

EDEXCEL PURE MATHEMATICS S1 (6683) - JANUARY 2003 PROVISIONAL MARK SCHEME

Question Number	Scheme	Marks
1.	Frequency densities: 0.16, 1.0, 1.0, 0.4, 0.4, 0.08 Histogram: Scale and labels Correct histogram	M1, A1 B1 B1 (4 marks)
2.	(a) $P(A \cap B) = \frac{10}{100} = \frac{1}{10} = 0.1$ (b) $P(A') = \frac{75}{100} = 0.75$ (c) $P(B' A) = \frac{P(B' \cap A)}{P(A)} = \frac{\frac{15}{100}}{\frac{25}{100}} = \frac{15}{25} = \frac{3}{5} = 0.6$ (d) $P(A' \cap B) = 0.4$; $P(A')P(B) = 0.75 \times 0.5 = 0.375$ Since $P(A' \cap B) \neq P(A')P(B) \Rightarrow$ not independent One of models is less reliable	M1 A1 (2) M1 A1 (2) M1 A1 (2) M1 A1 A1 (3) (9 marks)
3.	Let X represent amount dispersed into cups $\therefore X \sim N(55, \sigma)$ (a) $P(X < 50) = 0.10 \Rightarrow \frac{50 - 55}{\sigma} = -1.2816$ $\sigma = 3.90137$ (b) $P(X > 61) = P(Z > \frac{61 - 55}{3.90137...})$ $= P(Z > 1.54)$ $= 1 - 0.90382 = 0.0618$; 6.18% (c) Let Y represent new amount dispensed. $\therefore Y \sim N(\mu, 3)$ $P(Y < 50) = 0.025 \Rightarrow \frac{50 - \mu}{3} = -1.96$ $\mu = 55.88$	M1 B1 M1 A1 (4) M1 A1 A1 (3) M1 B1 M1 A1 (4) (11 marks)

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4.	(a) $Q_2 = \frac{16+16}{2} = 16$; $Q_1 = 15$; $Q_3 = 16.5$; IQR = 1.5 (b) $1.5 \times \text{IQR} = 1.5 \times 1.5 = 2.25$ $Q_1 - 1.5 \times \text{IQR} = 12.75 \Rightarrow$ no outliers below Q_1 $Q_3 + 1.5 \times \text{IQR} = 18.75 \Rightarrow 25$ is an outlier Boxplot, label scale 14, 15, 16, 16.5, 18.75 (18) Outlier (c) $\bar{x} = \frac{322}{20} = 16.1$ (d) Almost symmetrical/slight negative skew Mean (16.1) $\approx$ Median (16) and $Q_3 - Q_2$ (0.5) $\approx Q_2 - Q_1$ (1.0)	M1A1; B1; B1; B1 (5) M1 A1 A1 A1 M1 A1 A1 (7) M1 A1 (2) B1 B1 (2) (16 marks)
5.	(a) $2k + k + 0 + k = 1$ $\therefore 4k = 1 \Rightarrow k = 0.25$ (★) (b) $\begin{array}{ccccccc} x & 0 & 1 & 2 & 3 \\ P(X=x) & 0.5 & 0.25 & 0 & 0.25 \end{array}$ $\begin{array}{ccccccc} xP(X=x) & 0 & 0.25 & 0 & 0.75 \end{array}$ $\begin{array}{ccccccc} x^2P(X=x) & 0 & 0.25 & 0 & 2.75 \end{array}$ $E(X) = \sum xP(X=x) = 0 + 0.25 + 0 + 0.75 = 1$ $E(X^2) = 0 + 0.25 + 0 + 2.25 = 2.5$ (★) (c) $\text{Var}(3X - 2) = 3^2 \text{Var}(X)$ $= 9(2.5 - 1^2) = 13.5$ (d) $P(X_1 + X_2) = P(X_1 = 3 \cap X_2 = 2) + P(X_1 = 2 \cap X_2 = 3) = 0 + 0 = 0$ (e) Let $Y = X_1 + X_2$ $\begin{array}{ccccccc} y & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ P(Y=y) & 0.25 & 0.25 & 0.0625 & 0.25 & 0.125 & (0) & 0.0625 \end{array}$ (f) $P(1.3 \leq X_1 + X_2 \leq 3.2) = P(X_1 + X_2 = 2) + P(X_1 + X_2 = 3)$ $= 0.0625 + 0.25 = 0.3125$	M1 A1 (2) M1 A1 M1 A1 (4) M1 M1 A1 (3) B1 (1) B1 B2 (3) M1 A1ft, A1ft (3) (16 marks)

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6.	(a) x 20 26 32 34 37 44 48 50 53 58 y 24 38 42 44 43 52 59 66 70 79 Change in cost of advertising influences number of new car sales Graph: Scale and labels Points all correct (b) $S_{xy} = 22611 - \frac{402 \times 517}{10} = 1827.6$ $S_{xx} = 17538 - \frac{402^2}{10} = 1377.6$ $b = \frac{S_{xy}}{S_{xx}} = \frac{1827.6}{1377.6} = 1.326655\dots$ $a = \frac{517}{10} - (1.326655\dots) \times \frac{402}{10} = -1.63153\dots$ $\therefore y = -1.63 + 1.33x$ (c) $\frac{c - 4000}{10} = -1.63 + 1.33(p - 100)$ $c = 2653.7 + 13.3p$ (d) No. sold if no money spent on advertising $p = 0$ is well outside valid range – meaningless (e) $2 \times 13.3 = 27$ extra cars sold Only valid in range of data for 1990s	B1 B1 B1 B2 (5) M1 A1 A1 M1 A1 B1 B1ft (7) M1 A1ft A1 (3) B1 B1 (2) B1 B1 (2) (19 marks)