Question Number	Scheme	Marks
6. (a)	$[\bar{x} = 49.8]$	
	$2\times1.96\left(\frac{\sigma}{\sqrt{8}}\right) = 53.88 - 45.72 = 8.16$ $49.8 + 1.96\left(\frac{\sigma}{\sqrt{8}}\right) = 53.88$ or $49.8 - 1.96\left(\frac{\sigma}{\sqrt{8}}\right) = 45.72$	M1
	$2\times2.5758\left(\frac{\sigma}{\sqrt{8}}\right) = \frac{8.16\times2.5758}{1.96} = 10.7238...$ $2.5758\left(\frac{\sigma}{\sqrt{8}}\right) = \frac{4.08\times2.5758}{1.96} = 5.3618...$	B1 M1
	99%CI = $49.8 \pm \frac{10.7238}{2}$ 99%CI = 49.8 ± 5.3618	M1
	$= (44.438..., 55.1619...)$ (awrt 44.4, awrt 55.2)	A1 (5)
(b)	$\hat{\mu} = \bar{x} = \frac{91.2}{8} = 11.4$	B1
	$\hat{\sigma}^2 = s^2 = \frac{1145.16 - 8\times"11.4^2"}{7} = 15.06857...$ awrt 15.1	M1 A1 (3)
(c)	Combined $\Sigma x = 10.8\times24 + 91.2 = 350.4$	M1
	Combined $\Sigma x^2 = 1145.16 + 23\times17.64 + 24\times10.8^2 = 4350.24$	M1A1
	Combined $s^2 = \frac{"4350.24" - 32\times\left(\frac{"350.4"}{32}\right)^2}{31} = 16.56$	M1 A1
	$\frac{s}{\sqrt{n}} = \frac{\sqrt{16.56}}{\sqrt{32}} = 0.719374...$ awrt 0.719	M1 A1 (7) **[15]**

	Notes
(a)	1st M1 use of $2z\frac{\sigma}{\sqrt{n}}$ or $z\frac{\sigma}{\sqrt{n}}$ with $1.5 < \|z\| < 2$. Allow σ_m for $\frac{\sigma}{\sqrt{n}}$
	B1 1.96 (or better) and 2.5758 (or better)
	2nd M1 attempt to find width or semi-width of 99% CI with $\|z\| > 2$ Allow $\sigma = \frac{4.08\times\sqrt{8}}{1.96}$ [= 5.887...]
	3rd M1 Use of 49.8 ± awrt 5.36 or $49.8 \pm 2.5758\left(\frac{"5.887..."}{\sqrt{8}}\right)$ If σ is incorrect then working must be shown.
	A1 correct interval with (awrt 44.4, awrt 55.2)
	Correct answer from less accurate z –values scores M1B0M1M1A1
(b)	B1 11.4 cao
	M1 full attempt at s^2 ft their $\bar{x}$
	A1 awrt 15.1
(c)	M1 for correct combined sum (may be implied by combined mean of 10.95)
	2nd M1 for attempt at combined sum of squares $1145.16 + (n-1)\times17.64 + n\times10.8^2$ (allow 1 error)
	1st A1 fully correct expression or awrt 4350
	3rd M1 using their values in a complete expression for combined s^2 oe
	2nd A1 s^2 =16.56 or s = awrt 4.07 (either of these implies M1M1A1M1A1)
	4th M1 use of $\frac{s}{\sqrt{n}}$ with combined values
	3rd A1 awrt 0.719