EDEXCEL FOUNDATION - LONDON EXAMINATIONS

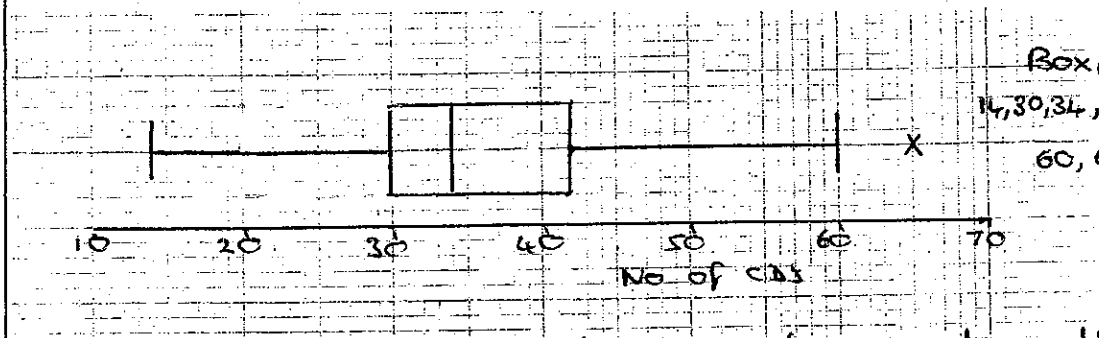
Stewart House 32 Russell Square London WC1B 5DN

January 2001

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject **STATISTICS 6683** Paper No. **S1**

Question number	Scheme	Marks
1.	$1.5(Q_3-Q_1) = 1.5(42-30) = 18$	B1 maybe implied
	$30-18 = 12 \Rightarrow$ no outliers below Q_1	M1 A1 for 12 & 60
	$42+18 = 60 \Rightarrow$ one outlier 65	A1✓ for 65 only
		Boxplot M1 14, 30, 34, 42 A1 60, 65 A1
	NB just a box plot & no working (even if 65 ringed as outlier) gets BO MO A0 A0	(7)
2.	a) $P(166 \leq X \leq 185) = P\left(\frac{166-177}{6.4} \leq Z \leq \frac{185-177}{6.4}\right)$	Standardising 6.4 or 6.4^2 M1 A1
	$= P(-1.72 \leq Z \leq 1.25)$ (awrt)	A1
	$= 0.8517$ (tables) or 0.8516 (interpolation) or 0.8515 (calc)	A1 (4)
	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	Any two sensible comments B1h B1g (2)
	c) Simplifies a real world problem; enables us to gain, quicker / cheaper some understanding of a real world problem	B1h B1g (2)
	A1,12e 2a) if use continuity correction 0/4	

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3	a) $P(Y=y) = 1/6$ $y = 1,2,3,4,5,6.$	B1 B1 (2)
	b) Discrete uniform distribution	B1 (1)
	c) $E(Y) = \frac{6+1}{2} = 3.5$	M1 A1
	$\therefore E(6Y+2) = 6E(Y)+2 = 6\times3.5+2 = 23$	M1 A1✓ (4)
	d) $Var(Y) = \frac{7\times5}{12} = \frac{35}{12}$ or 2.92 or 2.916̇	M1 A1
	$\therefore Var(4Y-2) = 16Var(Y) = 16\times\frac{35}{12} = 46\frac{2}{3}$ or 46.7 or 46.6̇	M1 M1 A1✓ for 16 no −2 (5)
	a) accept Y 1 2 3 4 5 6	B1
	$P(Y=y)$ 1/6 1/6 1/6 1/6 1/6 1/6	B1
	c) $\Sigma y.p(y) = (1+2+3+4+5+6)\times1/6 = 3.5$	M1 A1
	d) $\Sigma y^2.p(y) - \bar{y}^2 = 91/6 - 3.5^2 = 2.92$	
	or $\frac{n^2-1}{12} = 2.92$	
	Alite	
	c) $6Y+2$ 8 14 20 26 32 38	M1 A1
	$E(6Y+2) = \frac{8+14+20+26+32+38}{6} = \frac{138}{6} = 23$	M1 A1
	d) $4Y-2$ 2 6 10 14 18 22	
	$E(4Y-2) = \frac{2+6+10+14+18+22}{6} = \frac{72}{6}$	M1 A1
	$Var(4Y-2) = \frac{2^2+6^2+10^2+14^2+18^2+22^2}{6} - 12^2 = \frac{1144}{6} - 12^2$	M1 Σy^2 M1 $\frac{\Sigma y^2}{n} - \bar{x}^2$
	$= 46\frac{2}{3}, 46.6̇, 46.7$	A1

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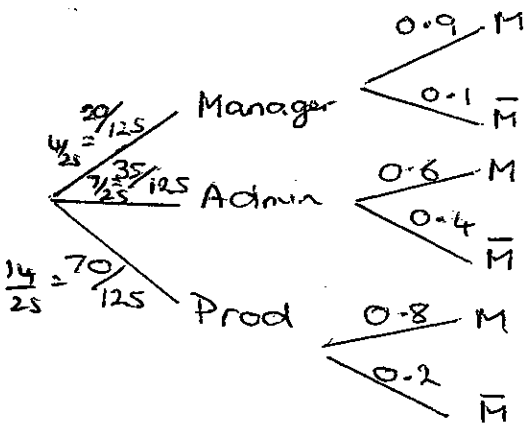
Question number	Scheme	Marks
4.	a) $P(\text{admin}) = \frac{35}{125} = \frac{7}{25}$ or 0.28	M1 A1 (2)
	b) $P(\text{close} \mid \text{Manager}) = \frac{6}{20} = \frac{3}{10}$ or 0.3	M1 A1 (2)
	c) 	Tree with correct branches M1 $\frac{20}{125}, \frac{35}{125}, \frac{70}{125}$ A1 All correct A1 (3) for Man$\bar{M}$ + Ad$\bar{M}$ + Prod$\bar{M}$
	d) $P(\text{Married}) = \frac{20}{125} \times 0.9 + \frac{35}{125} \times 0.6 + \frac{70}{125} \times 0.8$	M1 A1
	$= 0.76$ or $\frac{19}{25}$	A1 (3)
	e) $P(\text{Prod} \mid \text{Married}) = \frac{\frac{70}{125} \times 0.8}{0.76}$	for use of Bayes $\hat{M}$1 A1$\surd$
	$= 0.589$ or $\frac{56}{95}$ or 0.59	A1 (3)

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5	a) Histogram – fd's 5, 14, 49, 53, 15, 5, 2.	(4)
	b) The variable (minutes delayed) is continuous	B1 (1)
	c) Median $= 9.5 + \frac{(100-92)}{53} \times 1$ if use 100.5	M1 must use 100 or 100.5
	$= 9.65$ 9.66	A1 (2)
	d)	

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
	$\Sigma fx = 1991$	$\Sigma fx^2 = 21366.5$

Σfx M1, Σfx^2 M1 } must be to use midpt

Mean $= \frac{1991}{200} = 9.955 = 9.96$ M1 A1
or 9 mins 57 secs or 9 mins 58 secs

$s = \sqrt{\frac{21366.5}{200} - \left(\frac{1991}{200}\right)^2}$ M1

$= 2.78$ or 2 mins 47 secs A1 dep on M1 A1

(NB $S_{n-1} = 2.79$) (6)

e) $\frac{3(9.955 - 9.65)}{2.78} = 0.329$ awrt 0.3 M1 A1 (2)

f) For normal distribution skewness is zero B1h
In this case the skewness is 0.329 ∴ normal may not be suitable B1s (2)

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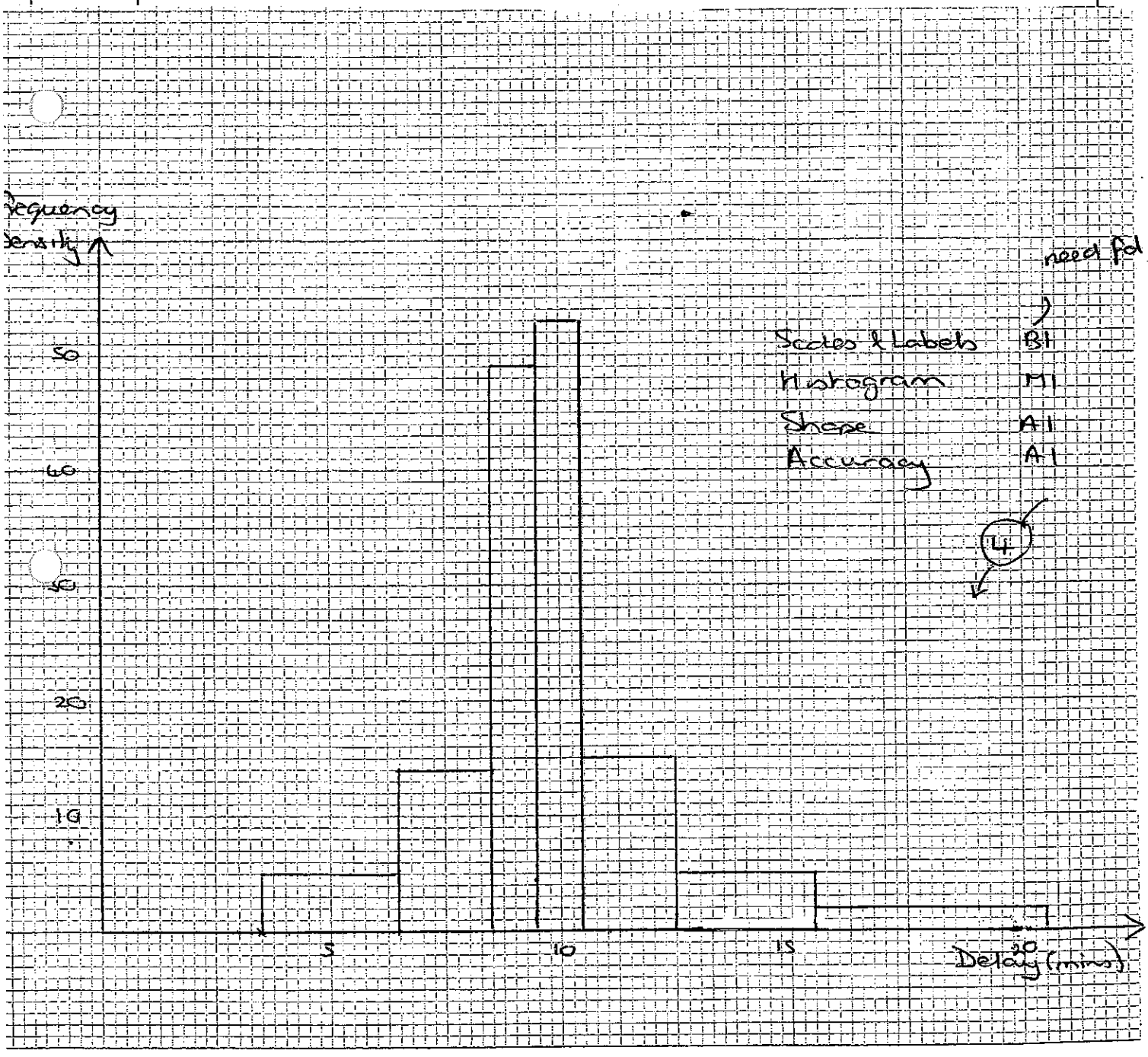
5a.		



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6.	a) $S_{xx} = 65\cdot68 - \frac{25^2}{10} = 3\cdot18$	B1
	$S_{xy} = 130\cdot64 - \frac{25\cdot0 \times 50\cdot0}{10} = 5\cdot64$	B1
	$S_{yy} = 260\cdot68 - \frac{50\cdot0^2}{10} = 10\cdot68$	B1 (3)
	b) p.m.c.c $= \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{5\cdot64}{\sqrt{3\cdot18 \times 10\cdot68}} = 0\cdot977$	M1 A1✓ A1 (3)
	c) ~~positive correlation close to 1, a near~~ perfect correlation.	B1 (1)
	d) $b = \frac{S_{xy}}{S_{xx}} = \frac{5\cdot64}{3\cdot18} = 1\cdot77$	M1 A1✓
	$a = \bar{y} - b\bar{x} = \left(\frac{50}{10}\right) - 1\cdot773 \cdot \left(\frac{25}{10}\right)$	M1
	$= 0\cdot566$	A1 (4)
	e) $a = 0\cdot566 \Rightarrow$ the cost of reconditioning immediately after it has been reconditioned (ie no usage) is £566	B1 (1)
	f) i) $y = 0\cdot566 + 1\cdot77 \times 2\cdot4 = 4\cdot814$ ie £4814	M1 A1✓
	ii) increase is $1\cdot77 \times 1\cdot5 = 2\cdot655$ ie increase of £2655 or $0\cdot566 + 1\cdot77 \times 3\cdot9 - 4\cdot814$	M1 A1✓ (4)
	g) 4500 hours is well out of the range of x values ($x \leqslant 3\cdot0$) and thus there is no evidence that the model will apply	B1s B1h (2)

NB. f) if use 2400, not 2·4 — a i) M0 A0; ii) can get M1 A1