

Qu	Scheme		Marks
3(a)	$[\bar{x} =] \frac{3711}{81} [= 45.814...]$	$[\sum l =] 3711 + 81 \times 600 [= 52311]$	M1
	$[\bar{l} =] "45.814..." + 600$	$[\bar{l} =] \frac{"52311"}{81}$	M1
	$[\bar{l} =] 645.81...$	awrt 646	A1
			(3)
(b)	$[\sigma_x^2 =] \frac{475181}{81} - \left(\frac{3711}{81}\right)^2 [= 3767]$	$[\text{Var}(L) =] \frac{34088381}{81} - \left(\frac{"52311"}{81}\right)^2$	M1
	$= 3767.43... \Rightarrow \sigma_l^2 = 3767.43...$	$= 3767.43... \quad \text{awrt 3770}$	A1
			(2)
(c)	40		B1cao
			(1)
(d)	IQR = 5400 – 3800 [= 1600]		M1
	5400 + 1.5 × "1600" [= 7800] or 3800 – 1.5 × "1600" [= 1400]		M1
	7800 > 7700 and 1400 < 1600 therefore there are no outliers		A1
			(3)
	Notes		Total 9

Question Number	Scheme	Marks
6. (a)	98% (Condone 0.98)	B1
(b)	$z = \pm 2.3263$ (or better: calculator gives 2.326347877...) $\frac{256 - 250}{\sigma} = 2.3263$ $\sigma = 2.579...$	B1 M1 A1 (3)
(c)	$[P(X < 246 \cup X > 254) =]$ $2 \times P\left(Z > \frac{254 - 250}{"2.579..."}\right) \text{ or } 1 - P\left(\frac{246 - 250}{"2.579"} < Z < \frac{254 - 250}{"2.579"}\right)$ $= 2 \times P(Z > 1.55) \text{ or } 1 - P(-1.55 < Z < 1.55) = 0.12(12)$ $P(\text{both bags outside range}) = (0.1212)^2 =, 0.01468...$	M1 A1 dM1, A1 (4)
	awrt 2.58 awrt 0.0146/7	[8 marks]

Question Number	Scheme	Marks
8. (a)	Total area of bars = 400 small squares Area required = $40 \times 4 + 20 \times 6 + 6 \times 10 = 340$ small squares No of staff = $340 \times \frac{40}{400} = 34$	B1 B1 M1, A1 (4)
(b)	Median is $(2 +) \frac{4}{12} \times 3 = 3$ or $(5 -) \frac{8}{12} \times 3 = 3$	M1A1 (2)
(c)	Mean is $\frac{\sum fx}{40} = \frac{1 \times 16 + 3.5 \times 12 + 7.5 \times 6 + 15 \times 4 + 25 \times 2}{40} = \frac{213}{40} = 5.325$	M1, A1 (2)
(d)	(Positive) skew but not negative or there are outliers (which affect mean) Median	B1 dB1 (2)
		Total 10

Question Number	Scheme	Marks
1(a)	$[S_{xy}] = \underline{1818}$	B1 (1)
(b)	$b = \frac{1818}{1754} [=1.036 \text{ or } \frac{909}{877}]$ ALT $c = -1.036... \times \frac{5}{8}$ or $\bar{f} = 80 \times \frac{5}{8} + 3500$ $= -0.6478$ [or $\frac{4545}{7016}$] or $\bar{h} = 4500$ and $\bar{f} = 3550$ $y = 1.04x - 0.6478...$ or eqn of form $h = ... + 1.04f$ $\frac{h - 4500}{80} = 1.036 \times \frac{f - 3500}{80} - 0.6479...$ or $4500 - 1.04 \times 3550 = (820.467...)$ $h = 820 + 1.04f$	M1 M1 A1 A1ft dM1 A1 (6)
(c)	On average for every <u>increase in area of 1</u> (m ²) the annual heating <u>bill increases</u> by approximately (\$) <u>1.04</u> The cost of heating is (\$) 820 even if there is no floor space (no building) or the "standing charge" / "base rate" etc is (\$) 820	B1ft B1ft (2)
(d)	"820.46..." + "1.036..." $\times$ 4600 = (\$) 5588.31... ans in range (5560-5610)	M1 A1 (2)
		Total 11

Question Number	Scheme	Marks
4.(a)	0.13	B1 (1)
(b)	$P(A) \times P(C) = P(A \cap C)$ $0.2 \times (0.08 + p) = 0.05$ <u>or</u> $P(C) = \frac{0.05}{0.10 + 0.05 + 0.01 + 0.04}$ <u>or</u> $\frac{0.05}{0.2}$ <u>or</u> 0.25 $p = 0.17$ $P(\text{no faults}) = 1 - (0.1 + 0.05 + 0.01 + 0.04 + 0.08 + 0.03 + "0.17")$ <u>or</u> $1 - ["P(C)" + 0.10 + 0.05 + 0.08]$ $q = \underline{0.52}$	M1 A1 M1 A1 (4)
Ans only	They can get q without finding p so a correct answer to q scores 4/4	
(c)	$P(\text{Fault } B \text{ but not fault } C \mid \text{Has fault } A) = \frac{0.05}{0.2}$ $= 0.25$	M1 A1 (2)
(d)	$P(\text{exactly 2 defects}) = 0.12$ <u>or</u> $\frac{3}{25}$ $P(\text{both have 2 defects}) = 0.12^2$ $= \underline{0.0144}$ <u>or</u> $\frac{9}{625}$	B1 M1 A1 (3)
		Total 10

Question Number	Scheme	Marks	
8 (a)	$\frac{162-\mu}{\sigma} = -1.2816$ (Calculator gives -1.28155...)	M1 A1 A1	
	or $\frac{175-\mu}{\sigma} = 1.04$ (Calculator gives 1.03987...)		
	$\mu - 1.2816\sigma = 162$		
	$\mu + 1.04\sigma = 175$		
	$2.3216\sigma = 13$	dM1	
	$\sigma = 5.5995...$ awrt 5.6 $\mu = 169.1764...$ awrt 169	A1	
		(5)	
(b)	$Q_1 = 208.26$ or $Q_3 - Q_1 = 13.48$	B1	
	$221.74 + 1.5(221.74 - 'Q_1') [= 241.96]$ or $'Q_1' - 1.5(221.74 - 'Q_1') [= 188.04]$	M1	
	Probability of an outlier	1 – Probability of not an outlier	
	$[P(B > '241.96') =]$	$[P('188.04' < B < '241.96') =]$	dM1
	$P\left(Z > \frac{'241.96' - 215}{10}\right) [= P(Z > 2.70)]$	$P\left(\frac{'188.04' - 215}{10} < Z < \frac{'241.96' - 215}{10}\right)$	
	or $[P(B < '188.04') =]$	$[= P(-2.70) < Z < P(2.70)]$	
	$P\left(Z < \frac{'188.04' - 215}{10}\right) [= P(Z < -2.70)]$		
	or		
$= 0.0035$ (Calculator gives 0.0034883...)	$= 0.993$ (Calculator gives 0.99298...)		
$P(\text{Outlier}) = 2 \times '0.0035'$	$P(\text{Outlier}) = 1 - '0.993'$	M1	
$= 0.007$ (Calculator gives 0.006976...) awrt 0.007	$= 0.007$ (Calculator gives 0.007017...) awrt 0.007	A1	
		(5)	
	Notes	Total 10	

Question Number	Scheme	Marks
5. (a)	$P(X < 7) = P\left(Z < \frac{7-10}{6}\right) = P(Z < -0.5)$ $= 1 - 0.6915 \quad ; = 0.308537... \quad \text{awrt } \underline{0.309}$	M1 M1; A1 (3)
(b)	$\frac{10+k-10}{6} = 0.8416$ $k = 5.0496 \quad \text{awrt } \underline{5.05}$	M1 B1 A1 (3)
(c)	Area of rectangle is $X(X-3)$ Need $X(X-3) > 40$ $X^2 - 3X - 40 > 0 \Rightarrow (X-8)(X+5) > 0$ So critical values are 8 and -5 Need $P(X > 8) + P(X < -5)$ or $1 - P(-5 < X < 8)$ So $P(Z > -0.33) + P(Z < -2.5)$ $= 0.6293 + 0.0062$ $= 0.6355 \quad [0.6355 \sim 0.637]$	M1 M1 M1 A1 M1 M1 dM1 A1 (8)
		[14]

Question	Scheme	Marks
1. (a)	$(d =) 1$	B1 (1)
(b)	$a = 0.26 - 0.1$ or $b = 0.26 + 0.28$ or ' a ' + 0.38 or $0.76 - 'c'$ or $c = 0.76 - 'b'$ or $1 - (0.62 + 'a')$ $a = \underline{0.16}$ $b = \underline{0.54}$ $c = \underline{0.22}$	M1 A2 (3)
(c)	0.24 (only)	B1 (1)
(d)	$P(X \text{ is an odd number}) = 0.1 + 0.28 + 0.24 = 0.62$ $P(X_1 \text{ and } X_2 \text{ are both odd}) = 0.62^2$ $= 0.3844$	M1 A1 (2)
(e)	$P(X_1 + X_2 = 6 \mid \text{both are odd})$ $= \frac{P(X_1 + X_2 = 6 \cap X_1 \text{ and } X_2 \text{ are odd})}{P(X_1 \text{ and } X_2 \text{ are odd})}$ $= \frac{0.1 \times 0.24 + 0.28 \times 0.28 + 0.24 \times 0.1}{\text{'(their answer to d)'}}$ $= \frac{0.1264}{\text{'(d)'}}$ $= 0.328824141.....$	M1 A1ft A1 (3)
		(10 marks)

Question	Scheme	Marks
7.(a)		B1B1 (-1 ee) (2)
(b)	For any sensible comment about H being far away from the other points. e.g. ‘H is an outlier/anomaly’, ‘The blood protein/p/70 for H is much higher than the other patients’, ‘H does not follow the (linear) pattern’, ‘Data collected for H may be incorrect’, etc.	B1 (1)
(c)	$r = \frac{369}{\sqrt{423 \frac{5}{7} \times 490}} = 0.809826106$	M1A1 (2)
(d)	r would be closer to 0	B1 (1)
		Total 6