

Question Number	Scheme	Marks
8 (a)	$\frac{162 - \mu}{\sigma} = -1.2816$ (Calculator gives $-1.28155\dots$)	M1 A1 A1
	or $\frac{175 - \mu}{\sigma} = 1.04$ (Calculator gives $1.03987\dots$)	
	$\mu - 1.2816\sigma = 162$	
	$\mu + 1.04\sigma = 175$	
	$2.3216\sigma = 13$	dM1
	$\sigma = 5.5995\dots$ awrt 5.6 $\mu = 169.1764\dots$ awrt 169	A1
		(5)
(b)	$Q_1 = 208.26$ or $Q_3 - Q_1 = 13.48$	B1
	$221.74 + 1.5(221.74 - 'Q_1') [= 241.96]$ or $'Q_1' - 1.5(221.74 - 'Q_1') [= 188.04]$	M1
	Probability of an outlier	1 - Probability of not an outlier
	$[P(B > '241.96') =]$	
	$P\left(Z > \frac{'241.96' - 215}{10}\right) [= P(Z > 2.70)]$	$[P('188.04' < B < '241.96') =]$
	or	$P\left(\frac{'188.04' - 215}{10} < Z < \frac{'241.96' - 215}{10}\right)$
	$[P(B < '188.04') =]$	
	$P\left(Z < \frac{'188.04' - 215}{10}\right) [= P(Z < -2.70)]$	$[= P(-2.70) < Z < P(2.70)]$
	or	
	$= 0.0035$ (Calculator gives $0.0034883\dots$)	$= 0.993$ (Calculator gives $0.99298\dots$)
$P(\text{Outlier}) = 2 \times 0.0035'$	$P(\text{Outlier}) = 1 - '0.993'$	M1
$= 0.007$ (Calculator gives $0.006976\dots$)	$= 0.007$ (Calculator gives $0.007017\dots$)	
awrt 0.007	awrt 0.007	A1
		(5)
Notes		Total 10

Question Number	Scheme	Marks
4 (a)	(Discrete) uniform (distribution)	B1 (1)
(b)(i)	[By symmetry] $E(X) = \underline{13}$	B1 (1)
(ii)	$\frac{10^2 + 12^2 + 14^2 + 16^2}{4} - 13^2$ or $\frac{696}{4} - 169$ or $174 - 169$	M1
	$= \underline{5}$	A1 (2)
(c)(i)	$E(Y) = \frac{1}{30}(1 \times 4 + 2 \times 9 + 3 \times 6 + 4 \times 5 + 5 \times 6)$; $= \frac{90}{30} = \underline{3}$	M1; A1 (2)
(ii)	$E(Y^2) = \frac{1}{30}(1^2 \times 4 + 2^2 \times 9 + 3^2 \times 6 + 4^2 \times 5 + 5^2 \times 6) = \left[\frac{324}{30} \text{ or } 10.8\right]$	M1
	$\text{Var}(Y) = "10.8" - "[3]^2"; = \underline{1.8}$	M1; A1 (3)
(d)	$E(W) = E(Y) \Rightarrow aE(X) + b [= E(W) \text{ or } E(Y) \text{ or } "3"]; \text{ i.e. } "13"a + b = "3"$	M1; A1ft
	$\text{Var}(W) = \text{Var}(Y) \Rightarrow a^2 \times "5" = "1.8"; \text{ so } a = \frac{3}{5} \text{ or } \underline{0.6}$	M1; A1
	$b = \underline{-4.8}$	A1 (5)
(e)	Values of w are: $10 \times "0.6" - "4.8" = 1.2$ or 2.4 or 3.6 or 4.8 i.e. all non integers	M1
	[So no cases are possible when $W = Y$ so $P(W = Y) = \underline{0}$]	A1 (2)
		[16 marks]

Question Number	Scheme	Marks
7(a)(i)	$P(X > 505) = P\left(Z > \frac{505 - 503}{1.6}\right)$ $= 1 - P(Z < 1.25) = 1 - 0.8944$ $= 0.1056$	M1 M1 A1 (3)
(ii)	$P(501 < X < 505) = 1 - 2 \times 0.1056 \quad \text{or} \quad 0.8944 - 0.1056$ $= 0.7888$	M1 A1 (2)
(b)	$P(X < w) = 0.9713 \quad \text{or} \quad P(X > w) = 0.0287 \quad (\text{may be implied by } z = \pm 1.9)$ $\frac{w - 503}{1.6} = 1.9 \quad \text{or} \quad \frac{(1006 - w) - 503}{1.6} = -1.9$ $w = 506.04\dots$	M1 M1 A1 (3)
(c)	$\frac{r - 503}{q} = -2.3263$ $\frac{r + 6 - 503}{q} = 1.6449$ $1.6449q - 6 = -2.3263q$ $q = 1.51\dots$ $r = 499.48\dots\dots$	M1A1 M1A1 ddM1 A1 A1 (7) Total 15

Question Number	Scheme					Marks										
7 (a)	$\frac{k+4}{8} = 1 \quad [k = 4^*]$					B1*										
						(1)										
(b)	x	1	2	3	4	M1 M1 A1										
	P(X=x)	$\frac{1}{13}$	$\frac{7}{26} - \frac{1}{13} = \frac{5}{26}$	$\frac{15}{26} - \frac{7}{26} = \frac{4}{13}$	$1 - \frac{15}{26} = \frac{11}{26}$											
						(3)										
(c)	4					B1ft										
						(1)										
(d)	$E(X) = 1 \times \frac{1}{13} + 2 \times \frac{5}{26} + 3 \times \frac{4}{13} + 4 \times \frac{11}{26} \left[= \frac{40}{13} \right]$	<table border="1"> <tr> <td>Y</td> <td>7</td> <td>20</td> <td>33</td> <td>46</td> </tr> <tr> <td>P(Y=y)</td> <td>$\frac{1}{13}$</td> <td>$\frac{5}{26}$</td> <td>$\frac{4}{13}$</td> <td>$\frac{11}{26}$</td> </tr> </table>				Y	7	20	33	46	P(Y=y)	$\frac{1}{13}$	$\frac{5}{26}$	$\frac{4}{13}$	$\frac{11}{26}$	M1
	Y	7	20	33	46											
	P(Y=y)	$\frac{1}{13}$	$\frac{5}{26}$	$\frac{4}{13}$	$\frac{11}{26}$											
	$E(X^2) = 1^2 \times \frac{1}{13} + 2^2 \times \frac{5}{26} + 3^2 \times \frac{4}{13} + 4^2 \times \frac{11}{26} \left[= \frac{135}{13} \right]$	$E(Y) = 7 \times \frac{1}{13} + 20 \times \frac{5}{26} + 33 \times \frac{4}{13} + 46 \times \frac{11}{26} \left[= 34 \right]$				M1										
	$\text{Var}(X) = \frac{135}{13} - \left(\frac{40}{13} \right)^2 \left[= \frac{155}{169} \right]$	$E(Y^2) = 7^2 \times \frac{1}{13} + 20^2 \times \frac{5}{26} + 33^2 \times \frac{4}{13} + 46^2 \times \frac{11}{26} \left[= 1311 \right]$				M1										
$\text{Var}(13X - 6) = 13^2 \times \frac{155}{169}$	$\text{Var}(13X - 6) = '1311' - '34'^2$				M1											
	$= 155$					A1										
						(5)										
Notes						Total 10										