

Edexcel GCE
Statistics S1
Gold Level G4
(Mark Scheme)

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Question Number	Scheme	Marks
1. (a)	$(S_{th}) = 64980 - \frac{7150 \times 110}{9} = -22408.9 \dots$ $(S_{hh}) = 7171500 - \frac{7150^2}{9} = 1491222.2 \dots$	<p style="text-align: right;">-22 400</p> <p style="text-align: right;">1 490 000</p>
(b)	$r = \frac{-22408.9}{\sqrt{1491222} \times 371.56} = -0.95200068 \dots$	<p style="text-align: right;">awrt -0.952</p>
(c)	<p>Yes as r is close to -1 (if $-1 < r < -0.5$) <u>or</u> Yes as r is close to 1 (if $1 > r > 0.5$)</p>	<p style="text-align: right;">B1ft</p>
(d)	$b = \frac{-22408.9}{1491222.2} = -0.015027 \dots$ <p style="text-align: center;">(allow $\frac{-56}{3725}$)</p> $a = \frac{110}{9} - \text{"their } b \text{"} \times \frac{7150}{9} = (12.2 - -0.015 \times 794.4), = 24.1604 \dots$ <p style="text-align: center;">so $t = 24.2 - 0.015h$</p>	<p style="text-align: right;">awrt -0.015</p>
(e)	<p>0.015 is the <u>drop</u> in temp, (in $^{\circ}\text{C}$), for every 1(m) <u>increase</u> in height above sea level.</p>	<p style="text-align: right;">M1 A1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">(3)</p>
(f)	<p>Change = ("24.2 - 0.015" \times 500) - ("24.2 - 0.015" \times 1000) <u>or</u> 500 \times "0.015"</p> <p style="text-align: center;">$= \pm 7.5$ (awrt ± 7.5)</p>	<p style="text-align: right;">M1 A1</p> <p style="text-align: right;">M1</p> <p style="text-align: right;">A1ft</p> <p style="text-align: right;">(4)</p> <p style="text-align: right;">(1)</p> <p style="text-align: right;">M1</p> <p style="text-align: right;">A1ft</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;">[13]</p>
2. (a)	<p>E = take regular exercise B = always eat breakfast</p> <p>$P(E \cap B) = P(E B) \times P(B)$</p> $= \frac{9}{25} \times \frac{2}{3} = 0.24 \quad \text{or} \quad \frac{6}{25} \quad \text{or}$	<p style="text-align: right;">M1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">(2)</p>
(b)	$P(E \cup B) = \frac{2}{3} + \frac{2}{5} - \frac{6}{25} \quad \left \quad \text{or} \quad P(E' B') \quad \left \quad \text{or} \quad P(B' \cap E) \quad \left \quad \text{or} \quad P(B \cap E') \right.$ $= \frac{62}{75} \quad \left \quad = \frac{13}{25} \quad \left \quad = \frac{12}{75} \quad \left \quad = \frac{32}{75} \right.$ <p>$P(E' \cap B') = 1 - P(E \cup B) = \frac{13}{75}$ or 0.173</p>	<p style="text-align: right;">M1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">M1 A1</p> <p style="text-align: right;">(4)</p>
(c)	<p>$P(E B) = 0.36 \neq 0.40 = P(E)$ or $P(E \cap B) = \frac{6}{25} \neq \frac{2}{5} \times \frac{2}{3} = P(E) \times P(B)$</p> <p>So E and B are <u>not</u> statistically independent</p>	<p style="text-align: right;">M1</p> <p style="text-align: right;">A1</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;">[8]</p>

Question Number	Scheme	Marks	
3. (a)	Width = $2 \times 1.5 = \underline{\mathbf{3 \text{ (cm)}}}$	B1	
	Area = $8 \times 1.5 = 12 \text{ cm}^2$ Frequency = 24 so $\underline{1 \text{ cm}^2 = 2 \text{ plants}}$ (o.e.)	M1	
	Frequency of 12 corresponds to area of 6 so height = $\underline{\mathbf{2 \text{ (cm)}}}$	A1	
		(3)	
	(b)	$[Q_2 =] (5+) \frac{19}{24} \times 5$ or (use of $(n+1)$) $(5+) \frac{19.5}{24} \times 5$	M1
		$= 8.9583\dots$ awrt 8.96 or $9.0625\dots$ awrt 9.06	A1
		(2)	
(c)	$[\bar{x} =] \frac{755}{70}$ or awrt 10.8	B1	
	$[\sigma_x =] \sqrt{\frac{12037.5}{70} - \bar{x}^2} = \sqrt{55.6326\dots}$	M1A1ft	
	$= \underline{\mathbf{awrt 7.46}}$ (Accept $s =$ awrt 7.51)	A1	
		(4)	
(d)	$\bar{x} > Q_2$	B1ft	
	So <u>positive skew</u>	dB1	
		(2)	
(e)	$\bar{x} + \sigma \approx 18.3$ so number of plants is e.g. $\frac{(25 - "18.3")}{10} \times 12 (+4)$ (o.e.)	M1	
	$= 12.04$ so $\underline{\mathbf{12}}$ plants	A1	
		(2)	
		[13]	

Question Number	Scheme	Marks	
4. (a)	$S_{yy} = 393 - \frac{61^2}{10} = \underline{\underline{20.9}}$	M1A1	
	$S_{xy} = 382 - \frac{61 \times 60}{10} = \underline{\underline{16}}$	A1	
		(3)	
	(b)	$[r =] \frac{"16"}{\sqrt{"20.9" \times 28}}$ $= 0.66140\dots$	M1
		awrt 0.661	
		(2)	
(c)	<p>Researcher's belief suggests <u>negative</u> correlation, data suggests <u>positive</u> correlation</p> <p>So data does <u>not</u> support researcher's belief</p>	B1	
		dB1	
		(2)	
(d)	<p>New x equals $\bar{x} = 6$</p> <p>Since $S_{xx} = \sum (x - \bar{x})^2$ the value of S_{xx} is the same = 28</p>	B1	
		dB1	
		(2)	
(e)	$S_{xy} = \sum (x - \bar{x})(y - \bar{y}) = \sum (x - \bar{x})y$ <p>so the new term will be zero (since mean = x) and since S_{yy} increases</p>	B1	
	<p>So r will decrease</p>	dB1	
		(2)	
		[11]	

Question Number	Scheme	Marks								
5. (a)	<p>One large square = $\frac{450}{"22.5"}$ <u>or</u> one small square = $\frac{450}{"562.5"}$ (o.e.)</p> <p>One large square = 20 cars <u>or</u> one small square = 0.8 cars <u>or</u> 1 car = 1.25 squares</p> <p>No. > 35 mph is: $4.5 \times "20"$ <u>or</u> $112.5 \times "0.8"$ (o.e. e.g. using fd) = 90 (cars)</p>	<p>M1</p> <p>A1</p> <p>dM1</p> <p>A1</p> <p>(4)</p>								
(b)	$[\bar{x}] = \frac{30 \times 12.5 + 240 \times 25 + 90 \times 32.5 + 30 \times 37.5 + 60 \times 42.5}{450} \left[= \frac{12975}{450} \right]$ <p>= 28.83... <u>or</u> $\frac{173}{6}$ awrt 28.8</p>	<p>M1 M1</p> <p>A1</p> <p>(3)</p>								
(c)	$[Q_2 =] 20 + \frac{195}{240} \times 10$ (o.e) = 28.125 [Use of $(n + 1)$ gives 28.145...] awrt 28.1	<p>M1</p> <p>A1</p> <p>(2)</p>								
(d)	$Q_2 < \bar{x}$ So <u>positive skew</u>	<p>[Condone $Q_2 \approx \bar{x}$]</p> <p>[so (almost) <u>symmetric</u>]</p> <p>B1ft</p> <p>dB1ft</p> <p>(2)</p>								
(e)	[If chose <u>skew</u> in (d)] median (Q_2) Since the data is skewed or median not affected by extreme values	[If chose <u>symmetric</u> in (d)] mean (\bar{x}) Since it uses all the data dB1								
		(2)								
		[13]								
6. (a)	$F(4) = 1, (4+k)^2 = 25$ $k = 1$ as $k > 0$	<p>M1</p> <p>A1</p> <p>(2)</p>								
(b)	<table border="1" style="width: 100%; text-align: center;"> <tr> <td>x</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>$P(X=x)$</td> <td>$\frac{9}{25}$</td> <td>$\frac{7}{25}$</td> <td>$\frac{9}{25}$</td> </tr> </table>	x	2	3	4	$P(X=x)$	$\frac{9}{25}$	$\frac{7}{25}$	$\frac{9}{25}$	<p>B1ft</p> <p>B1 B1</p> <p>(3)</p>
x	2	3	4							
$P(X=x)$	$\frac{9}{25}$	$\frac{7}{25}$	$\frac{9}{25}$							
		[5]								

Question Number	Scheme	Marks
7. (a)	$P(D > 20) = P\left(Z > \frac{20-30}{8}\right)$	M1
	$= P(Z > -1.25)$	A1
	$= \underline{\mathbf{0.8944}}$	A1
		(3)
	$\text{awrt } \underline{\mathbf{0.894}}$	
(b)	$P(D < Q_3) = 0.75 \text{ so } \frac{Q_3 - 30}{8} = 0.67$	M1 B1
	$Q_3 = \text{awrt } \underline{\mathbf{35.4}}$	A1
(c)	$35.4 - 30 = 5.4 \text{ so } Q_1 = 30 - 5.4 = \text{awrt } \underline{\mathbf{24.6}}$	B1ft
		(1)
(d)	$Q_3 - Q_1 = 10.8 \text{ so } 1.5(Q_3 - Q_1) = 16.2$	M1
	$\text{so } Q_1 - 16.2 = h \text{ or } Q_3 + 16.2 = k$	
(e)	$h = \underline{\mathbf{8.4 \text{ to } 8.6}} \text{ and } k = \underline{\mathbf{51.4 \text{ to } 51.6}}$	both
	$2P(D > 51.6) = 2P(Z > 2.7)$	A1
	$= 2[1 - 0.9965] = \text{awrt } \underline{\mathbf{0.007}}$	M1 A1
		(3)
		[12]

Statistics for S1 Practice Paper Gold Level G4

Qu	Max Score	Modal score	Mean %	ALL	A*	A	B	C	D	E	U
1	13	11	65	8.46	11.72	11.08	9.61	8.61	7.61	6.70	4.73
2	8		33	2.62		3.82	1.98	1.53	1.31	1.01	0.64
3	13		67	8.73	10.84	10.13	8.54	7.53	6.43	4.72	3.11
4	11		59	6.50	7.82	7.18	6.29	5.70	5.56	5.14	4.50
5	13		39	5.02	10.63	9.16	5.68	3.90	2.78	2.12	1.48
6	5		25	1.23		2.87	0.98	0.55	0.32	0.16	0.06
7	12		43	5.20	10.39	8.98	6.01	4.31	3.10	2.08	0.98
	75		50	37.76		53.22	39.09	32.13	27.11	21.93	15.50