Statistics 1 Estimation Answers

4(a)	$\Sigma fx = 8025$ $\Sigma fx^2 = 739975$			
	Mean ($\bar{x}$) = 80.2 to 80.3	B2		AWFW 80.25
	Standard Deviation (s_n, s_{n-1}) = 30.9 to 31.2	B2		AWFW 30.97882 or 31.13489
	MPs (x): 25, 35, 50, 70, 90, 110, 135, 165	(B1)		At least 4 correct
	Mean $(\bar{x}) = \frac{\Sigma fx}{100}$	(M1)	4	Use of
(b)(i)	**Large** ($n > 30$) **sample** **or** **Central Limit Theorem**	B1	1	OE
(ii)	Mean $(\bar{Y})$ = 80.2 to 80.3	B1√		√ on (a)
	Standard error $(\bar{Y}) = \frac{30.9 \text{ to } 31.2}{\sqrt{36}}$			
	= 5.1 to 5.25	M1	2	$\sqrt{s^2} > 0$ in (a) ÷ $\sqrt{36}$ or 6
(iii)	$P(\bar{Y} < 90) = P\left(Z < \frac{90 - (80.2 \text{ to } 80.3)}{(5.1 \text{ to } 5.25)}\right)$	M1 M1		Standardising 90 Using values from (b)(ii) with $\sqrt{s^2/36} > 0$ or $\sqrt{s^2/100} > 0$
	$= P(Z < 1.84 \text{ to } 1.93)$ = 0.967 to 0.974	A1	3	AWFW
	Total		**10**	

4(a)(i)	Mean, $\bar{x}$ = 505.2	B1		CAO; stated or implied
	99% $\Rightarrow$ $z = 2.57$ to 2.58 or	B1		AWFW (2.5758)
	99% $\Rightarrow$ $t = 3.25$ (Knowledge of the t-distribution is not required in this unit)	B1		AWRT (3.250)
	CI for μ is $\bar{x} \pm (z \text{ or } t) \times \frac{(\sigma \text{ or } s)}{\sqrt{n}}$	M1		use of; must have $\left(\div \sqrt{n}\right)$ with $n > 1$
	Thus $505.2 \pm 2.5758 \times \frac{6}{\sqrt{10}}$	A1√		√ on $\bar{x}$ and z only
	or $505.2 \pm 3.25 \times \left(\frac{5.96}{\sqrt{10}} \text{ or } \frac{5.65}{\sqrt{9}}\right)$	A1√		√ on $\bar{x}$ only
	Hence 505.2 ± 4.9 or			use of t $\Rightarrow$ 505.2 ± 6.1
	(500.3, 510.1)	A1	5	AWRT
(ii)	Weights of packets can be assumed to be normally distributed	B1	1	accept 'population of weights'; not 'sample of weights' or 'it'
(iii)	Given sample: 3 in 10/ some of packets have weights below 500 grams	B1		or equivalent
	Confidence interval: CI > 500	B1√		√ on CI in (a)(i)
	Conclusion: Statement does not appear justified	B1 dep	3	or equivalent dependent on both B1 and B1√
(b)	0.01 or 1%	B1	1	CAO; or equivalent
	Total		**10**	

4(a)	90% $\Rightarrow z = 1.64$ to 1.65 **or** 90% $\Rightarrow t = 1.66$ to 1.67 (Knowledge of the t–distribution is **not** required in this unit)	B1 (B1)		AWFW (1.6449) AWFW (1.6649)
	CI for μ is $\bar{x} \pm (z \text{ or } t) \times \frac{(s_{n-1} \text{ or } s_n)}{\sqrt{n}}$	M1		Used; must have $\sqrt{n}$ with $n > 1$
	Thus $184 \pm (1.6449 \text{ or } 1.6649) \times \frac{(32 \text{ or } 32.2)}{(\sqrt{78} \text{ or } \sqrt{77})}$	A1√		√ on z or t only
	Hence $184 \pm (5.94$ to $6.13)$ **or** $£184 \pm £6$ **or** (£178, £190)	A1	4	AWRT; ignore units
(b)(i)	**Likely** to be **valid**	B1		Accept 'valid' or equivalent
(ii)	Different plays have different: programme prices, sales, marketing, etc theatre or audience sizes, etc popularity, artists, etc so **Unlikely** to be **valid**	B1 ↑Dep↑ B1	3	Accept 'not valid' or equivalent
	Total		7	

3(a)	95% $\Rightarrow z = 1.96$ or 95% $\Rightarrow t = 2.0$ to 2.01 (Knowledge of the t–distribution is not required in this unit)	B1 (B1)		CAO AWFW (2.009)
	CI for μ is $\bar{x} \pm (z \text{ or } t) \times \frac{(s_{n-1} \text{ or } s_n)}{\sqrt{n}}$	M1		Used; must have $\sqrt{n}$ with $n > 1$
	Note that $25.1 \times \sqrt{\frac{50}{49}} = 25.35483$			$25.1 \times \frac{50}{49} = 25.61224$ Max of B1 M1 A0√ A1
	Thus $234 \pm (1.96 \text{ or } 2.009) \times \frac{(25.1 \text{ or } 25.3 \text{ to } 25.4)}{(\sqrt{50} \text{ or } \sqrt{49})}$	A1√		√ on z or t only
	Hence $234 \pm (6.95$ to $7.30)$ ie 234 ± 7 or $(227, 241)$	A1	4	AWRT
(b)	Customers are likely to choose large / similar sized potatoes	B1	1	OE; accept any sensible alternative
	Total		**5**	