

EDEXCEL FOUNDATION - LONDON EXAMINATIONS

Stewart House 32 Russell Square London WC1B 5DN

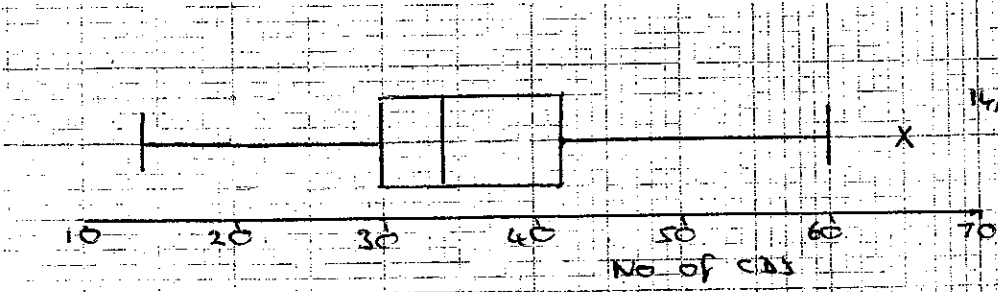
January 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject STATISTICS 6683

Paper No. S1

Question number	Scheme	Marks
1.	$1.5(Q_3 - Q_1) = 1.5(42 - 30) = 18$ $30 - 18 = 12 \Rightarrow$ no outliers below Q_1 $42 + 18 = 60 \Rightarrow$ one outlier 65 	B1 maybe implied M1 A1 for 12 & 60 A1 ✓ for 65 only Boxplot M1 12, 30, 36, 42 A1 60, 65 A1
2.	NB just a box plot & no working (even if 65 ringed as outlier) (7) gets 30 M0 A0 A0 M1 A1 A1 a) $P(166 \leq x \leq 185) = P\left(\frac{166-177}{6.4} \leq z \leq \frac{185-177}{6.4}\right)$ $= P\left(\frac{-1.072}{1} \leq z \leq \frac{1.25}{1}\right)$ $= 0.8517$ or 0.8516 or 0.8515 tables Interpolation calc 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 c) Simplifies a real world problem; enables us to gain, quicker / cheaper, some understanding of a real world problem 2d) if use continuity correction 0/4	Standardising $6.4 \leftarrow 6.4^2$ M1 A1 A1 A1 (4) Any two B1 L Sensible B1 L Comments (2) B1 L B1 (2)

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3	a) $P(Y=y) = \frac{1}{6} \quad y = 1, 2, 3, 4, 5, 6.$ b) Discrete uniform distribution c) $E(Y) = \frac{6+1}{2} = 3.5$ $\therefore E(6Y+2) = 6E(Y) + 2 = 6 \times 3.5 + 2 = 23$ d) $Var(Y) = \frac{7 \times 5}{12} = \frac{35}{12} \text{ or } 2.92 \text{ or } 2.91\bar{6}$ $\therefore Var(4Y-2) = 16Var(Y) = 16 \times \frac{35}{12} = \frac{140}{3} \text{ or } 46\frac{2}{3} \text{ or } 46.7$	BI BI (2) BI (1) MI AI MI AI ✓ (4) MI AI MI MI AI ✓ for 16 no -2 (5)																
	a) accept <table border="0"> <tr> <td>Y</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>BI</td> </tr> <tr> <td>P(Y=y)</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{6}$</td> <td>$\frac{1}{6}$</td> <td>BI</td> </tr> </table> c) $\sum y \cdot p(y) = (1+2+3+4+5+6) \times \frac{1}{6} = 3.5$ MI AI d) $\sum y^2 \cdot p(y) - \bar{y}^2 = 9\frac{1}{6} - 3.5^2 = 2.92$ or $\frac{n^2-1}{12} = 2.92$ <u>Alt</u> 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 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 $Var(4Y-2) = \frac{2^2+6^2+10^2+14^2+18^2+22^2}{6} - 12^2 = \frac{1144}{6} - 12^2 = 46\frac{2}{3}, 46.6, 46.7$	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	MI $\sum y^2$ MI $\frac{\sum y^2}{n} - \bar{y}^2$ AI
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											

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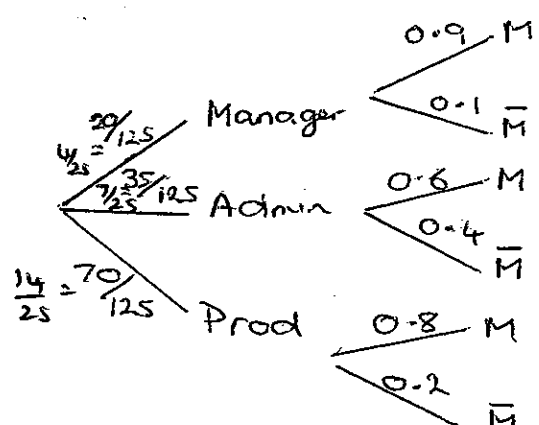
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4.	a) $P(\text{Admin}) = \frac{35}{125} = \frac{7}{25} \approx 0.28$ b) $P(\text{close} / \text{Manager}) = \frac{6}{20} = \frac{3}{10} \approx 0.3$ c)  Tree with correct branches $\frac{20}{125}, \frac{35}{125}, \frac{70}{125}$ All correct for $M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

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5	a) Histogram - Fd's 5, 14, 49, 53, 15, 5, 2. b) The variable (minutes delayed) is continuous c) Median = $9.5 + \frac{(100 - 92)}{53} \times 1$ if use 100.5 $= 9.65$ 9.66 d) <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>midpt x</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>$\Sigma fx = 1991$</td><td>$\Sigma fx^2 = 21366.5$</td><td></td></tr> </tbody> </table> Mean = $\frac{1991}{200} = 9.955 = 9.96$ or 9 mins 57 secs or 9 mins 58 secs $s = \sqrt{\frac{21366.5}{200} - \left(\frac{1991}{200}\right)^2}$ $= 2.78$ or 2 mins 67 secs (NB $S_{n-1} = 2.79$) e) $\frac{3(9.955 - 9.65)}{2.78} = 0.329$ awrt 0.3 f) For normal distribution skewness is zero In this case the skewness is 0.329 $\therefore$ normal may not be suitable	midpt x	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	$\Sigma fx = 1991$	$\Sigma fx^2 = 21366.5$		(4) B1 (1) M1 ^{must use 100 or 100.5} (2) A1 (2) Σfx M1 } must be to use midpt Σfx^2 M1 } M1 A1 M1 A1 ^{depend on} (6) M1 A1 (2) B1 (1) B1 (2)
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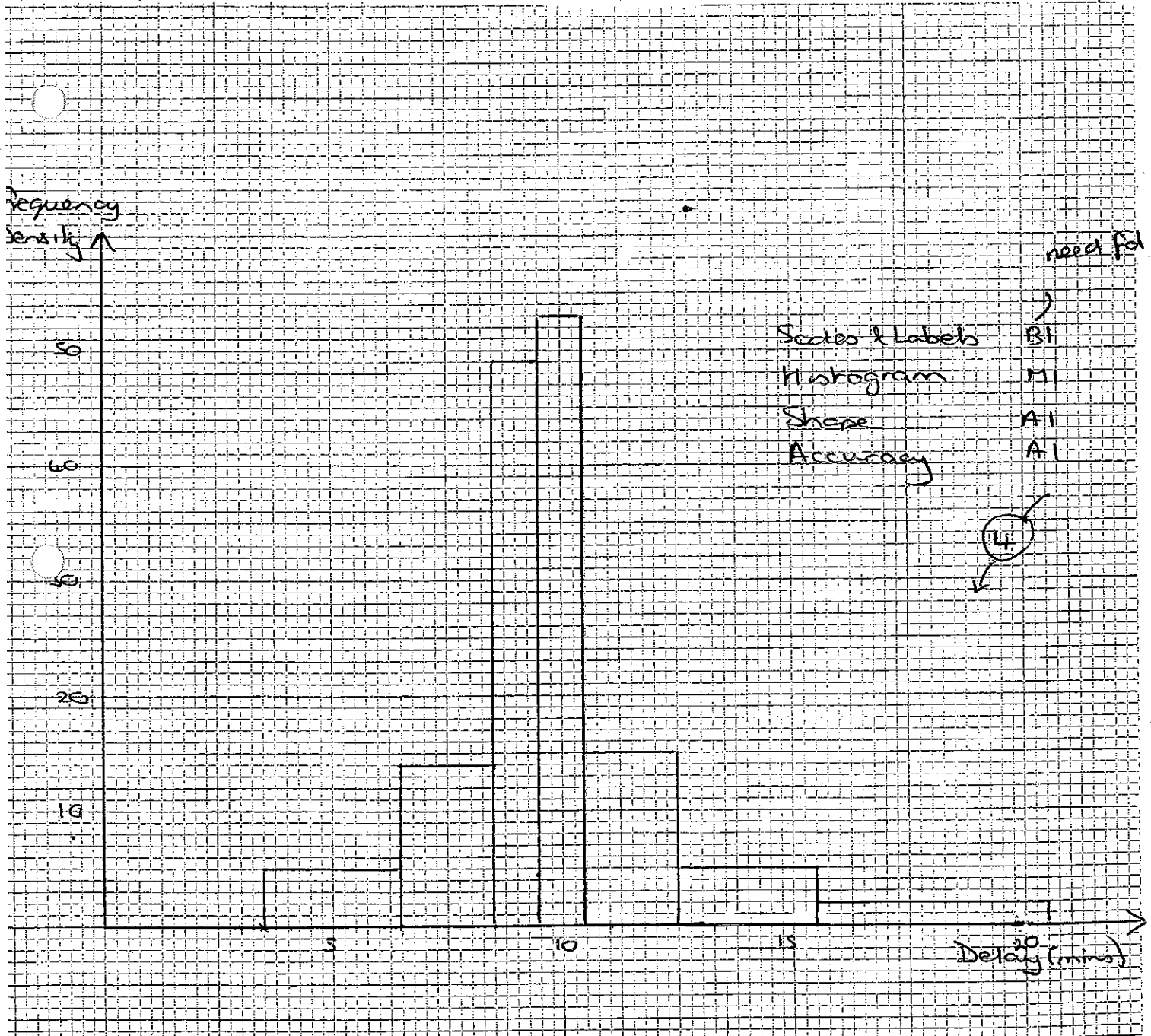
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5a.		



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6.	a) $S_{xx} = 65.68 - \frac{25^2}{10} = 3.18$ $S_{xy} = 130.64 - \frac{25 \times 50.0}{10} = 5.64$ $S_{yy} = 260.48 - \frac{50.0^2}{10} = 10.48$ b) $p.m.c.c. = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{5.64}{\sqrt{3.18 \times 10.48}} = 0.977$ c) positive correlation close to but not a near perfect correlation. d) $b = \frac{S_{xy}}{S_{xx}} = \frac{5.64}{3.18} = 1.77$ $a = \bar{y} - b\bar{x} = \left(\frac{50}{10}\right) - 1.773 \cdot \left(\frac{25}{10}\right)$ $= 0.566$ e) $a = 0.566 \Rightarrow$ the cost of reconditioning immediately after it has been reconditioned (ie no usage) is £566 f) i) $y = 0.566 + 1.77 \times 2.4 = 4.814$ ie £4814 ii) increase is $1.77 \times 1.5 = 2.655$ ie increase of £2655 or $0.566 + 1.77 \times 3.9 = 4.814$ 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	B1 B1 B1 (3) M1 A1 ✓ A1 (3) B1 (1) M1 A1 ✓ M1 A1 (4) B1 (1) M1 A1 ✓ M1 A1 ✓ (4) B1 5 B1 11 (2)

NB. f) if use 2400, not 2.4

or i) M1 A1

ii) can get M1 A1

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