

Qu 5	Scheme	Marks	AO
(a)	$\left[ \text{Let } F \sim N(166.5, 6.1^2) \right] \quad P(F < k) = 0.01 \Rightarrow \frac{k-166.5}{6.1} = -2.3263$ $k = 152.309... \quad \underline{\underline{152}} \text{ or awrt } \underline{\underline{152.3}}$	M1 A1 (2)	3.4 1.1b
(b)	$[P(150 < F < 175) = ] \quad 0.914840... \quad \text{awrt } \underline{\underline{0.915}}$	B1 (1)	1.1b
(c)	$P(F > 160 \mid 150 < F < 175)$ $= \frac{P(160 < F < 175)}{P(150 < F < 175)} \quad \text{or} \quad \frac{P(160 < F < 175)}{"(b)"}$ $= \frac{0.7749487...}{"0.91484..."} = 0.84708... \text{ awrt } \underline{\underline{0.847}}$	M1 M1 A1ft A1 (4)	3.1b 1.1b 1.1b 1.1b
(d)	$H_0 : \mu = 166.5 \quad H_1 : \mu < 166.5$ $[\text{Let } X = \text{height of female from 2}^{\text{nd}} \text{ country}] \quad \bar{X} \sim N\left(166.5, \left(\frac{7.4}{\sqrt{50}}\right)^2\right)$ $P(\bar{X} < 164.6) = 0.03472...$ $[0.0347... < 0.05 \text{ so significant or reject } H_0]$ There is evidence to support Mia’s belief	B1 M1 A1 dA1 (4)	2.5 3.3 3.4 2.2b
( 11 marks)			
Notes			
(a)	M1 for standardising (allow $\pm$ ) with $k$ , 166.5 and 6.1 and set equal to a $z$ value $2.3 <  z  < 2.4$ A1 for 152 or awrt 152.3 <b>Ans only</b> 2/2 [Condone poor use of notation e.g. $P(\frac{k-166.5}{6.1}) = -2.3263$ ] <b>Allow percentages instead of probabilities throughout.</b>		
(b)	B1 for awrt 0.915		
(c)	1 <sup>st</sup> M1 for interpreting demand as an appropriate conditional probability ( $\Rightarrow$ by 2 <sup>nd</sup> M1) 2 <sup>nd</sup> M1 for correct ratio of expressions (can ft their (b) on denominator) ( $\Rightarrow$ by 1 <sup>st</sup> A1ft) 1 <sup>st</sup> A1ft for a correct ratio of probs (can ft their “0.9148...” to 3sf from (b) if $> 0.775$ ) 2 <sup>nd</sup> A1 for awrt 0.847		
(d)	B1 for both correct hypotheses in terms of $\mu$ 1 <sup>st</sup> M1 for selecting the correct model (needn’t use $\bar{X} \Rightarrow$ by standardisation or 1 <sup>st</sup> A1) 1 <sup>st</sup> A1 for correct use of the correct model i.e. awrt 0.035 (allow 0.04 if $P(\bar{X} < 164.6)$ seen) Condone $P(\bar{X} > 164.6) = 0.9652$ or awrt 0.97 <u>only if</u> comparison with 0.95 is made		
ALT	<b>Use of <math>z</math> value:</b> Need to see $Z = -1.8(15...)$ <b>and</b> cv of $\pm 1.6449$ (allow 1.64 or better) for 1 <sup>st</sup> A1		
ALT	<b>Use of CR or CV for <math>\bar{X}</math>:</b> Need to see “ $\bar{X}$ ” $< 164.7786...$ or CV = ... (awrt 164.8) for 1 <sup>st</sup> A1 Condone truncation i.e 164.7 or better 2 <sup>nd</sup> dA1 ( <b>dep on M1A1</b> only) for a correct inference in context. Must mention <u>Mia’s belief</u> <b>or</b> <u>mean height of females/women</u> Do NOT award if contradictory statements about hypotheses made e.g. “not sig”		
SC	<b>M0 for <math>\bar{X} \sim N(164.6, ...)</math></b> If they achieve $p =$ awrt 0.035 (o.e. with $z$ -value or CV of 166.3) <b>and</b> a correct conclusion in context is given score M0A0A1 [and SC for awrt 0.97 $> 0.95$ case]		