| Question | Scheme | Marks | AOs |
|---|---|---|---|
| **6(a)(i)** | $P(X > 15) = 0.1150697...$ <div style="text-align:right">awrt 0.115</div> | B1 | 1.1b |
| | | **(1)** | |
| **(a)(ii)** | $$1 - \left[ P(X < 15) \right]^2 = 1 - \left( 1 - '0.115' \right)^2$$ <div style="text-align:center">or</div> $$2 \times P(X > 15) \times P(X < 15) + \left[ P(X > 15) \right]^2$$ $$= 2 \times '0.115' \times \left( 1 - '0.115' \right) + '0.115'^2$$ | M1 | 3.1b |
| | <div style="text-align:right">awrt 0.217</div> | A1ft | 1.1b |
| | | **(2)** | |
| **(b)** | $$P(X > m \mid X > 15) = 0.25$$ $$\frac{P(X > m)}{P(X > 15)} = 0.25$$ | M1 | 3.4 |
| | $P(X > m) = 0.25 \times P(X > 15) = 0.25 \times 0.115... = 0.028767...$ <div style="text-align:right">awrt 0.0288</div> | A1 | 1.1b |
| | | **(2)** | |
| **(c)** | $H_0 : \mu = 12 \quad H_1 : \mu \neq 12$ | B1 | 2.5 |
| | $\bar{X} \sim N\left( 12, \frac{2.5^2}{25} \right) = \bar{X} \sim N(12, 0.25)$ seen or used | M1 | 3.3 |
| | $P(\bar{X} \leqslant c_1) < 0.005$ or $P(\bar{X} \geqslant c_2) > 0.005$ $\qquad$ $\dfrac{\bar{X} - 12}{\frac{2.5}{5}} = \pm 2.57...$ | M1 | 3.4 |
| | $c_1 = 10.7, \quad c_2 = 13.3$ <div style="text-align:right">awrt 10.7 and 13.3</div> | A1 | 1.1b |
| | $\left( \bar{X} \leqslant 10.7 \right) \cup \left( \bar{X} \geqslant 13.3 \right)$ o.e. | A1 | 1.1b |
| | | **(5)** | |
| | | **(10 marks)** | |

**Notes:**

| | | |
|---|---|---|
| **(a)(i)** | **B1** | Finding $P(X > 15) = $ awrt $0.115$ |
| **(a)(ii)** | **M1:** | Correct method using their $P(X > 15)$ |
| | **A1ft:** | awrt 0.217 |
| **(b)** | **M1:** **A1:** | Correct use of conditional probability formula given as a fraction equal to 0.25 <br> awrt 0.0288 |
| **(c)** | **B1:** | For both hypotheses correct and in terms of $\mu$ |

| | **M1:** | Correct distribution written or used. Condone $\bar{X} \sim \mathrm{N}(12, 0.5)$ if used correctly subsequently |
| --- | --- | --- |
| | **M1:** | Correct method or statement for finding two-tailed 1% CR |
| | **A1:** | Both CVs given correctly to 3.s.f. |
| | **A1:** | CR written correctly in terms of $\bar{X}$ (allow < and >) |
| | | Allow any letter in place of $\bar{X}$ providing it denotes a mean |