Question	Answer	Marks	Partial Marks
8(c)	no real value for $\log_2(-4)$ or $\log_2(-4+2)$	**B1**	must identify specific term in one of original equations and use $x = -4$
	$y=1$	**B1**	
9(a)	$(AC=)\ \sqrt{300^2+x^2}$ seen isw	**B1**	
	time for $AC=\dfrac{\sqrt{300^2+x^2}}{0.9}$ oe or time for $CD=\dfrac{400-x}{1.5}$ oe	**M1**	using clearly indicated value for *their AC* or *their CD*
	$T=\dfrac{\sqrt{300^2+x^2}}{0.9}+\dfrac{400-x}{1.5}$ oe seen isw	**A1**	
9(b)	$\dfrac{\mathrm{d}T}{\mathrm{d}x}=\dfrac{1}{2}\dfrac{\left(300^2+x^2\right)^{-\frac{1}{2}}}{0.9}\times 2x\ -\dfrac{2}{3}$ oe	**B2**	accept unsimplified; if incorrect allow B1 for correct differentiation of $\left(300^2+x^2\right)^{\pm\frac{1}{2}}$
	set *their* $\dfrac{\mathrm{d}T}{\mathrm{d}x}=0$	**M1**	$\dfrac{\mathrm{d}T}{\mathrm{d}x}$ must be a function of x
	$25x^2=9\left(300^2+x^2\right)$ oe	**A1**	equation in x^2 with square root removed
	$x=225$ (m)	**A1**	
	$T=533$ (s) or 1600/3 (exact value)	**A1**	or 8 min 53 s
10(a)	use S_4 or S_8	**M1**	
	$S_4=\dfrac{4}{2}[2a+3d]=38\quad(2a+3d=19)$	**A1**	accept unsimplified
	$S_8=\dfrac{8}{2}[2a+7d]=38+86\ (2a+7d=31)$ or $S_8-S_4=\dfrac{8}{2}[2a+7d]-\dfrac{4}{2}[2a+3d]=86$ $(4a+22d=86)$	**A1**	accept unsimplified
	solve correct equations for a or d	**M1**	
	$a=5$ and $d=3$	**A1**	

Question	Answer	Marks	Partial Marks
10(b)	$ar^2 = 12$ soi	**B1**	
	$ar^5 = -96$ soi	**B1**	
	solve correct equations for a or r	**M1**	
	$r = -2$ and $a = 3$	**A1**	
	insert *their* a and r into S_{10} $\left(S_{10} = \frac{3\left(1-(-2)^{10}\right)}{1-(-2)} \right)$	**M1**	
	–1023	**A1**	
11	$\left(\sqrt{7}-2\right)\left(\sqrt{7}+2\right) = 3$ soi	**B1**	seen anywhere
	use quadratic formula to solve for x	**M1**	
	$x = \frac{4 \pm \sqrt{16 - 4\left(\sqrt{7}-2\right)\left(\sqrt{7}+2\right)}}{2\left(\sqrt{7}-2\right)}$	**A1**	
	$x = \frac{4 \pm 2}{2\left(\sqrt{7}-2\right)}$	**A1**	or $4 \pm \sqrt{4}$ in numerator
	rationalise one of *their* solutions e.g. $\frac{4+2}{2\left(\sqrt{7}-2\right)} \times \frac{\left(\sqrt{7}+2\right)}{\left(\sqrt{7}+2\right)}$	**B1**	full rationalisation statement must be shown
	$x = 2 + \sqrt{7}$ nfww	**A1**	
	$x = \frac{2}{3} + \frac{1}{3}\sqrt{7}$ nfww	**A1**	accept $\frac{2+\sqrt{7}}{3}$