Question	Scheme		Marks
1 (a)(i)	Method 1	Method 2	
	$[\bar{y} =]\frac{847}{100}[=8.47]$	$847+100\times1000$ [=100847]	M1
	So $\bar{x}=1000+\frac{847}{100}=1008.47$ *	$\bar{x}=\frac{847+1000\times100}{100}$ = 1008.47*	A1*
(ii)	$\left[s_x{}^2=s_y{}^2=\right]\frac{13510.09-100\times"8.47"^2}{99}$	$\left[s_x{}^2=\right]\frac{101707510.1-\frac{"100847"^2}{100}}{99}$	M1
	= 64		A1
			(4)
(b)	$H_0:\mu_x=1010$ $H_1:\mu_x\neq1010$		B1
			(1)
(c)	$\frac{\bar{X}-1010}{"8"/\sqrt{100}}=-1.96$ oe $\frac{\bar{X}-1010}{"8"/\sqrt{100}}=1.96$ oe		M1 B1
	$\bar{X}=1008.432$ $\bar{X}=1011.568$ awrt 1008 and 1012(or 1011)		A1
	$\bar{X}\leqslant"1008.432"$ $\bar{X}\geqslant"1011.568"$		A1ft
			(4)
(d)	1008.47 is not in the critical region		M1
	The machine does not need to be stopped /reset		A1ft
			(2)
(e)	It is reasonable since the sample size is (reasonably) large		B1
			(1)

	Notes		**Total 12**
(a)(i)	**M1**	For 8.47 or $847/100$ or $847+100\times1000$ or $847=\sum x-100\times1000$ or 100847 seen	
	A1*	cso correct solution including $\bar{x}$ = .. and …=1008.47 allow alt notation for $\bar{x}$ but must refer to *x* not *y* and must not be just *x* eg E(*X*), μ_x, mean of *x*	
(ii)	**M1**	For a correct expression ft their 100847 Allow for answer of 1064	
	A1	Cao do not ISW Allow 64.00…	
(b)	**B1**	Both hypotheses correct. Must be in terms of μ. (Allow $H_0:\mu_y=10$ $H_1:\mu_y\neq10$)	
		Mark (c) and (d) together	
(c)	**M1**	For $\pm$ standardisation with 1010 and their sd Allow equivalent eg $1010\pm n\times"8"/\sqrt{100}$ SC condone use of 1008.47 for 1010 or for $\bar{X}$	
	B1	For c.v. = ±1.96 or better seen (Calculator gives 1.95996…) Condone 1.6449 or better if they have a one tail hypotheses in (b)	
	A1	For **both** limits 1008 or better **and** 1012 or better seen. (condone 1011from correct working)	
	A1	For selecting the correct region ft their figures(not *z* value). Allow use of < and > also allow other letters(condone μ) Allow other notation eg [1012, ∞], (∞, 1008] allow [1012, ∞] , [∞, 1008]	
(d)	**M1**	ft their CR if the final A mark in part (c) is awarded. For a correct comment compatible with their CR. Must refer to 1008.47 (allow mean of *x*) is in or out of their CR Allow writing in the form "1008.432" < 1008.47 < "1011.568" etc but if in middle it must have both ends. If no clear CR it is M0A0	
	A1ft	dep on M1 awarded. Correct conclusion consistent with comparing 1008.47 with their CR(allow interval/ range etc). If it is in the CR they must say it needs to be reset/stopped. If it is not in the CR it must say it does not need to be stopped/reset. (allow equivalent wording)	

	SC	If the CR in (c) is of the form "1008.432" < $\bar{X}$ < "1011.568" oe (not z values) then award M0A1 for concluding the machine does not need to be stopped/reset.
(e)	**B1**	Any suitable comment about the sample being large eg n is large