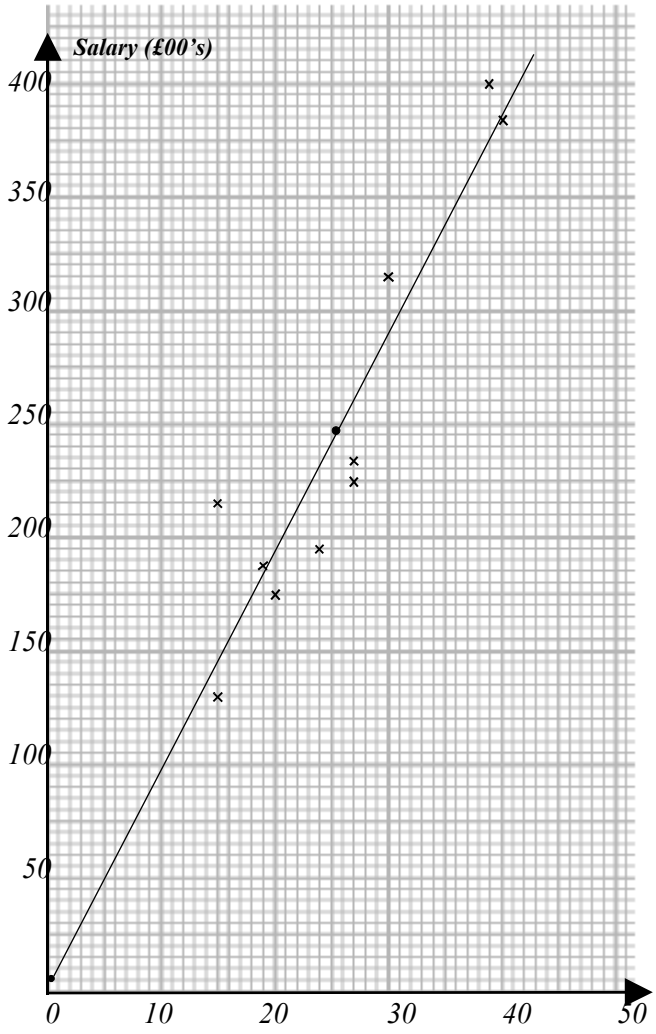
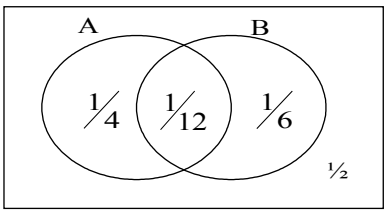
EDEXCEL STATISTICS S1 (6683)
PROVISIONAL MARK SCHEME NOVEMBER 2003

Question Number	Scheme	Marks
1.	**(a)** 	Scales and labels B1 Points B3 (-1e.e.) (4)

Question Number	Scheme		Marks
	(b) $S_{xy} = 69798 - \frac{256 \times 2465}{10} = \underline{6694}$	256, 2465	B1
		S_{xy} or S_{xx}	M1
	$S_{xx} = 7266 - \frac{256^2}{10} = \underline{712.4}$	6694	A1
		712.4	A1 (4)
	(c) **(i)** $b = \frac{6694}{712.4} = \underline{9.3964\ldots}$		M1 A1
	$a = \frac{2465}{10} - \frac{6694}{712.4} \times \frac{256}{10} = \underline{5.95199\ldots}$		B1
	$\therefore\ \underline{y = 5.95 + 9.40x}$	*3.s.f.*	B1 √
	(ii) Line on graph		B1 (5)
	(d) Salary increases by £940 for every 1 point performance increase		B1 (1)
	(e) $x = 35 \Rightarrow y = 334.95$		B1
	Salary is £33,495		B1 √ (2)
			16

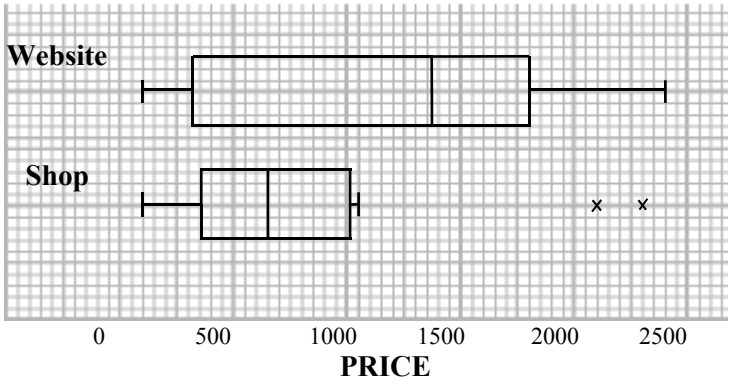
Question Number	Scheme	Marks
2.	**(a)** P(scores 30 points) = P(hit, hit, hit,) = $0.6^3 = 0.216$ 0.6^3	M1
	0.216	A1 (2)
	(b)	
	x: 0 | 10 | 20 | 30 — $x = 0, 10, 20, 30$	B1
	0.4 | 0.6×0.4 | $0.6^2\times0.4$ | — One correct P ($X=x$)	M1
	P($X=x$): 0.4 | 0.24 | 0.144 | (0.216) — 0.4; 0.24; 0.144	A1; A1; A1 (5)
	(c) $E(X) = (0\times 0.4) + \ldots + (30\times 0.216) = \underline{11.76}$ $\sum xP(X = x)$	M1
	11.8	A1
	$E(X^2) = (10^2 \times 0.24) + \ldots + (30^2 \times 0.216) = \underline{276}$	B1
	Std Dev = $\sqrt{276 - 11.76^2} = 11.7346\ldots$ $\sqrt{E(X^2) - (E(X))^2}$	M1
	11.7	A1 (5)
	(d) P (Linda scores more in round 2 than in round 1)	
	$= P(X_1 = 0 \,\&\, X_2 = 10, 20, 30)$ $X_2 > X_1$	M1
	$+ P(X_1 = 0 \,\&\, X_2 = 10, 20, 30)$ All possible	A1
	$+ P(X_1 = 20 \,\&\, X_2 = 30)$	A1 √
	$= 0.4\times(0.24 + 0.144 + 0.216)$	A1 √
	$+ (0.24(0.144 + 0.216))$	A1 √
	$+ (0.144\times 0.126)$	A1 √
	$= \underline{0.357504}$ 0.358	A1 (6) **18**

Question Number	Scheme		Marks	
3.	**(a)(i)** Let X represent amount of sauce in a jar. $\therefore X \sim N(505, 10^2)$			
	$\therefore P(X < 500) = P(Z < \frac{500 - 505}{10})$	Standardising with 505, 10	M1	
	$= P(Z < -0.5)$	-0.5	A1	
	$= 1 - 0.6915$			
	$= \underline{0.3085}$	0.3085	A1	
	(ii) Expected number $= 30 \times 0.3085$	$30 \times (i)$	M1	
	$= \underline{9.225}$	9.23	A1	(5)
	(b) $P(X < 500) = 0.01$		B1	
	$\therefore \frac{500 - \mu}{10} = -2.3263$	Standardising	M1	
		-2.3263	B1	
	$\therefore \underline{\mu = 523.263}$	523	A1	(4)
				9

Question Number	Scheme	Marks
4.	**(a)** A list of all possible outcomes of an experiment	B1 (1)
	(b) A set of outcomes of an experiment	B1 (1)
	(c) $P(A \cap B) = P(A)P(B) = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$	B1 (1)
	(d) $P(A \mid B) = P(A) = \frac{1}{3}$ Application of indep.	M1
	$1/3$	A1 (2)
	(e) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$	
	$= \frac{1}{3} + \frac{1}{4} - \frac{1}{12}$ Application of $P(A \cup B)$	M1
	$= \frac{1}{2}$	
	$\frac{1}{2}$	A1 (2)
		7
	Aliter 	

Question Number	Scheme		Marks		
5.	**(a)** $\mathrm{E}(X) = \sum x \times \mathrm{P}(X = x) = \frac{1}{n} + \frac{2}{n} + \ldots\ldots + \frac{n}{n}$	Use of E(X)	M1		
	$= \frac{1}{n}\{1 + 2 \ldots + n\}$				
	$= \frac{1}{n} \cdot \frac{1}{2} n(n+1) = \frac{n+1}{2}$	Use of $\frac{1}{2} n(n+1)$	M1		
	$\therefore \frac{n+1}{2} = 5 \Rightarrow \underline{n = 9}^{*}$	c.s.o	A1		(3)
	(b) $\mathrm{P}(X < T) = \frac{1}{9} \times 6 = \frac{2}{3}$		M1	A1	(2)
	(c) $\mathrm{Var}(X) = \mathrm{E}(X^2) - \{\mathrm{E}(X)\}^2$				
	$= \frac{1^2}{9} + \frac{2^2}{9} + \ldots + \frac{9^2}{9} - 5^2$	Use of Var(X)	M1		
	$= \frac{1}{9} \times \frac{1}{6} \times 9 \times 10 \times 19 - 5^2$	Use of $\sum n^3$	M1		
		Correct	A1		
	$= \underline{\frac{20}{3}}$	$\frac{20}{3}$	A1		(4)
	OR				
	$\mathrm{Var}(X) = \frac{n^2 - 1}{12} = \frac{80}{12} = \frac{20}{3}$		M2	A1	A1
					9

Question Number	Scheme		Marks	
6.	**(a)** $\sum x = 12075; \quad \sum x^2 = 15\,499\,685$			
	$\therefore \bar{x} = \frac{12075}{15} = \underline{805}$		B1	
	$\text{sd} = \sqrt{\frac{15499685}{15} - 805^2} = 620.71491$		M1	
		621	A1	(3)
	(NB Using n-1 gives 642.50125…)			
	(b) 99, 169, 299, 350, 475, 485, 550, 650, 689, 830, 999, 1015, 1050, 2100, 2315	Attempt to order	M1	
	$\therefore Q_2 = \underline{650}$	650	A1	
	$\therefore IQR = Q_3 - Q_1 = 1015 - 350 = \underline{665}$	Attempt at $Q_3 - Q_1$	M1	
		665	A1	(4)
	(c) $Q_3 + 1.5(Q_3 - Q_1) = 1015 + 1.5 \times 665 = 2012.5$	Use of given outlier formula	M1	
	$\therefore$ 2100 and 2315 are outliers		A1	
	$Q_1 - 1.5(Q_3 - Q_1) = 350 - 1.5 \times 665 < 0$			
	$\therefore$ No outliers		A1	(3)

Question Number	Scheme		Marks	
	(d)			
		Boxplot Scales & Labels Website Shop	M1 A1 A1 A1	(4)
	(e) Median website > median shop Website negative skew; shop approx symmetrical Ignoring outliers Ranges approximately equal Shop Q_3 < Website Q_3 ⇒ shop sales low value Website sales more variable in value	Any two sensible comments	B1	B1 (2) **16**