

Qu 4	Scheme	Marks	AO
(a)	[Let N = height from region A; $P(N > 180) =$] 0.24937... awrt 0.249	B1 (1)	1.1b
(b)	$H_0 : \mu = 175.4 \quad H_1 : \mu \neq 175.4$ [S = height from region B] $\bar{S} \sim N\left(175.4, \frac{6.8^2}{52}\right)$ Allow $\sigma^2 =$ awrt 0.889 [$P(\bar{S} > 177.2) = 0.02814...$ [0.028... > 0.025, Not sig, do not reject H_0] <u>Insufficient evidence to support student's claim</u>	B1 M1 A1 A1 (4)	2.5 3.3 3.4 2.2b
(c)	[p -value = $2 \times 0.02814... =$] 0.05628... in range 0.056~0.06 or 5.6(%)~6(%)	B1ft (1)	1.2
(6 marks)			
Notes			
(a)	B1 for awrt 0.249		
(b)	B1 for both hypotheses correct in terms of μ (See below for one-tail test) M1 for selecting the correct model, may be implied by standardisation using correct values or may be implied by a correct value in 1 st A1 e.g.(Prob =) 0.028 or awrt 0.972, (Z =) 1.9(08..) (CV=) 177.25 Condone use of S (or any other letter) instead of $\bar{S}$ Condone use of $\bar{S} \sim N\left(177.2, \frac{6.8^2}{52}\right)$ but this will lose 2nd A mark		
ALT	1 st A1 for probability of awrt 0.028 (allow 0.03 if $P(\bar{S} > 177.2)$ is seen) Condone $1 - 0.02814... = 0.9718...$ (awrt 0.972) only if clearly compared with 0.975 Allow $Z = 1.9(088...)$ and comparison with 1.96 (or better: calc gives 1.95996...) or CR of $[\bar{S}]... 177.248...$ (awrt 177.25) Allow $[\bar{S}] > 177.248...$ (awrt 177.25) Implied by diagram or correct interpretation of inequality with their CV (Ignore any attempt at a lower CR for $\bar{S}$)		
	2 nd A1 (dep on 1 st A1 and use of correct model. Use of $N(177.2, ...)$ scores A0) for a conclusion using context: e.g. does <u>not support</u> student's <u>claim</u> or e.g. <u>insufficient</u> evidence of a <u>difference in heights</u> Do not allow 2 nd A mark for contradictory statements e.g. "significant" so "no support for claim"		
(c)	B1ft for answer in range 0.056~0.06 or 5.6%~6% (Ranges are inclusive, condone missing %) (can fit their probability, provided < 0.5, from part (b) but not 0.025 leading to 5%)		
NB	One-tail test [Max of 3/5 for (b) and (c)] In (b) B0 (hypotheses) M1(model as above) 1 st A1[for probability or Z compared with 1.6449 or CR $[\bar{S}]... > 176.95...$ (awrt 177)] 2 nd A1 for conclusion in context that <u>supports claim</u> or "heights of men from B is <u>different from/greater than</u> from A" In (c) B0		