Stats 2 Discrete Random Variables Answers

Question	Solution	Marks	Total	Comments
5(a)	$\mathrm{E}(X)=\sum_{\text{all } x} x\ \mathrm{P}(X=x)$			
	$=50$	B1		(cao)
	$\mathrm{E}(X^2)=\sum_{\text{all } x} x^2\mathrm{P}(X=x)$			
	$=2602.6(0)$	M1		
	$\mathrm{Var}(X)=\mathrm{E}(X^2)-[\mathrm{E}(X)]^2$			
	$=2602.6-50^2$	M1		
	$=102.6(0)$			
	$\Rightarrow$ standard deviation $(X)=10.13$	A1	4	(to nearest 1p)
(b)	$\mathrm{E}(Y)=\mu=\mathrm{E}(10X+250)$			
	$=10\times\mathrm{E}(X)+250$			
	$=750$	B1√		(on their $\mathrm{E}(X)$)
	$\mathrm{s.d}(Y)=10\times10.1$			
	$=101$	B1√	2	(on their $\mathrm{sd}(X)$)
	Total		**6**	

Q	Solution	Marks	Total	Comments
3(a)	$\mathrm{E}(R)=\sum_{\text{all } r} r\ \mathrm{P}(R=r)$			
	$=\left(1\times\frac{7}{16}\right)+\left(2\times\frac{5}{16}\right)+\left(3\times\frac{3}{16}\right)+\left(4\times\frac{1}{16}\right)$			
	$=\frac{30}{16}$			
	$=1\frac{7}{8}$	B1		(1.875)
	$\mathrm{E}(R^2)=\sum_{\text{all } r} r^2\ \mathrm{P}(R=r)$			
	$=\frac{70}{16}$ or $4\frac{3}{8}$	B1		(4.375)
	$\mathrm{Var}(R)=4\frac{3}{8}-\left(1\frac{7}{8}\right)^2$	M1		

	$= \frac{220}{256}$ or $\frac{55}{64}$	A1	4	(0.859375)
(b)(i)	$32 \times \frac{1}{4} = 8$	B1	1	
(ii)	$= \left(32 \times \frac{7}{16} \times \frac{1}{5}\right) + \left(32 \times \frac{5}{16} \times \frac{1}{2}\right) + 8 \times \frac{9}{10}$	M1		
	$= 2.8 + 5 + 7.2$			A0 if these numbers rounded before adding
	$= 15$	A1	2	
	Total		**7**	

4(a)	$\sum p = 1$ $k = 1 - (0.01 + 0.05 + 0.14 + 0.30 + 0.12)$ $k = 0.38$	B1	1	
(b)(i)	$\mathrm{E}(X) = \sum_{\text{all } x} x \, \mathrm{P}(X = x) = 4.35$	B1	1	$\frac{87}{20}$
(ii)	$\mathrm{Var}(X) = \sum_{\text{all } x} x^2 \, \mathrm{P}(X = x) - \mu^2$	M1		$\mathrm{E}(X^2)$ attempted
	$= 20.09 - 18.9225$	M1		$\sum x^2 \mathrm{P}(X = x) - \mu^2$
	$= 1.1675$	A1	3	$\frac{467}{400}$ (AWFW 1.16 – 1.17)
(c)(i)	$\mathrm{E}(Y) = 5\mathrm{E}(X) + 2$ $= 5 \times 4.35 + 2$ $= 23.75$	M1	1	Their (b)(i) × 5 + 2
(ii)	$\mathrm{Var}(Y) = 25\mathrm{Var}(X)$ $= 29.1875$	M1		Their (b)(ii) × 25
	Standard deviation $= 5.40$	m1 A1	3	$\sqrt{}$ $(5.40 - 5.41)$
	Total		**9**	

Q	Solution	Marks	Total	Comments
7(a)(i)	$\begin{array}{\|c\|c\|c\|}\hline x & 4 & -1 \\ \hline \mathbf{P}(X=x) & \frac{1}{5} & \frac{4}{5} \\ \hline \end{array}$	B1	1	
(ii)	$\mathrm{E}(X)=\left(4\times\frac{1}{5}\right)+\left(-1\times\frac{4}{5}\right)=0$	M1 A1	2	$\left(p>0, \sum p=1\right)$
(b)	$\begin{array}{\|c\|c\|c\|}\hline x & 4 & -1 \\ \hline \mathbf{P}(X=x) & \frac{1}{3} & \frac{2}{3} \\ \hline \end{array}$	B1		
	$\mathrm{E}(X)=\left(4\times\frac{1}{3}\right)+\left(-1\times\frac{2}{3}\right)=\frac{2}{3}$	B1		$\left(p>0, \sum p=1\right)$
	$\mathrm{E}(24X)=24\times\mathrm{E}(X)$			
	$=24\times\frac{2}{3}$	M1		
	$=16$	A1	4	
	Total		**7**	