

GCE

Edexcel GCE

Statistics S1 (6683)

Summer 2005

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Mark Scheme (Results)

June 2005
6683 Statistics S1
Mark Scheme

Question Number	Scheme	Marks
1.	Diagram A : y & x : $r = -0.79$; As x increases, y decreases or most points lie in the 2 nd and 4 th quadrant. Diagram B : v & u : $r = 0.08$; No real pattern. Several values of v for one value of u or points lie in all four quadrants, randomly scattered. Diagram C : t & s : $r = 0.68$; As s increases, t increases or most points lie in the 1 st and 3 rd quadrants	B1;B1dep B1;B1dep B1;B1dep (6)
2. (a)	Distance is a continuous.	continuous B1 (1)
(b)	F.D = freq/class width \Rightarrow 0.8, 3.8, 5.3, 3.7, 0.75, 0.1	or the same multiple of M1 A1 (2)
(c)	$Q_2 = 50.5 + \frac{(67-23)}{53} \times 10 = 58.8$ $Q_1 = 52.48$; $Q_3 = 67.12$	awrt 58.8/58.9 M1 A1 awrt 52.5/52.6 67.1/67.3 A1 A1 (4)
	Special case : no working B1 B1 B1 (= A's on the open)	
(d)	$\bar{x} = \frac{8379.5}{134} = 62.5335\dots$ $s = \sqrt{\frac{557489.75}{134} - \left(\frac{8379.5}{134}\right)^2}$ $s = 15.8089\dots$ ($S_{n-1} = 15.86825\dots$)	awrt 62.5 B1 M1 A1√ awrt 15.8 (15.9) A1 (4)
	Special case : answer only B1 B1 (= A's on the open)	
(e)	$\frac{Q_3 - 2Q_2 + Q_1}{Q_3 - Q_1} = \frac{67.12 - 2 \times 58.8 + 52.48}{67.12 - 52.48}$ $= 0.1366 \Rightarrow ; +ve$ skew	subst their Q_1, Q_2 & Q_3 need to show working for A1√ and have reasonable values for quartiles awrt 0.14 M1 A1√ A1; B1 (4)
(f)	For +ve skew Mean > Median & $62.53 > 58.80$ or $Q_3 - Q_2$ (8.32) > $Q_2 - Q_1$ (6.32) Therefore +ve skew	B1 (1)

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3. (a)	$S_{xy} = 8880 - \frac{130 \times 48}{8} = (8100)$ <p style="text-align: right;">may be implied</p> $S_{xx} = 20487.5$ $b = \frac{s_{xy}}{s_{xx}} = \frac{8100}{20487.5} = 0.395363\dots$ <p style="text-align: right;">allow use of their S_{xy} for M awrt 0.395</p> $a = \frac{48}{8} - (0.395363\dots) \frac{130}{8} = -0.424649\dots$ <p style="text-align: right;">allow use of their b for M awrt -0.425</p> $y = -0.425 + 0.395x$ <p style="text-align: right;">3s.f.</p> <p>Special case answer only B0 M0 B1 M0 B1 B1 (fully correct 3sf) (\equiv to B0 M0 A1 M0 A1 B1 on the open)</p>	<p>B1</p> <p>M1 A1</p> <p>M1 A1</p> <p>B1 \checkmark</p> <p>(6)</p>
(b)	$f - 100 = -0.424649\dots + 0.395\dots(m - 250)$ $f = 0.735 + 0.395m$	<p style="text-align: right;">subst f - 100 & m - 250</p> <p>M1 A1 \checkmark</p> <p style="text-align: right;">3 s.f.</p> <p>A1</p> <p>(3)</p>
(c)	$m = 235 \Rightarrow f = 93.64489\dots$	<p style="text-align: right;">awrt 93.6/93.7</p> <p>B1</p> <p>(1)</p>

<p>4(a)</p>	<p> $1.5 (Q_3 - Q_1) = 1.5 (28 - 12) = 24$ $Q_3 + 24 = 52 \Rightarrow 63$ is an outlier $Q_1 - 24 < 0 \Rightarrow$ no outliers </p>	<p> may be implied att $Q_3 + \dots$ or $Q_1 - \dots$, 52 and -12 or < 0 or evidence of no lower outliers 63 is an outlier B1 M1, A1 A1 M1 A1 A1 (7) </p>
<p>(b)</p>	<p>Distribution is +ve skew; $Q_2 - Q_1 (5) < Q_3 - Q_2 (11)$;</p>	<p>B1; B1 (2)</p>
<p>(c)</p>	<p>Many delays are small so passengers should find these acceptable or sensible comment in the context of the question.</p>	<p>B1 (1)</p>

<p>5.(a)</p>	$k + 2k + 3k + 5k + 6k = 1$ $17k = 1$ $k = \frac{1}{17} = 0.0588$	<p>use of $\sum P(X = x) = 1$</p>	<p>M1</p> <p>A1</p> <p>(2)</p>
<p>(b)</p>	$E(X) = 1 \times \frac{1}{17} + 2 \times \frac{2}{17} + \dots + 5 \times \frac{6}{17} = \frac{64}{17}$ $= 3 \frac{13}{17}$	<p>use of $\sum xP(X = x)$ and at least 2 prob correct</p> <p>Do not ignore subsequent working</p>	<p>M1</p> <p>A1</p>
<p>(c)</p>	$E(X^2) = 1^2 \times \frac{1}{17} + 2^2 \times \frac{2}{17} + \dots + 5^2 \times \frac{6}{17} = \left(\frac{266}{17} = 15.6 \right)$ $\text{Var}(X) = \frac{266}{17} - \left(\frac{64}{17} \right)^2$ $(E(X))^2 = 1.4740\dots$	<p>use of $\sum x^2 P(X = x)$</p> <p>and at least 2 prob correct</p> <p>use of $\sum x^2 P(X = x) -$</p> <p>awrt 1.47</p>	<p>M1 A1</p> <p>A1</p> <p>(4)</p>
<p>(d)</p>	$\text{Var}(4 - 3X) = 9 \text{Var}(X) = 9 \times 1.47 = 13.23 \Rightarrow 13.2$ $\text{or } 9 \times 1.4740\dots = 13.266 \Rightarrow 13.3$	<p>cao $9 \text{Var } X$</p>	<p>M1 A1</p> <p>(2)</p>

<p>6(a)</p> <p>(b)</p> <p>(c)</p>	<p>$M \sim N(155, 3.5^2)$</p> <p>$P(M > 160) = P\left(z > \frac{160-155}{3.5}\right)$ $= P(z > 1.43)$ $= 0.0764$</p> <p>$P(150 \leq M \leq 157) = P(-1.43 \leq z \leq 0.57)$ $= 0.7157 - (1 - 0.9236)$ $= 0.6393$</p> <p>special case : answer only B0 B0 M1 A1</p> <p>$P(M \leq m) = 0.3 \Rightarrow \frac{m-155}{3.5} = -0.5244$ $m = 153.2$</p>	<p>standardising $\pm(160-155), \sigma, \sigma^2, \sqrt{\sigma}$</p> <p>M1 A1 A1 (3)</p> <p>awrt -1.43, 0.57 $p > 0.5$ 0.6393 - 0.6400 4dp</p> <p>B1 B1 M1 A1 (4)</p> <p>-0.5244 att stand = z value for A1 may use awrt to - 0.52.</p> <p>B1 M1 A1 A1 (4)</p>																									
<p>7.</p> <p>(a)</p> <p>(b)</p> <p>(c)</p> <p>(d)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Glasses</th> <th style="text-align: center;">No Glasses</th> <th style="text-align: center;">Totals</th> <th></th> </tr> </thead> <tbody> <tr> <td>Science</td> <td style="text-align: center;">18</td> <td style="text-align: center;">12</td> <td style="text-align: center;">30</td> <td></td> </tr> <tr> <td>Arts</td> <td style="text-align: center;">27</td> <td style="text-align: center;">23</td> <td style="text-align: center;">50</td> <td>50 may be seen in (a)</td> </tr> <tr> <td>Humanities</td> <td style="text-align: center;">44</td> <td style="text-align: center;">24</td> <td style="text-align: center;">68</td> <td>23 may be seen in (b)</td> </tr> <tr> <td>Totals</td> <td style="text-align: center;">89</td> <td style="text-align: center;">59</td> <td style="text-align: center;">148</td> <td></td> </tr> </tbody> </table> <p>$P(\text{Arts}) = \frac{50}{148} = \frac{25}{74} = 0.338$</p> <p>$P(\text{No glasses} / \text{Arts}) = \frac{23/148}{50/148} = \frac{23}{50} = 0.46$</p> <p>$P(\text{Right Handed}) = \left(\frac{30}{148} \times 0.8\right) + \left(\frac{50}{148} \times 0.7\right) + \left(\frac{68}{148} \times 0.75\right)$ $= \frac{55}{74} = 0.743$</p> <p>$P(\text{Science} / \text{Right handed}) = \frac{\frac{30}{148} \times 0.8}{\frac{55}{74}} = \frac{12}{55} = 0.218$</p>		Glasses	No Glasses	Totals		Science	18	12	30		Arts	27	23	50	50 may be seen in (a)	Humanities	44	24	68	23 may be seen in (b)	Totals	89	59	148		<p>B1 B1</p> <p>a number/148</p> <p>M1 A1 (4)</p> <p>prob their(a)prob or number their 50</p> <p>M1 A1 (2)</p> <p>attempt add three prob A1 ✓ on their (a)</p> <p>awrt 0.743</p> <p>M1 A1 ✓ A1 (3)</p> <p>✓ on their (c)</p> <p>M1 A1 ✓ A1 (3)</p>
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