Assessment Schedule – 2008

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

Evidence Statement

Question	Evidence	Code	Judgement
One	142.3 ± 2.73 **OR** $139.57 < \mu < 145.02$	**A**	Accept any rounding more than one sig. fig. Accept intervals written in equivalent forms. **CRO**. Ignore units.
Two (a)	0.1 ± 0.081 **OR** $0.0185 < \pi < 0.181$	**A**	Accept any rounding more than one sig. fig. **CRO**. Accept intervals written in equivalent forms.
(b)	$2.576 \times \sqrt{\dfrac{0.5 \times 0.5}{n}} \le 0.04$ $n \ge 1036.84$ Minimum = 1037 **OR** $2.576 \times \sqrt{\dfrac{0.1 \times 0.9}{n}} \le 0.04$ $n \ge 373.26$ Minimum = 374	**M**	Accept variations due to use of different z values, and accept variations in calculations that are due to rounding, but the final answer must be rounded up. Ignore units.
Three (a)	3.9 ± 3.68 **OR** $0.22 < \mu_1 - \mu_2 < 7.58$	**A**	Accept any rounding more than one sig. fig. Accept intervals written in equivalent forms. **CRO**. Ignore units.
(b)	The manager's belief is justified because: • zero lies outside this interval **OR** • the whole interval is positive.	**M**	Must have conclusion **AND** a correct reason. Or equivalent. Answer must be consistent with the interval calculated in part (a).
Four (a)	There is a 96% chance that the interval contains the mean girth of all trees in the nursery. **OR** If the sampling process was repeated a large number of times, 96% of such intervals would contain the mean girth of all trees in the nursery.	**M**	Or equivalent. Do NOT accept a statement that assigns a probability to the population mean (eg "There is a 96% chance that the population mean is within this interval").
(b)	Current interval width = 25.8 cm. New interval width is $\dfrac{1}{\sqrt{k}}$ times the original interval width. So new interval width is $\dfrac{25.8}{\sqrt{k}}$.	**M** **E**	**CRO**. Or equivalent.

Question	Evidence	Code	Judgement
Five	$\sigma_{\bar{X}} = \dfrac{13.2}{\sqrt{90}} = 1.391402$ $P(\bar{X} < 142.3) \approx 0$ It is <u>highly unlikely</u> that a <u>sample</u> would be obtained with a <u>mean</u> height of 142.3 cm or less.	**E**	Must identify the need to use the distribution of sample means AND must comment on the likelihood of this sample mean occurring if the owner's prediction were true. Accept a statement that the sample would have to be bias (or equivalent). Accept variations in rounding.
Six	$E[T] = 12 \times 38.7 = 464.4$ $\sigma_T = \sqrt{12} \times 2.4 = 8.3138$ Confidence Interval: 464.4 ± 16.295 **OR** $448.1 < T < 480.7$	**E**	Need to see supportive working. Accept variations in rounding. Ignore units. Watch for **RAWW**: $\sigma_T = 12 \times 2.4 = 28.8$, then use of $n = 12$ for CI.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Calculate confidence intervals for population parameters.	Demonstrate an understanding of confidence intervals.	Demonstrate an understanding of the theory behind confidence intervals.
3 **A** OR 2 **A** + 1 **M**	3 **M** OR 2 **M** + 2 **A**	1 **E** + 3 **M** OR 1 **E** + 2 **M** + 2 **A**

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

- errors are circled
- a caret ($\wedge$) indicates an omission
- **NS** indicates there is not sufficient evidence to award a grade
- **CON** indicates "consistency" where an answer is obtained using a prior – but incorrect – answer, and **NC** indicates the answer is not consistent with wrong working
- **CRO** indicates the "correct response only" is given but that the Assessment Schedule indicates that more evidence is required
- **#** indicates that a correct answer is obtained but then further (unnecessary) working results in an incorrect final answer
- **RAWW** indicates "right answer, wrong working"
- **R** indicates "rounding error" and **PR** is "premature rounding", either of which results in a significant round-off error in the answer (if the question requires evidence for rounding)
- **U** indicates incorrect or omitted units (if the question requires evidence for units)
- **MEI** indicates where a minor error has been made and ignored.