Question Number	Scheme	Marks
4 (a)	$\left[\bar{y}=\frac{23200}{80}\Rightarrow\right]\ \bar{y}=290$	B1
	$\left[s_y^{\,2}=\right]\frac{6741351-80(290)^2}{80-1}$ or $\left[s_y^{\,2}=\right]\frac{80}{79}\left(\frac{6741351}{80}-\left(\frac{23200}{80}\right)^2\right)$	M1
	$=169$	A1
		(3)
(b)	$H_0:\mu_x-\mu_y=200$ $\quad H_1:\mu_x-\mu_y>200$ oe	B1
	$z=\pm\frac{500-'290'-200}{\sqrt{\frac{'169'}{80}+\frac{1156}{80}}}$	M1 A1ft
	$=2.45718...$ awrt 2.46	A1
	One tailed c.v. Z = 1.6449 **or** CR: Z …1.6449	B1
	e.g. In CR/Significant/Reject H_0	M1
	Sufficient evidence to support the research **student's belief**	A1
		(7)
(c)	Assume that $s^2=\sigma^2$	B1
		(1)
	Notes	**Total 11**

(a)	**B1**	For $\bar{y}=290$
	M1	A correct method for $s_y^{\,2}$. May be implied by 169 on its own (not within a calculation)
	A1	169 do not isw
(b)	**B1**	Both hypotheses correct. Allow equivalent hypotheses. Must be in terms of μ . Use of $\bar{X}-\bar{Y}$ is B0. Allow *g* for *x* and *r* for *y* but use of any other letters must be defined.
	M1	An attempt at $\pm\frac{500-a-200}{\sqrt{\frac{b}{80}+\frac{1156}{80}}}$ oe with at least 1 of *a* or *b* correct using their 290 or their 169 May be implied by awrt ±2.46 or may state e.g. $N\left(\pm200,\frac{'169'}{80}+\frac{1156}{80}\right)$ (μ may be 0)
	A1ft	A correct expression [se $\sqrt{\frac{265}{16}}=4.0697...$] or imp by awrt ±2.46 or *p*-value of awrt 0.0072
	A1	awrt $z=$ 2.46 (possibly $\pm$) or $P(\bar{X}-\bar{Y}>210)=$ awrt 0.00716 Correct answer scores M1A1ftA1 but $200-(500-290)\rightarrow-10$ loses this 2nd A mark
	B1	awrt $\pm$ 1.6449 or better seen or a comparison of *p*-value awrt 0.007 < 0.05 oe
	M1	Dep. on $1<\lvert z\rvert<3$ or $0<P(\bar{X}-\bar{Y}>'210')<0.5$ A correct statement ft on their *z* value and CV, with compatible signs, or prob. Context not needed but do not accept contradicting non contextual comments
	A1	Dep on all **previous M and A marks** but independent of hypotheses. A correct contextual statement e.g. the **mean weight** of **grey squirrels** is **more than 200g greater** than (the mean weight) of **red squirrels** o.e. Must mention **mean weight** at least once if they mention weight or weights. Condone the **difference** (in **mean weights**) is **greater than 200g**
(c)	**B1**	Assume that sample variance = population variance oe (but not e.g. $s_x=s_y$).