

EDEXCEL FOUNDATION

Stewart House 32 Russell Square London WC1B 5DN

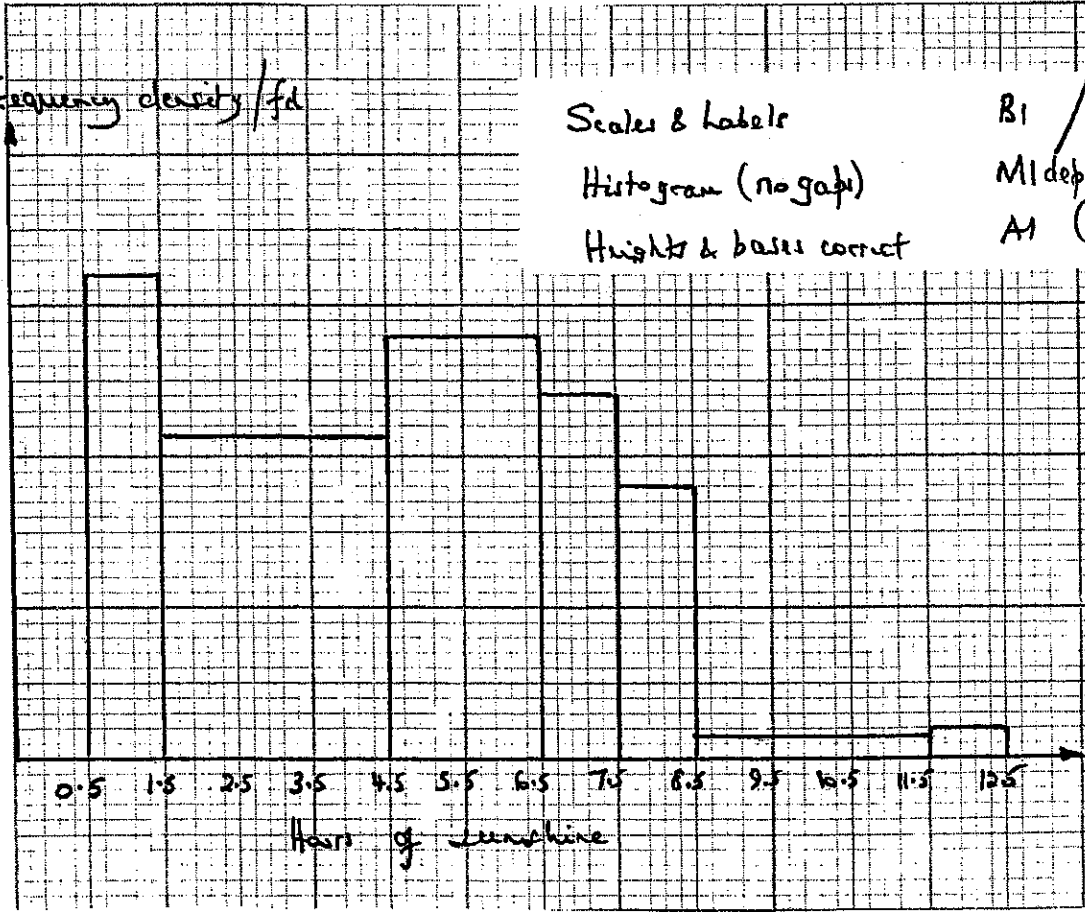
January 2002

Advanced Supplementary/Advanced Level

General Certificate of Education

Subject STATISTICS 6683

Paper No. S1

Question number	Scheme	Marks
1.	<p>(a)(i) A <u>test</u>/<u>investigation</u>/<u>process</u> adopted for <u>collecting data</u> to provide evidence for or against a hypothesis</p> <p>(ii) Sub-set of possible outcomes of an experiment.</p> <p>(b) Advantage — Quick, cheap, vary parameters/predict</p> <p>Disadvantage — Does not replicate real-world situation in every detail.</p>	<p>B1 (1)</p> <p>B1 (1)</p> <p>B1</p> <p>B1 (2)</p>
2.	<p>(a) Frequency densities: 16, $10\frac{2}{3}$, 14, 12, 9, $\frac{2}{3}$, 1 can be implied</p>  <p>Scales & labels</p> <p>Histogram (no gaps)</p> <p>Heights & bases correct</p> <p>(b) No. of days = $(14 \times \frac{1}{2}) + (12 \times 1) + (9 \times 1) + (\frac{2}{3} \times \frac{2}{3})$ $= 28\frac{1}{3}$</p> <p>Allow $28\frac{1}{3}$; 28.3; 28.3</p>	<p>M1</p> <p>A1</p> <p>B1</p> <p>M1 dep</p> <p>A1 (5)</p> <p>M1</p> <p>A1 (2)</p>

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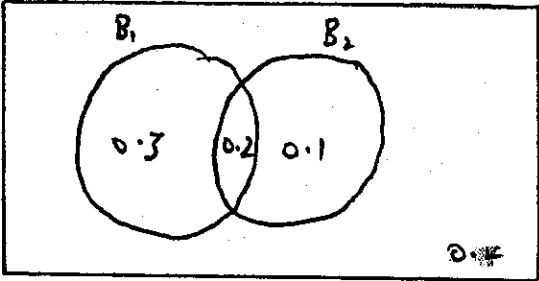
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3.	<p>(a) $a + 2\left(\frac{2}{3} - a\right) = \frac{5}{6}$ $\therefore a = \frac{1}{2}$</p> <p>(b) $\text{Var}(X) = 1^2 \times \frac{1}{2} + 2^2 \times \frac{1}{6} - \left(\frac{5}{6}\right)^2$ $= \frac{17}{36} = 0.472$</p> <p>(c) $P(X \leq 1.5) = P(0) + P(1) = \frac{1}{3} + \frac{1}{2} = \frac{5}{6}$</p>	<p>Use of $E(X)$ M1 correct equation A1 cao A1 (3)</p> <p>Use of $\sum x^2 P(X=x)$ M1 $-\mu^2$ M1 allow 1sw; cao A1 (3)</p> <p>B1 (1)</p>
4.	 <p>(a) $P(\text{Does not win either}) = 0.4$</p> <p>(b) $P(\text{Wins exactly one}) = 0.3 + 0.1$ $= 0.4$</p> <p>(c) $P(B_2 B_1') = \frac{P(B_2 \cap B_1')}{P(B_1')} = \frac{0.1}{0.5}$ $= 0.2$</p> <p>(d) For independence $P(B_1 \cap B_2) = P(B_1) \times P(B_2)$ $P(B_1 \cap B_2) = 0.2$; $P(B_1) \times P(B_2) = 0.15$ LHS \neq RHS \Rightarrow events not independent NB: Accept alternative correct solutions.</p>	<p>Venn diagram M1 0.3, 0.2, 0.1 A1</p> <p>A1 (3) M1 A1 (2)</p> <p>Use of condⁿ prob. M1 A1 (2)</p> <p>M1 0.2; 0.15 A1 A1 (3)</p>

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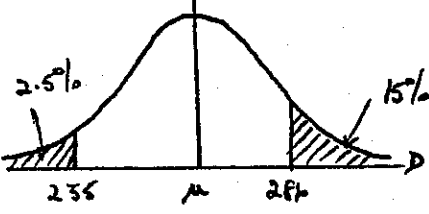
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4.	<p>Aliter: (a) $P(\text{Does not win either}) = 1 - P(B_1 \cup B_2)$</p> $= 1 - (0.5 + 0.3 - 0.2)$ $= \underline{0.4}$ <p>(b) $P(\text{Win exactly one}) = P(B_1 \cap B_2^c) + P(B_1^c \cap B_2)$</p> $= 0.3 + 0.1$ $= \underline{0.4}$	<p>M1</p> <p>A1</p> <p>A1 (3)</p> <p>M1</p> <p>A1 (2)</p>
5.	<p>(a) </p> $P(D < 235) = 0.025$ $\therefore \frac{235 - \mu}{\sigma} = -1.96$ $\therefore \underline{\mu - 235 = 1.96\sigma} *$ <p>(b) $P(D > 268) = 0.15$</p> $\therefore \frac{268 - \mu}{\sigma} = 1.0364$ $\therefore \underline{268 - \mu = 1.0364\sigma}$ <p>(c) Solving for μ or σ Substituting for other unknown</p> $\mu = 268.360 \dots \quad \sigma = 17.0204 \dots$ <p>(d) $\mu \pm \sigma = 268.36 \pm 17.02$</p> $= (251, 285)$	<p>$\frac{235 - \mu}{\sigma} = -1.96$ M1</p> <p>A1 (2)</p> <p>$\frac{268 - \mu}{\sigma} = 1.0364$ M1</p> <p>1.0364 B1</p> <p>A1 (3)</p> <p>M1</p> <p>M1</p> <p>AWRT 268 A1</p> <p>AWRT 17 A1 (4)</p> <p>$\mu + \text{thru } \sigma$ M1</p> <p>3 of A1 (2)</p>

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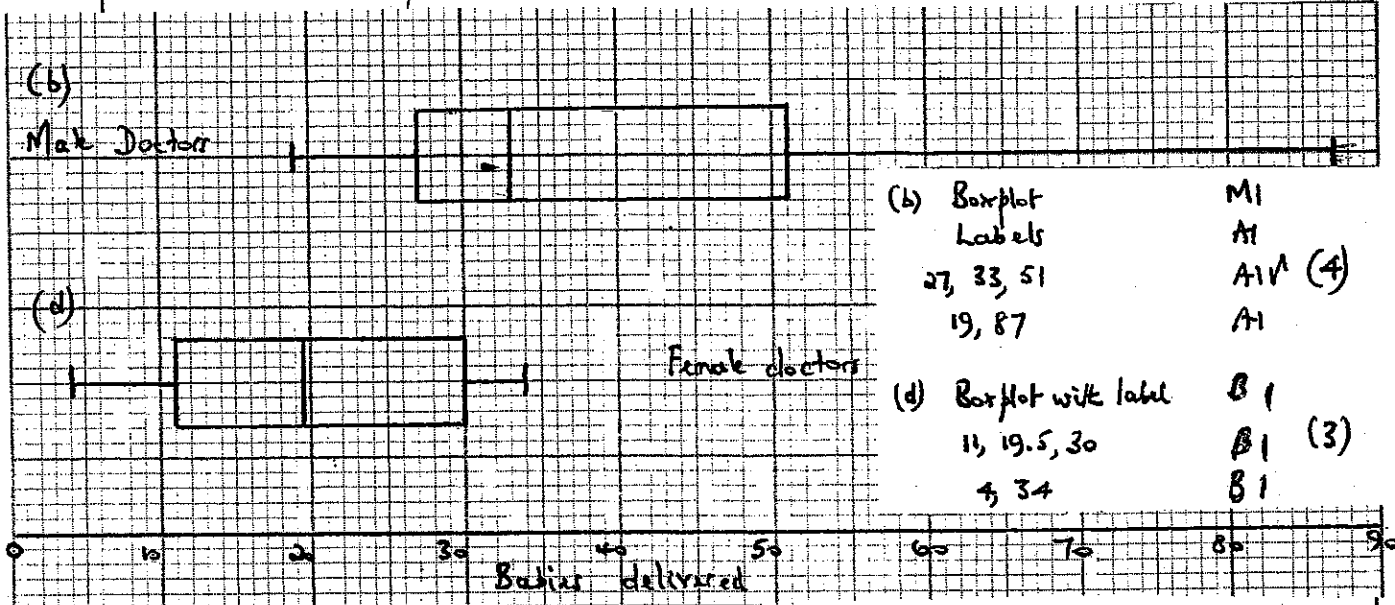
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6.	(a) $Q_2 = 33$ $Q_1 = 27; Q_3 = 51$ $IQR = 51 - 27 = 24$	B1 B1 B1 (3)



(b) Boxplot
Labels
27, 33, 51
19, 87
M1
A1
A1✓ (4)
A1

(d) Boxplot with label
11, 19.5, 30
3, 34
B1
B1 (3)
B1

(c) $\mu = \frac{618}{15}$
 $= 41.2$
 $\sigma^2 = \frac{31864}{15} - 41.2^2$
 $\Rightarrow \sigma = 20.65978\dots$
 $\sum (x - \bar{x})^2 = 6403.4$

$\sum x^2 / 15$ M1
41.2 cas A1

$\frac{\sum x^2}{15} - \mu^2$ M1
20.7 A1 (5)

SR: $\sum_{i=1}^n = 21.38\dots$
B1 only

(e) $\underline{\text{Median male}} > \text{Median female}$
 $\text{IQR male} > \text{IQR female}$
 $\text{Range male} > \text{Range female etc.}$
Males: +ve skew; Females: slight +ve skew/almost symmetrical

} Any Two sensible
independent comments
B1
B1 (2)

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7.	<p>(a)</p> <p>(a) Sales & Labels Points (8,9 points → B1)</p> <p>(e) (\bar{E}, \bar{S}) plotted Correct line</p>	<p>B1 B2 (3) B1 B1 (2)</p>

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7.	<p>(b) $S_{yy} = 694650 - \frac{2310^2}{10} = 161040$</p> <p>$S_{tt} = 66490$; $S_{yy} = 87235$</p> <p>$r = \frac{87235}{\sqrt{66490 \times 161040}}$</p> <p>$= 0.843035 \dots$</p> <p>SR: 0.843 without working \Rightarrow B1 only</p> <p>(c) No change; coding does not affect p.m.c.</p> <p>(d) $\hat{\beta} = \frac{72587.5}{63671.875} = 1.140024 \dots$</p> <p>$\hat{\alpha} = 187.5 - (1.140024 \dots \times 125.625) = 44.2844 \dots$</p> <p>$\therefore \underline{s = 44.3 + 1.14t}$</p> <p>(e) Graph</p> <p>(f) Both points above the line, so more line up Predictions of s from t less accurate</p>	<p>M1 A1</p> <p>A1 A1</p> <p>M1 A1 ✓</p> <p>0.843 A1 (1)</p> <p>B1; B1 (2)</p> <p>M1</p> <p>M1</p> <p>A1 (3)</p> <p>Graph </p> <p>B1</p> <p>B1 (2)</p>