

EDEXCEL FOUNDATION - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

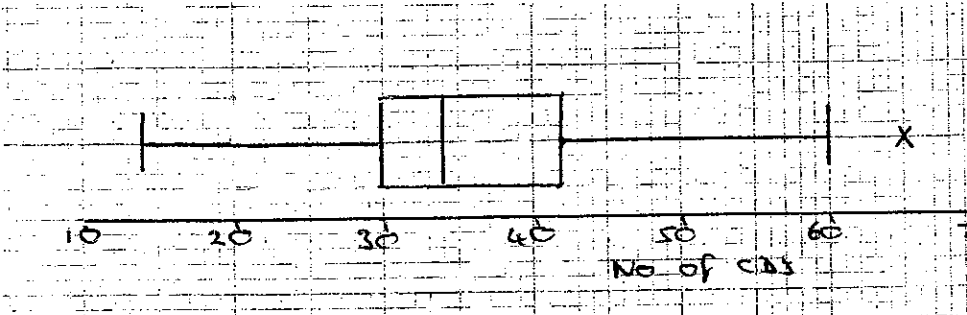
January 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject STATISTICS 6683

Paper No. S1

Question number	Scheme	Marks
1.	$1.5(Q_3 - Q_1) = 1.5(42 - 30) = 18$ $30 - 18 = 12 \Rightarrow \text{no outliers below } Q_1$ $42 + 18 = 60 \Rightarrow \text{one outlier } 65$  <p>NB just a box plot & no working (even if 65 ringed as outlier) (7) sets BO MO AO AO MIAIAI</p>	<p>B1 may be implied M1 A1 for 12 & 60 A1 ✓ for 65 only</p> <p>Box plot M1 10, 30, 34, 42 A1 60, 65 A1</p>
2.	<p>a) $P(166 \leq X \leq 185) = P\left(\frac{166-177}{6.4} \leq Z \leq \frac{185-177}{6.4}\right)$ $= P\left(\overset{\text{awrt}}{-1.72} \leq Z \leq 1.25\right)$ $= 0.8517$ or 0.8516 or 0.8515 tables interpolation calc</p> <p>b) Male heights cluster round a central value of approx 177/178 cm; Height is a continuous random variable; Most male heights are covered by $177 \pm 3 \times 6.4$; etc</p> <p>c) Simplifies a real world problem; enables us to gain, quicker / cheaper, some understanding of a real world problem</p> <p><u>A1/1e</u> 2a) if use continuity correction 0/4</p>	<p>Standardising $6.4 \rightarrow 6.4^2$ M1 A1</p> <p>A1</p> <p>A1 (4)</p> <p>Any two B1/1 Sensible B1/1 Comments (2)</p> <p>B1/1 B1/2</p>

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3	<p>a) $P(Y=y) = \frac{1}{6}$ $y = 1, 2, 3, 4, 5, 6.$</p> <p>b) Discrete uniform distribution</p> <p>c) $E(Y) = \frac{6+1}{2} = 3.5$ $\therefore E(6Y+2) = 6E(Y) + 2 = 6 \times 3.5 + 2 = 23$</p> <p>d) $Var(Y) = \frac{7 \times 5}{12} = \frac{35}{12}$ or 2.92 or $2.91\bar{6}$ $\therefore Var(4Y-2) = 16Var(Y) = 16 \times \frac{35}{12} = 46\frac{2}{3}$ or 46.7 or $46.\bar{6}$</p>	<p>BI BI (2)</p> <p>BI (1)</p> <p>MI AI</p> <p>MI AI ✓ (4)</p> <p>MI AI</p> <p>MI MI AI ✓ for 16 no -2 (5)</p>
	<p>a) accept y 1 2 3 4 5 6 BI $P(Y=y)$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ BI</p> <p>c) $\sum y \cdot p(y) = (1+2+3+4+5+6) \times \frac{1}{6} = 3.5$ MI AI</p> <p>d) $\sum y^2 \cdot p(y) - \bar{y}^2 = 9\frac{1}{6} - 3.5^2 = 2.92$ or $\frac{n^2-1}{12} = 2.92$</p> <p><u>Alter</u></p> <p>c) $6Y+2$ 8 14 20 26 32 38 MI AI $E(6Y+2) = \frac{8+14+20+26+32+38}{6} = \frac{138}{6} = 23$ MI AI</p> <p>d) $4Y-2$ 2 6 10 14 18 22 $E(4Y-2) = \frac{2+6+10+14+18+22}{6} = \frac{72}{6}$ MI AI</p> <p>$Var(4Y-2) = \frac{2^2+6^2+10^2+14^2+18^2+22^2}{6} - 12^2 = \frac{1144}{6} - 12^2 = 46\frac{2}{3}, 46.\bar{6}, 46.7$</p>	<p>MI $\sum y^2$ MI $\frac{\sum y^2}{n} - \bar{y}^2$ AI</p>

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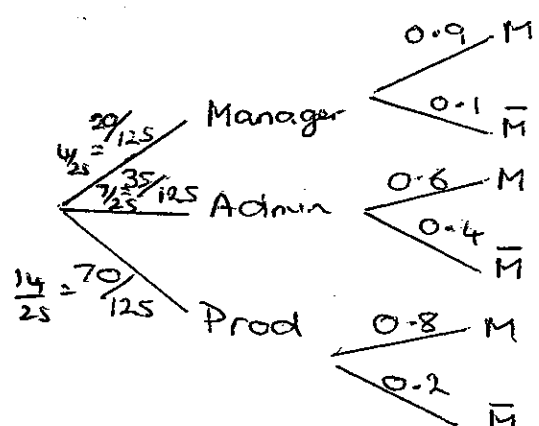
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4.	<p>a) $P(\text{admin}) = \frac{35}{125} = \frac{7}{25}$ or 0.28</p> <p>b) $P(\text{close} / \text{Manager}) = \frac{6}{20} = \frac{3}{10}$ or 0.3</p> <p>c)  <p>Tree with correct branches</p> <p>$\frac{20}{125}, \frac{35}{125}, \frac{70}{125}$</p> <p>All correct</p> <p>for $M \& \bar{M} + Ad \& \bar{M} + Pr \& \bar{M}$</p> <p>d) $P(\text{Married}) = \frac{20}{125} \times 0.9 + \frac{35}{125} \times 0.6 + \frac{70}{125} \times 0.8$</p> <p>$= 0.76$ or $\frac{19}{25}$</p> <p>e) $P(\text{Prod} / \text{Married}) = \frac{\frac{70}{125} \times 0.8}{0.76}$</p> <p>$= 0.589$ or $\frac{56}{95}$ or 0.59</p> </p>	<p>M1 A1 (2)</p> <p>M1 A1 (2)</p> <p>M1 A1 (3)</p> <p>M1 A1 (3)</p> <p>A1 (3)</p> <p>M1 A1 (3)</p> <p>A1 (3)</p> <p>M1 A1 (3)</p>

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5	<p>a) Histogram - fct's 5, 14, 49, 53, 15, 5, 2.</p> <p>b) The variable (minutes delayed) is continuous</p> <p>c) Median = $9.5 + \frac{(100 - 92)}{53} \times 1$ if use 100.5 $= \underline{9.65}$ $\underline{9.66}$</p> <p>d)</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>midpt $\frac{x}{2}$</th> <th>fx</th> <th>fx^2</th> </tr> </thead> <tbody> <tr><td>5</td><td>75</td><td>375</td></tr> <tr><td>7.5</td><td>210</td><td>1575</td></tr> <tr><td>9</td><td>441</td><td>3969</td></tr> <tr><td>10</td><td>530</td><td>5300</td></tr> <tr><td>11.5</td><td>345</td><td>3967.5</td></tr> <tr><td>14</td><td>210</td><td>2940</td></tr> <tr><td>18</td><td>180</td><td>3240</td></tr> <tr><td></td><td>$\Sigma fx = 1991$</td><td>$\Sigma fx^2 = 21366.5$</td></tr> </tbody> </table> <p>Mean = $\frac{1991}{200} = \underline{9.955} = \underline{9.96}$ or 9 mins 57 secs or 9 mins 58 secs</p> <p>$s = \sqrt{\frac{21366.5}{200} - \left(\frac{1991}{200}\right)^2}$ $= \underline{2.78}$ or 2 mins 67 secs (NB $S_{n-1} = 2.79$)</p> <p>e) $\frac{3(9.955 - 9.65)}{2.78} = \underline{0.329}$ \approx awrt 0.3</p> <p>f) For normal distribution skewness is zero In this case the skewness is 0.329 \therefore normal may not be suitable</p>	midpt $\frac{x}{2}$	fx	fx^2	5	75	375	7.5	210	1575	9	441	3969	10	530	5300	11.5	345	3967.5	14	210	2940	18	180	3240		$\Sigma fx = 1991$	$\Sigma fx^2 = 21366.5$	<p style="text-align: right;">(4)</p> <p style="text-align: right;">B1 (1)</p> <p style="text-align: right;">M1 ^{must use 100 or 100.5} (2)</p> <p style="text-align: right;">A1 (2)</p> <p style="text-align: right;">M1 A1 } must be to use midpt</p> <p style="text-align: right;">M1</p> <p style="text-align: right;">A1 } depend on</p> <p style="text-align: right;">(6)</p> <p style="text-align: right;">M1 A1 (2)</p> <p style="text-align: right;">B1 B1 (2)</p>
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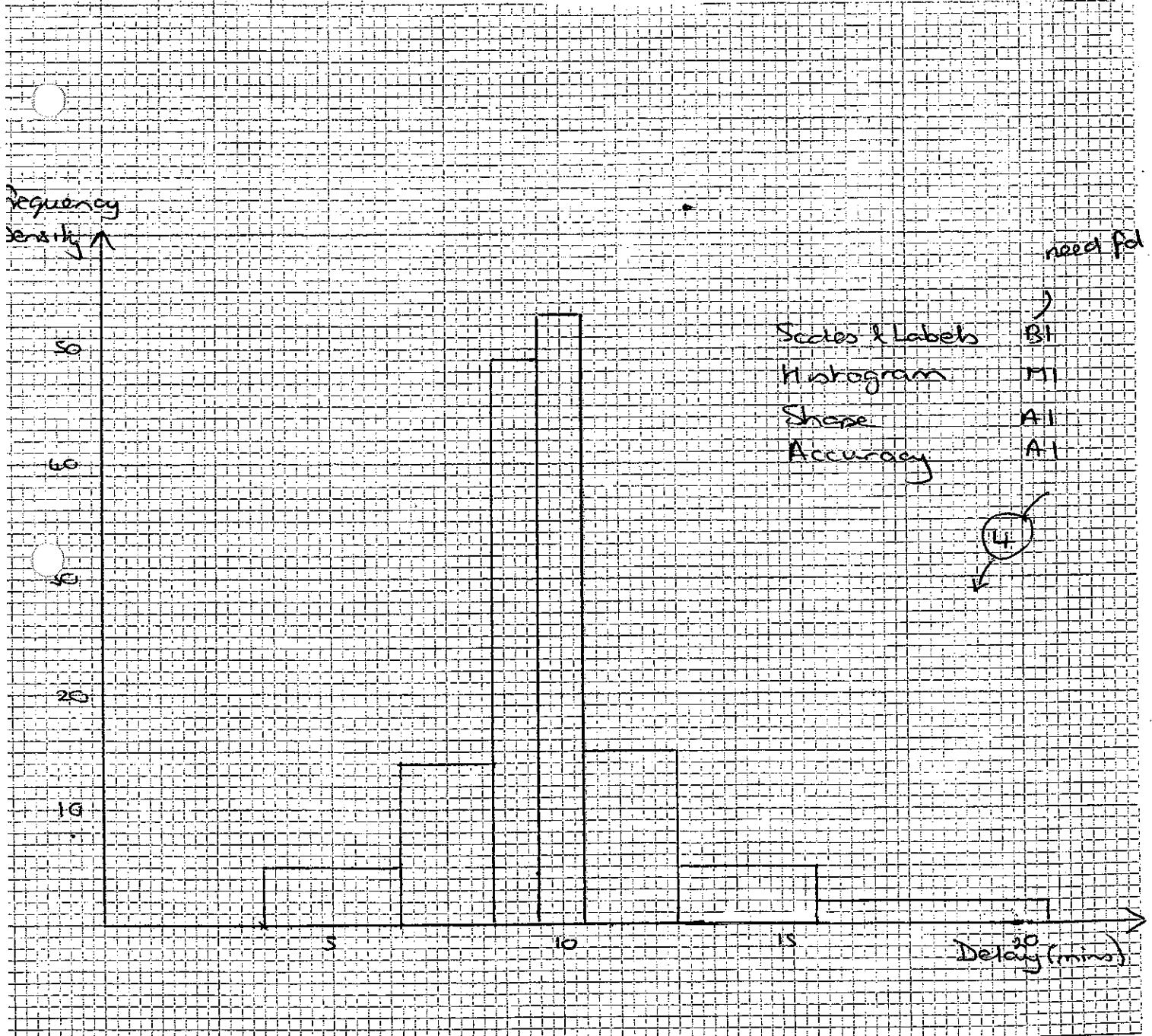
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5a.		



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6.	<p>a) $S_{xx} = 65.68 - \frac{25^2}{10} = 3.18$</p> <p>$S_{xy} = 130.64 - \frac{25 \cdot 50 \cdot 0}{10} = 5.64$</p> <p>$S_{yy} = 260.48 - \frac{50 \cdot 0^2}{10} = 10.48$</p>	B1 B1 B1 (3)
	<p>b) $r.m.c.c. = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{5.64}{\sqrt{3.18 \times 10.48}} = 0.977$</p>	M1 A1 A1 (3)
	<p>c) positive correlation close to but not a near perfect correlation.</p>	B1 (1)
	<p>d) $b = \frac{S_{xy}}{S_{xx}} = \frac{5.64}{3.18} = 1.77$</p> <p>$a = \bar{y} - b\bar{x} = \left(\frac{50}{10}\right) - 1.773 \cdot \left(\frac{25}{10}\right)$</p> <p>$= 0.566$</p>	M1 A1 A1 M1 A1 (4)
	<p>e) $a = 0.566 \Rightarrow$ the cost of reconditioning immediately after it has been reconditioned (ie no usage) is £566</p>	B1 (1)
	<p>f) i) $y = 0.566 + 1.77 \times 2.4 = 4.814$ ie £4814</p> <p>ii) increase is $1.77 \times 1.5 = 2.655$ ie increase of £2655 or $0.566 + 1.77 \times 3.9 = 7.473$</p>	M1 A1 A1 M1 A1 A1 (4)
	<p>g) 4500 hours is well out of the range of x values ($x \leq 3.0$) and thus there is no evidence that the model will apply</p>	B1s B1h (2)

NB. f) if use 2400, not 2.4

a) i) M0 A0

ii) can get M1 A1

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