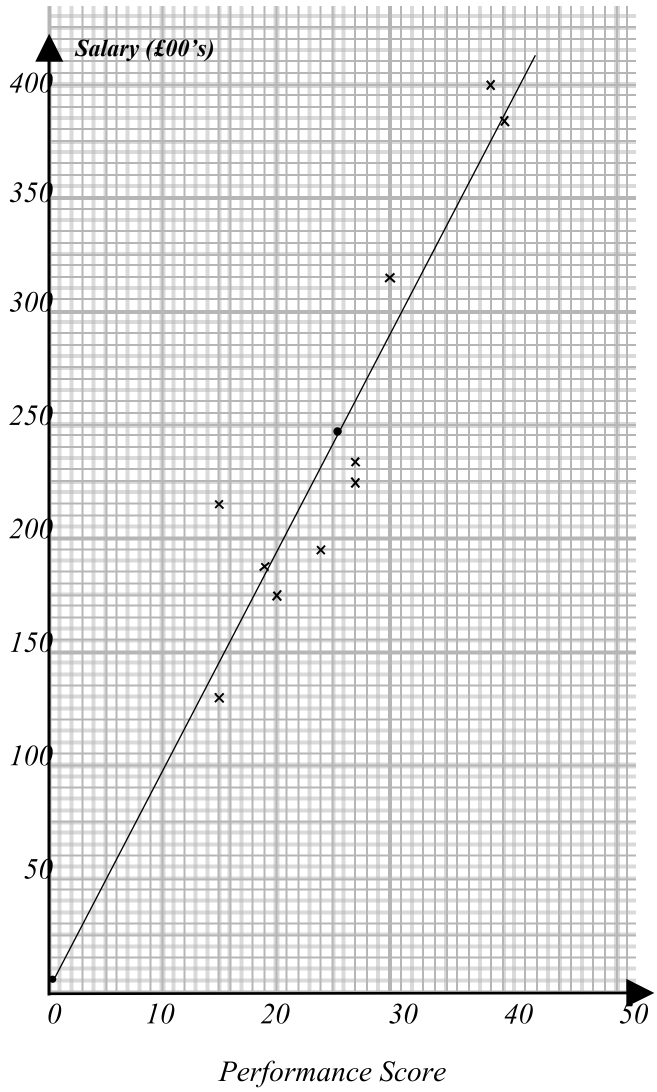
EDEXCEL STATISTICS S1 (6683)
PROVISIONAL MARK SCHEME NOVEMBER 2003

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

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Question Number	Scheme		Marks	
	(b) $Sxy = 69798 - \frac{256 \times 2465}{10} = \underline{6694}$	256, 2465	B1	
		Sxy or Sxx	M1	
	$Sxx = 7266 - \frac{256^2}{10} = \underline{712.4}$	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 $\surd$	
	(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 $\surd$	(2)
				<u>16</u>

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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) (table below)	x = 0, 10, 20, 30	B1
		One correct P (X=x)	M1
		0.4; 0.24; 0.144	A1; A1; A1 (5)
	(c) $\mathrm{E}(X) = (0\times 0.4) + \ldots + (30\times 0.216) = \underline{11.76}$	$\Sigma\, x\mathrm{P}(X = x)$	M1
		11.8	A1
	$\mathrm{E}(X^2) = (10^2\times 0.24) + \ldots + (30^2\times 0.216) = \underline{276}$		B1
	Std Dev = $\sqrt{276 - 11.76^2} = 11.7346\ldots$	$\sqrt{\mathrm{E}(X^2) - (\mathrm{E}(X))^2}$	M1
		11.7	A1 (5)
	(d) P (Linda scores more in round 2 than in round 1)		
	$= \mathrm{P}(X_1 = 0\ \&\ X_2 = 10, 20, 30)$	$X_2 > X_1$	M1
	$+\ \mathrm{P}(X_1 = 0\ \&\ X_2 = 10, 20, 30)$	All possible	A1
	$+\ \mathrm{P}(X_1 = 20\ \&\ X_2 = 30)$		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) **<u>18</u>**

Table for (b):

x	0	10	20	30
	0.4	0.6×0.4	$0.6^2\times 0.4$	
P(X=x)	0.4	0.24	0.144	(0.216)

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

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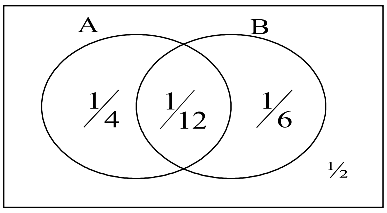
Question Number	Scheme	Marks
4.	**(a)** A list of all possible outcomes of an experiment	B1 (1)
	(b) A set of outcomes of an experiment	B1 (1)
	(c) $\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B) = \frac{1}{3} \times \frac{1}{4} = \underline{\frac{1}{12}}$	B1 (1)
	(d) $\mathrm{P}(A \mid B) = \mathrm{P}(A) = \frac{1}{3}$ Application of indep.	M1
	1/3	A1 (2)
	(e) $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$	
	$= \frac{1}{3} + \frac{1}{4} - \frac{1}{12}$ Application of $\mathrm{P}(A \cup B)$	M1
	$= \underline{\frac{1}{2}}$ ½	A1 (2)
		<u>7</u>
	Aliter 	

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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
	$\therefore \frac{n+1}{2} = 5 \quad \Rightarrow \quad \underline{n = 9}$ *	c.s.o	A1 (3)
	(b) $\mathrm{P}(X < T) = \frac{1}{9} \times 6 \quad = \frac{2}{3}$		M1 A1 (2)
	(c) $\mathrm{Var}(X) = \mathrm{E}(X^2) - \{\mathrm{E}(X)\}^2$		
	$= \frac{1^2}{9} + \frac{2^2}{9} + \ldots + \frac{9^2}{} - 5^2$	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
			$\underline{9}$

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Question Number	Scheme		Marks	
6.	**(a)** $\sum x = 12075;\quad \sum x^2 = 15\,499\,685$			
	$\therefore\ \bar{x} = \dfrac{12075}{15} = \underline{805}$		B1	
	$\text{sd} = \sqrt{\dfrac{15499685}{15} - 805^2} = 620.71491$		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)

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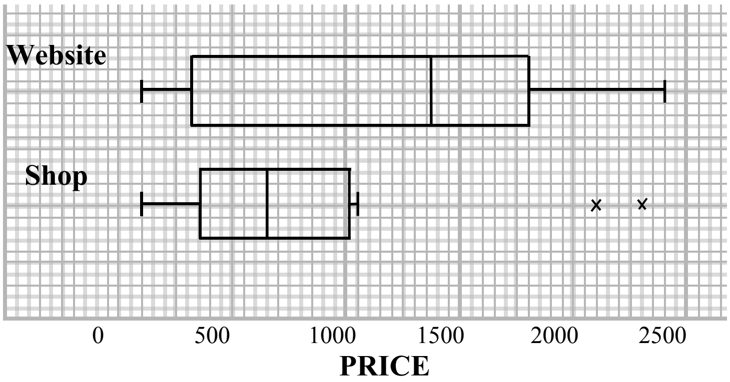
Question Number	Scheme		Marks	
	(d)			
		Boxplot	M1	
		Scales & Labels	A1	
		Website	A1	
		Shop	A1	
				(4)
	(e) Median website > median shop			
	Website negative skew; shop approx symmetrical Ignoring outliers			
	Ranges approximately equal Shop Q_3 < Website Q_3 $\Rightarrow$ shop sales low value	Any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