Edexcel GCE

Statistics S1

Silver Level S4

(Mark Scheme)

Mr.S.V.Swarnaraja (Marking Examiner, Team Leader & Author)
www.swanash.com, Mobile: +94777304755 , email: swa@swanash.com

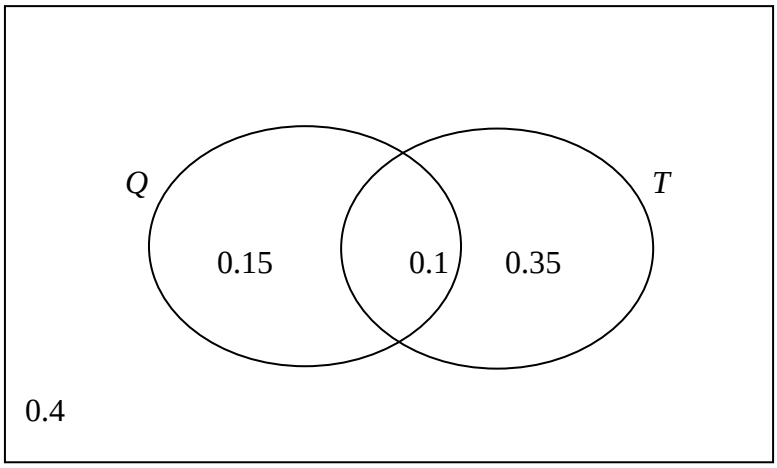
<table>
<tr><th>Question Number</th><th>Scheme</th><th>Marks</th></tr>
<tr><td>1. (a)</td><td>14, 5</td><td>M1 A1
(2)</td></tr>
<tr><td>(b)</td><td>21 + 45 + 3 = 69</td><td>M1 A1
(2)
[4]</td></tr>
<tr><td>2. (a)</td><td>$\mathrm{E}(X) = 0\times0.4+1\times0.3+...+3\times0.1,$ = 1</td><td>M1, A1
(2)</td></tr>
<tr><td>(b)</td><td>F(1.5) = $\left[\mathrm{P}(X \le 1.5) =\right]$ $\mathrm{P}(X \le 1)$, = 0.4 + 0.3 = 0.7</td><td>M1, A1
(2)</td></tr>
<tr><td>(c)</td><td>$\mathrm{E}(X^2) = 0^2\times0.4+1^2\times0.3+...+3^2\times0.1$, = 2

$\mathrm{Var}(X) = 2-1^2$, = 1 (*)</td><td>M1, A1

M1, A1cso
(4)</td></tr>
<tr><td>(d)</td><td>$\mathrm{Var}(5-3X) = (-3)^2\,\mathrm{Var}(X)$, = 9</td><td>M1, A1
(2)</td></tr>
<tr><td>(e)</td><td>
<table>
<tr><th>Total</th><th>Cases</th><th>Probability</th></tr>
<tr><td rowspan="3">4</td><td>$(X=3)\cap(X=1)$</td><td>$0.1\times0.3=0.03$</td></tr>
<tr><td>$(X=1)\cap(X=3)$</td><td>$0.3\times0.1=0.03$</td></tr>
<tr><td>$(X=2)\cap(X=2)$</td><td>$0.2\times0.2=0.04$</td></tr>
<tr><td rowspan="2">5</td><td>$(X=3)\cap(X=2)$</td><td>$0.1\times0.2=0.02$</td></tr>
<tr><td>$(X=2)\cap(X=3)$</td><td>$0.2\times0.1=0.02$</td></tr>
<tr><td>6</td><td>$(X=3)\cap(X=3)$</td><td>$0.1\times0.1=0.01$</td></tr>
</table>
Total probability = 0.03 + 0.03 + 0.04 + 0.02 + 0.02 + 0.01 = 0.15</td><td>B1B1B1
M1

A1

A1
(6)
[16]</td></tr>
</table>

Question Number	Scheme		Marks
3. (a)	$\mathrm{P}(Q \cup T) = 0.6$ $\mathrm{P}(Q) + \mathrm{P}(T) - \mathrm{P}(Q \cap T) = 0.6$ $\mathrm{P}(Q \cap T) = 0.1$		B1 M1 A1 (3)
(b)		Venn 0.15, 0.35 0.4 and box	M1 A1∫ B1 (3)
(c)	$P(Q \cap T' \mid Q \cup T) = \frac{0.15}{0.60} = \frac{1}{4}$ or 0.25 or 25%		M1A1∫ A1 (3) **[9]**

Question Number	Scheme	Marks
4. (a)	Width = 4 (cm)	B1
	Area of 14 cm^2 represents frequency 28 and area of 4*h* represents 18	M1
	Or $\frac{4h}{18}=\frac{14}{28}$ (o.e.) **h = <u>2.25</u>** (cm)	A1
		(3)
(b)	$m=(240)+\frac{10}{22}\times 80$ (o.e.)	M1
	= 276.36... ($\frac{3040}{11}$) ((£)**<u>276</u>** $\leq m <$ (£)276.5)	A1
		(2)
(c)	$\sum fy = 31600$ leading to $\underline{\bar{y}=316}$	M1A1
	$\sigma_y=\sqrt{\frac{12452800}{100}-\left(\bar{y}\right)^2}$ = 157 .07... (awrt **<u>157</u>**) Allow *s* = 157.86...	M1A1
		(4)
(d)	Skewness = 0.764... (awrt **<u>0.76</u>** or **<u>0.75</u>**)	B1
	[If *n*+1 used in (b) and *m* = £278 accept awrt 0.73 or 0.72]	
	<u>Positive</u> skew	B1ft
		(2)
(e)	$z=\pm\frac{80}{150}$	M1
	P(240< *X* < 400) = **<u>0.40 ~ 0.41</u>**	A1
		(2)
(f)	(e) suggests a reasonable fit for this range BUT (d) since skew it will not be a good fit overall	B2/1/0
		(2) **[15]**

Question Number	Scheme	Marks
5. (a)	$P(J \cup K) = 1 - 0.7$ or $0.1 + 0.15 + 0.05 =$ $\underline{0.3}$	B1 (1)
(b)	P(K) = 0.05 + 0.15 or "0.3" – 0.25 + 0.15 or "0.3" = 0.25 +P(K) – 0.15	M1
	= $\underline{0.2}$	A1 (2)
(c)	$\left[P(K \mid J)\right] = \dfrac{P(K \cap J)}{P(J)}$	M1
	$= \dfrac{0.15}{0.25}$	A1
	$= \underline{\dfrac{3}{5} \text{ or } 0.6}$	A1 (3)
(d)	$P(J) \times P(K) = 0.25 \times 0.2 (= 0.05)$, $P(J \cap K) = 0.15$	
	or $P(K \mid J) = 0.6$, $P(K) = 0.2$	M1
	or may see P(J|K) = 0.75 and P(J) = 0.25 not equal therefore not independent	A1ft (2)
(e)	Not independent so confirms the teacher's suspicion or they are linked (This requires a statement about independence in (d) or in (e))	B1ft (1) **[9]**
6. (a)	P(W < 224) $= P\left(z < \dfrac{224 - 232}{5}\right)$	M1
	= P (z < -1.6)	
	= 1 - 0.9452	M1
	= 0.0548 awrt 0.0548	A1 (3)
(b)	0.5 – 0.2 = 0.3 0.3 or 0.7 seen	M1
	$\dfrac{w - 232}{5} = 0.5244$ 0.5244 seen; any z	B1; M1
	w = 234.622 awrt 235	A1 (4)
(c)	$0.2 \times (1 - 0.2)$	M1
	$2 \times 0.8 \times (1 - 0.8) = 0.32$	M1 A1 (3) **[10]**

Question Number	Scheme		Marks
7. (a)	$P(X > 168) = P\left(Z > \frac{168-160}{5}\right)$		M1
	$= P(Z > 1.6)$		A1
	$= 0.0548$	**awrt 0.0548**	A1 (3)
(b)	$P(X < w) = P\left(Z < \frac{w-160}{5}\right)$		
	$\frac{w-160}{5} = -2.3263$		M1 B1
	$w = 148.37$	**awrt 148**	A1 (3)
(c)	$\frac{160-\mu}{\sigma} = 2.3263$		M1 B1
	$\frac{152-\mu}{\sigma} = -1.2816$		B1
	$160 - \mu = 2.3263\sigma$		
	$152 - \mu = -1.2816\sigma$		
	$8 = 3.6079\sigma$		M1
	$\sigma = 2.21\ldots.$	**awrt 2.22**	A1
	$\mu = 154.84\ldots$	**awrt 155**	A1 (6) **[12]**

Statistics for S1 Practice Paper Silver Level S4

Qu	Max Score	Modal score	Mean %	ALL	A*	A	B	C	D	E	U
1	4		68	2.70	3.54	3.34	2.72	2.43	2.03	1.66	1.32
2	16		58	9.24		11.41	9.28	7.74	6.54	5.19	2.53
3	9		58	5.19		7.08	5.45	4.78	4.31	3.87	3.12
4	15	14	62	9.23	12.72	11.86	9.86	8.05	6.51	4.87	2.75
5	9		54	4.87	8.36	7.63	5.88	4.49	3.29	2.29	1.23
6	10		51	5.10	8.65	7.40	5.17	3.78	2.86	2.39	1.28
7	12		55	6.61	10.72	9.38	6.84	5.23	3.90	2.82	1.55
	75		**57**	**42.94**		**58.10**	**45.20**	**36.50**	**29.44**	**23.09**	**13.78**