Question Number	Scheme	Marks
7(a)	$\mathrm{E}(D)=x+2$	M1
	$\mathrm{Var}(D)=\dfrac{\left((x+5)-(x-1)\right)^2}{12}\left[=3\right]$	M1
	$\overline{D}\sim N\left(x+2,\dfrac{3}{n}\right)$	A1
		(3)
(b)	$"x+2"=22.101+"2"\ (=24.101)$ or $"x+2"=24.6\Rightarrow 24.6-"2"\ (=22.6)$	M1
	$24.6-"2.5758"\sqrt{\dfrac{"3"}{n}}="24.101"$ oe	B1M1 dM1
	$n=80$	A1cao
		(5)
	Notes	Total 8

Question Number	Scheme	Marks
1(a)	Number all of the students in **each** year group. Use random numbers to select/take a (simple) random sample of ... 24 students in Group 1 (year 7-9) 20 students in Group 2 (year 10-11) 6 students in Group 3 (year 12-13)	B1 B1 B1
		(3)
(b)	'It is **more** representative when there might be systematic differences between age groups.'	B1
		(1)
		Total 4

Question	Scheme		Marks
1 (a)(i)	Method 1	Method 2	
	$[\bar{y}=]\dfrac{847}{100}[=8.47]$	$847+100\times1000$ [=100847]	M1
	So $\bar{x}=1000+\dfrac{847}{100}=1008.47$ *	$\bar{x}=\dfrac{847+1000\times100}{100}=1008.47$*	A1*
(ii)	$\left[s_x^{\,2}=s_y^{\,2}=\right]\dfrac{13510.09-100\times"8.47"^2}{99}$	$\left[s_x^{\,2}=\right]\dfrac{101707510.1-\frac{"100847"^2}{100}}{99}$	M1
	$=64$		A1
			(4)
(b)	$H_0:\mu_x=1010$ $\quad H_1:\mu_x\neq1010$		B1
			(1)
(c)	$\dfrac{\bar{X}-1010}{"8"/\sqrt{100}}=-1.96$ oe $\quad\dfrac{\bar{X}-1010}{"8"/\sqrt{100}}=1.96$ oe		M1 B1
	$\bar{X}=1008.432$ $\quad\bar{X}=1011.568$ awrt 1008 and 1012(or 1011)		A1
	$\bar{X}\leqslant"1008.432"$ $\quad\bar{X}\geqslant"1011.568"$		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**

Question Number	Scheme	Marks
5 (a)	$\hat{p} = \dfrac{0\times2+1\times40+2\times90+3\times85+4\times30+5\times3}{250\times5}$ or $\hat{p} = \dfrac{40+180+255+120+15}{250\times5}\left(=\dfrac{610}{1250}=\dfrac{122}{250}\right)$	M1
	$=0.488$	A1
		(2)
(b)	$250-(41.92+\ldots+6.92)$	M1
	$=8.79$	A1
		(2)
(c)	H_0 : Binomial distribution is suitable/sensible (model) H_1 : Binomial distribution is not suitable/sensible (model)	B1
	$\dfrac{(2-'8.8')^2}{'8.8'}\left[=5.25\ldots\right]$	M1
	$\left[\sum\dfrac{(O-E)^2}{E}=\right]5.70+'5.25'=10.95$	dM1 A1
	$\nu=6-1-1=4$	B1
	$\chi^2_4(0.05)=9.488\Rightarrow$ CR…9.488	B1ft
	[In CR/Significant/Reject H_0] Significant evidence to suggest that a binomial distribution is not a suitable model	A1
		(7)
	Notes	**Total 11**