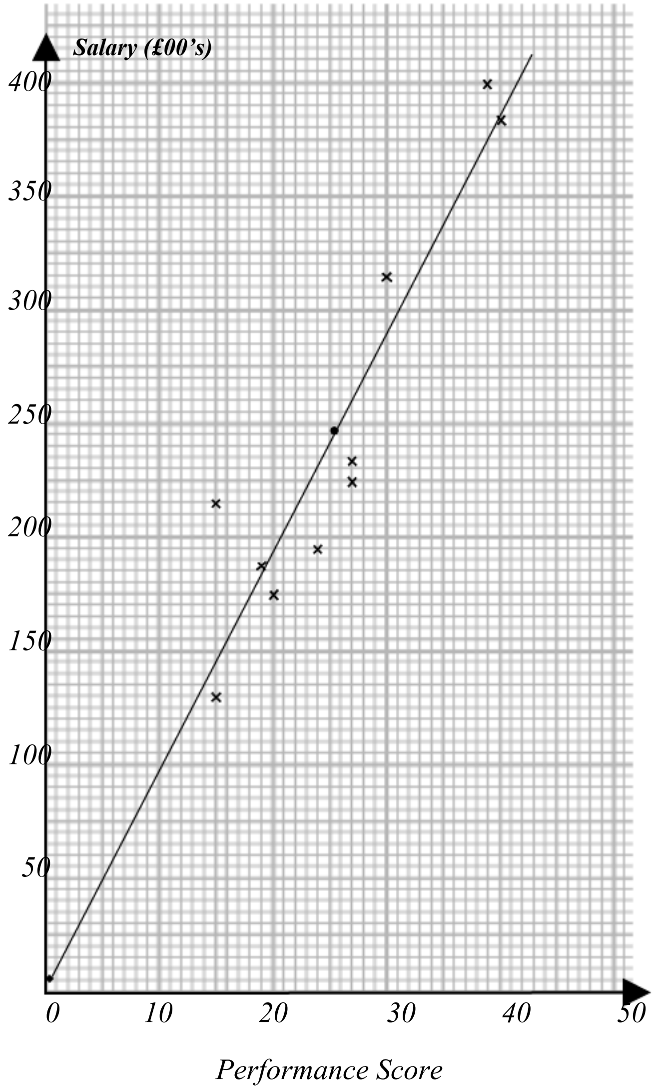
EDEXCEL STATISTICS S1 (6683)
PROVISIONAL MARK SCHEME NOVEMBER 2003

Question Number	Scheme		Marks
1.	(a) 	Scales and labels Points	B1 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)
		<u>16</u>

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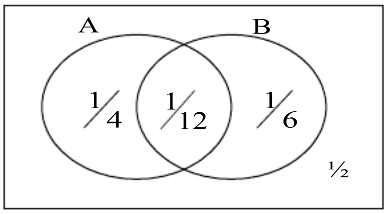
<table>
<tr><th>Question Number</th><th colspan="2">Scheme</th><th>Marks</th></tr>
<tr><td>2.</td><td>(a) P(scores 30 points) = P(hit, hit, hit,) = $0.6^3 = 0.216$</td><td>0.6^3</td><td>M1</td></tr>
<tr><td></td><td></td><td>0.216</td><td>A1 (2)</td></tr>
<tr><td></td><td>(b)
<table>
<tr><td>x</td><td>0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

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	
	$\therefore \frac{500-\alpha}{10} = -2.3263$	Standardising	M1	
		-2.3263	B1	
	$\therefore \underline{\alpha = 523.263}$	523	A1	(4)
				$\underline{9}$

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) $P(A\cap B) = P(A)P(B) = \frac{1}{3}\times\frac{1}{4} = \underline{\frac{1}{12}}$	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
	$= \underline{\frac{1}{2}}$ ½	A1 (2)
		$\underline{7}$
	Aliter  	

Question Number	Scheme	Marks
5.	**(a)** $\mathrm{E}(X) = \bullet\ x \times \mathrm{P}(X = x) = \frac{1}{n} + \frac{2}{n} + \ldots\ldots + \frac{n}{n}$ 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) $\mathrm{Var}(X) = \mathrm{E}(X^2) - \{\mathrm{E}(X)\}^2$	
	$= \frac{1^2}{9} + \frac{2^2}{9} + \ldots + \frac{9^2}{} - 5^2$ Use of Var(*X*)	M1
	$= \frac{1}{9} \times \frac{1}{6} \times 9 \times 10 \times 19 - 5^2$ Use of $\bullet\ n^3$	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
		$\underline{\mathbf{9}}$

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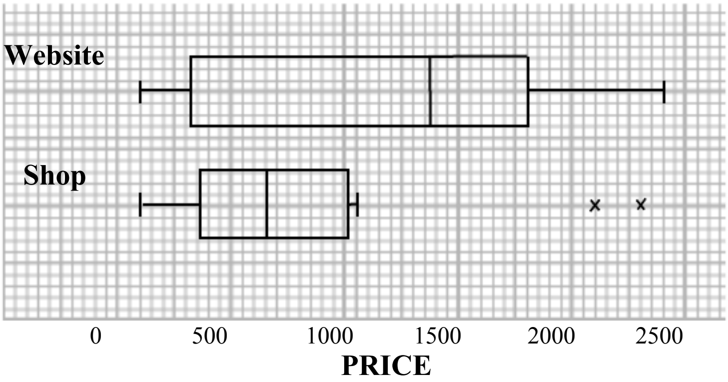
Question Number	Scheme	Marks
6.	**(a)** • $x = 12075$; • $x^2 = 15\,499\,685$	
	∴ $\bar{x} = \frac{12075}{15} = \underline{805}$	B1
	sd $= \sqrt{\frac{15499685}{15} - 805^2} = 620.71491$	M1
	621	A1 (3)
	(NB Using *n*-1 gives 642.50125…)	
	(b) 99, 169, 299, 350, 475, 485, 550, 650, 689, 830, 999, 1015,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

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 ⇒ shop sales low value Website sales more variable in value	Any two sensible comments	B1	B1
				(2)
				<u>**16**</u>