Question Number	Scheme	Marks
7 (a)	$\left[\mathrm{P}\left(\bar{X}_n < 45.2\right) = 0.3446\right] \Rightarrow \dfrac{45.2-\mu}{\frac{\sigma}{\sqrt{n}}} = -0.4$ oe	M1
	$45.2 + \dfrac{0.4\sigma}{\sqrt{n}} = \mu$ oe	A1
	$\left[\mathrm{P}\left(\bar{X}_n > 75.2\right) = 0.0179\right] \Rightarrow \dfrac{75.2-\mu}{\frac{\sigma}{\sqrt{n}}} = 2.1$ oe	M1
	$75.2 - \dfrac{2.1\sigma}{\sqrt{n}} = \mu$ oe	A1
	e.g. $45.2 + \dfrac{0.4\sigma}{\sqrt{n}} = 75.2 - \dfrac{2.1\sigma}{\sqrt{n}}$ or e.g. $\dfrac{30}{\frac{\sigma}{\sqrt{n}}} = 2.5$ oe	M1
	$\dfrac{2.5\sigma}{\sqrt{n}} = 30 \Rightarrow \left[\sigma = 12\sqrt{n}\right]$*	A1*
		(6)
(b)	$\mu = 45.2 + \dfrac{0.4\times 12\sqrt{n}}{\sqrt{n}}$ or $\mu = 75.2 - \dfrac{2.1\times 12\sqrt{n}}{\sqrt{n}}$	M1
	$\mu = 50$	A1
		(2)
(c)	$\dfrac{\sigma}{\sqrt{n}} = \left[\dfrac{12\sqrt{n}}{\sqrt{n}}\right] = 12$	B1
	$\mathrm{P}\left(\bar{X}_n > 59\right) = \mathrm{P}\left(Z > \dfrac{59-'50'}{12}\right)$	M1
	$= 0.2266$ awrt 0.227	A1
		(3)
	Notes	**Total 11**

(a)	**Note**	**If they have not used the tables then maximum score M1A1M1A1M1A0* (5/6)**
	M1	For standardising with μ and $\dfrac{\sigma}{\sqrt{n}}$ and setting = $\pm$awrt 0.4
	A1	For a correct equation with compatible signs. Condone use of e.g. awrt 0.4
	M1	For standardising with μ and $\dfrac{\sigma}{\sqrt{n}}$ and setting = $\pm$awrt 2.1
	A1	For a correct equation with compatible signs. Condone use of e.g. awrt 2.1
	M1	Dependent on at least one correct equation. For solving their 2 equations simultaneously to eliminate μ. Note they may eliminate $\dfrac{\sigma}{\sqrt{n}}$ first to find μ (= 50) and then substitute this back into one of their simultaneous equations which can score this mark.
	A1*	Answer is given so no incorrect working must be seen. They must have an intermediate stage where the equation without μ has the constant terms collected and does not have any fractions within fractions before proceeding to the given answer.

		e.g. $\dfrac{30}{\dfrac{\sigma}{\sqrt{n}}} = 2.5 \Rightarrow \dfrac{25\sigma}{\sqrt{n}} = 300 \Rightarrow \sigma = 12\sqrt{n}$
(b)	**Note**	**If they do not have an equation in (a) involving the standard error $\dfrac{\sigma}{\sqrt{n}}$ then M0A0**
	M1	For substitution of $\sigma = 12\sqrt{n}$ into an equation for μ. May be implied by 50
	A1	50
(c)	**B1**	Correct SE seen or may be implied e.g. N(...,144) or awrt 0.227
	M1	For standardising using their μ and standard error = 12. Can be implied by awrt 0.227
	A1	awrt 0.227 (correct answer provided no incorrect working seen in (c) scores 3/3)