

dM1: For finding **the first value** of t for their $\sin(30t)^\circ = k$ after $t = 8.5$.

You may well see other values as well which is not an issue for this dM mark
(Note that $\sin(30t)^\circ = -0.6 \Rightarrow 30t = 216.9^\circ$ as well but this gives $t = 7.2$)

For the correct $\sin(30t)^\circ = -0.6 \Rightarrow 30t = 323.1 \Rightarrow t = \text{awrt } 10.8$

For the incorrect $\sin(30t)^\circ = +0.6 \Rightarrow 30t = 396.9 \Rightarrow t = \text{awrt } 13.2$

So award this mark if you see $30t = \text{inv sin their } -0.6$ to give the first value of t where $30t > 255$

A1: Allow 10:46 a.m. (12 hour clock notation) or 10:46 (24 hour clock notation) oe
Allow 10:47 a.m. (12 hour clock notation) or 10:47 (24 hour clock notation) oe
DO NOT allow 646 minutes or 10 hours 46 minutes.