Assessment Schedule – 2007

Statistics and Modelling: Calculate confidence intervals for population parameters (90642)

Evidence Statement

	Achievement Criteria	No	Evidence	Code	Judgement	Sufficiency
ACHIEVEMENT	Calculate confidence intervals for population parameters	1	752.7 ± 2.6 or $750.1 < \mu < 755.3$	A	Accept any rounding of at least 2 sig fig. for all 3 intervals.	TWO of Code A
		2	4.6 ± 3.2 or $1.4 < \mu_1 - \mu_2 < 7.8$	A	Accept intervals written in equivalent forms.	
		3(a)	0.05 ± 0.033 or $0.017 < \pi < 0.083$	A	Ignore units.	
MERIT	Demonstrate an understanding of confidence intervals.	3(b)	Eg: There is a 90% chance that the interval contains the proportion of all bottles that are rejected. Eg: That if the sampling process was repeated a large number of times, 90% of such intervals would contain the proportion of all bottles that are rejected.	M	Or equivalent. Do not accept a statement that assigns a probability to the population proportion.	Achievement **plus** TWO of code M **OR** THREE of code M
		4	744.6 mL < μ < 749.8 mL Eg: Since 750 lies outside this interval we can conclude that the mean volume is different from 750 mL. Eg: Yes, because 750 lies outside this interval.	A M	Or equivalent – must have interval, conclusion and a correct reason. Accept any rounding of at least 2 sig fig. for intervals. Accept intervals written in equivalent forms.	
		5	$1.96 \times \frac{9.4}{\sqrt{n}} \leq 1.5$ $n \geq 150.86$ Minimum = 151.	M	Accept variations in calculations that are due to rounding, but final answer must be rounded up. Ignore units.	

EXCELLENCE	Demonstrate an understanding of the theory behind confidence intervals.	6	$\text{Var}\left[\bar{X}\right] = \text{Var}\left[\frac{X_1 + \ldots + X_n}{n}\right]$ $= \frac{1}{n^2}\left(\text{Var}\left[X_1 + \ldots + X_n\right]\right)$ $= \frac{1}{n^2} n\,\sigma^2$ $= \frac{\sigma^2}{n}$ So $\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$	E	Must identify the need to square the constant and use expectation algebra logically.	Merit **plus** One of code E
		7	$z = \frac{750 - 752.5}{\frac{5.1}{\sqrt{30}}}$ $z = -2.685$ $P(\bar{x} < 750) = P(z < -2.685)$ $= 0.0036$	E	Must identify the need to use the distribution of sample means. Accept variations in rounding.	
		8	$\frac{1.96 \times \frac{\sigma}{\sqrt{n}}}{1.96 \times \frac{\sigma}{\sqrt{2n}}} = \sqrt{2} = 1.414$	M E	Accept variations in rounding.	

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Calculate confidence intervals for population parameters. $2 \times A$	Demonstrate an understanding of confidence intervals. **Achievement** *plus* $2 \times M$ *or* $3 \times M$	Demonstrate an understanding of the theory behind confidence intervals. **Merit** *plus* $1 \times E$

The following Mathematics specific marking conventions may also have been used when marking this paper:

- Errors are circled.
- Omissions are indicated by a caret (^).
- **NS** may have been used when there was not sufficient evidence to award a grade.
- **CON** may have been used to indicate 'consistency' where an answer is obtained using a prior, but incorrect answer and **NC** if the answer is not consistent with wrong working.
- **CAO** is used when the 'correct answer only' is given and the assessment schedule indicates that more evidence was required.
- # may be used when a correct answer is obtained but then further (unnecessary) working results in an incorrect final answer being offered.
- **RAWW** indicates right answer, wrong working.
- **R** for 'rounding error' and **PR** for 'premature rounding' resulting in a significant round-off error in the answer (if the question required evidence for rounding).
- **U** for incorrect or omitted units (if the question required evidence for units).
- **MEI** may have been used to indicate where a minor error has been made and ignored.