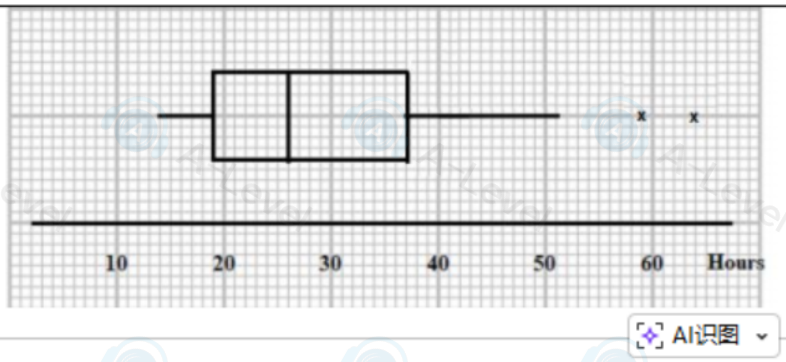
Question Number	Scheme	Marks
1(a)	$w = 8$	B1
	$x = 19$	B1
	$y = 37$	B1
		(3)
(b)	"37"+1×("37"−"19") [= 55]	M1
	59 and 64	A1ft
		(2)
(c)		M1 A1ft A1ft
		(3)
(d)	$\frac{("37"-26)-(26-"19")}{("37"-"19")}$	M1
	= 0.22 (to 2 sf)	A1
		(2)
(e)	E.g. 'The mean uses all the data'	B1
		(1)
		Total 11

Question Number	Scheme	Marks
1.(a)	$[F(5) =]\ \underline{\frac{5}{6}}$	B1
		(1)
(b)	$[E(X) =]\ -2\times\frac{1}{4}+1\times\frac{1}{6}+3\times\frac{1}{3}+4\times\frac{1}{12}+6\times\frac{1}{6}$ or $\frac{1}{12}(-6+2+12+4+12)$	M1
	$= \underline{\mathbf{2}}$	A1
		(2)
(c)	$[E(X^2) =]\ (-2)^2\times\frac{1}{4}+1\times\frac{1}{6}+3^2\times\frac{1}{3}+4^2\times\frac{1}{12}+6^2\times\frac{1}{6}$ (o.e.)	M1
	or $\frac{1}{12}(12+2+36+16+72)$ or $\frac{138}{12}$ or $\frac{23}{2}$ (o.e.)	
	$[\text{Var}(X) =]\ "\frac{23}{2}"-"2"^2$	M1
	$= \underline{\mathbf{7.5}}$ (o.e.)	A1
		(3)
(d)(i)	$[E(Y) = 7 - 2E(X) =]\ \underline{\mathbf{3}}$	B1
(ii)	$[\text{Var}(Y) =]\ (-2)^2\ \text{Var}(X)$ or $4\ \text{Var}(X)$	M1
	$= \underline{\mathbf{30}}$	A1
(iii)	$7 - 2X > X \Rightarrow 7 > 3X$	M1
	so $X = 1$ or -2	A1
	So $[P(Y > X) =]\ \underline{\frac{5}{12}}$	A1
		(6)

Question Number	Scheme			Marks
8 (a)	$P(X > \mu+2k) = 0.2$	or	$P(X < \mu-2k) = 0.2$	M1
	or $P(X < \mu+2k) = 0.8$	or	$P(X > \mu-2k) = 0.8$	
	$\frac{\mu+2k-\mu}{6} = 0.8416$	or	$\frac{\mu-2k-\mu}{6} = -0.8416$	M1 A1
	$k = 2.5248...$		awrt 2.52	A1
				(4)
(b)	$P\left(Y > \frac{3}{2}\mu\right) \Rightarrow P\left(Z > \frac{\frac{3}{2}\mu-\mu}{\sigma}\right) \Rightarrow P\left(Z > \frac{\frac{1}{2}\mu}{\sigma}\right)$			M1
	$\mu = \frac{3}{2}\sigma^2 \Rightarrow P\left(Z > \frac{'\frac{1}{2}\left(\frac{3}{2}\sigma^2\right)'}{\sigma}\right)$ $\left[=P\left(Z > \frac{3}{4}\sigma\right)\right]$			
	or			
	$\sigma = \sqrt{\frac{2\mu}{3}} \Rightarrow P\left(Z > \frac{\frac{1}{2}\mu}{\sqrt{\frac{2\mu}{3}}}\right) = \left[P\left(Z > \frac{1}{2}\sqrt{\frac{3\mu}{2}}\right)\right]$			M1
	or $\frac{\frac{1}{2}\mu}{\sigma} = k$ and $2\mu = 3\sigma^2$			
	$'\frac{3}{4}\sigma' = 1.5$ or $\frac{1}{2}\sqrt{\frac{3\mu}{2}} = 1.5$ or $3\sigma^2 = 6\sigma$			M1
	$\mu = 6$ only, $\sigma = 2$ only			A1 A1
				(5)
	Notes			**Total 9**

Question Number	Scheme	Marks
2 (a)	$\left[S_{xp} =\right] 2347 - \frac{93\times 273}{12}$ or $2347 - \frac{25\,389}{12}$ $\left[= 231.25\right]$ (*)	B1cso (1)
(b)	$\left[S_{pp} =\right] 6602.72 - \frac{273^2}{12} = [391.97]$	M1
	$[r =] \frac{231.25}{\sqrt{148.25\times "391.97"}}$	M1
	$= 0.959307\ldots$ awrt **0.959**	A1 (3)
(c)	$\left[b = \frac{S_{xp}}{S_{xx}} = \right] \frac{231.25}{148.25} [= 1.559865\ldots]$	M1
	$a = \frac{273}{12} - "1.56"\times \frac{93}{12}$ or $22.75 - "1.56"\times 7.75$ $[= 10.66\ldots]$	M1
	b = awrt 1.6 **or** a = awrt 11	A1
	$p = 10.7 + 1.56x$	A1 (4)
(d)	e.g. each extra **employee** costs the company (on average)[$"]156" a year in **paper**	B1 (1)
(e)	[New p =] $0.8\times "10.66\ldots" + \frac{"1.559\ldots"}{2}\times \frac{93}{12}$ [=14.573…]	M1
	[compared with $\overline{p} = 22.75$] so percentage saving is $\frac{22.75 - 14.573\ldots}{22.75}[\times 100]$	M1
	$= 35.94\ldots$ awrt **36[%]**	A1 (3)
	Notes	[12]

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

Question Number	Scheme	Marks
1 (a)	$2\times36=72 \quad 8\times4=32$	M1 A1
		(2)
(b)	$[13]+\frac{(204-184)}{120}\times2$ $\quad$ $[13]+\frac{(204.5-184)}{120}\times2$	M1
	$=\frac{40}{3}=$ awrt 13.3	A1
		(2)
(c)	Symmetrically distributed/No skew as the mean ≈ median	B1
		(1)
(d)	$\frac{32}{4}+152+\frac{120}{2}[=220]$	M1
	$\frac{'220'}{408}\times\frac{'219'}{407}$	M1
	$\frac{365}{1258}$ or 0.2901… awrt 0.29	A1
		(3)
	Notes	**Total 8**

3.	**(a)**	$29\times75+29\times83+....+46\times126=33\,856$ **<u>33856</u>**	B1cao
			(1)
	(b)	$\sum m=306$ and $\sum b=861$	B1
		$S_{bm}='33\ 856'-\frac{'861'\times'306'}{8}=922.75$ **awrt <u>923</u>**	M1 A1
			(3)
	(c)	$r=\frac{"922.75"}{\sqrt{3083.875\times305.5}}=0.9506706....$ **awrt <u>0.951</u>**	M1 A1
			(2)
	(d)	As milk price increase, so does bread price.	B1
			(1)
	(e)	Since bread price increases but milk price stays the same Therefore the correlation will decrease (or be weaker)	B1 dB1
			(2)
			(9 marks)

Question Number	Scheme	Marks
5 (a)	$X \sim \mathrm{N}(210, 25^2)$	
	$\mathrm{P}(X < 240) = \mathrm{P}\left(Z < \dfrac{240-210}{25}\right)\left[= \mathrm{P}(Z < 1.2)\right]$	M1
	$= 0.8849^*$	A1*
		(2)
(b)	$\mathrm{P}(190 < X < 240) = 0.8849 - \mathrm{P}\left(Z < \dfrac{190-210}{25}\right)\left[= 0.8849 - \mathrm{P}(Z < -0.8)\right]$	M1
	$0.8849 - 0.2119 = 0.673$ awrt 0.673	A1
		(2)
(c)	$\dfrac{210+k-210}{25} = 1.96$ or $\dfrac{210-k-210}{25} = -1.96$	M1 B1
	$k = 49$ awrt 49	A1
		(3)
(d)	$\mathrm{P}(X < S) = 0.15 \Rightarrow \dfrac{S-210}{25} = -1.0364$	M1 B1
	$S = 184.09$ awrt 184	A1
		(3)
(e)	$Y \sim \mathrm{N}(\mu,\ \sigma^2)$	
	$\mathrm{P}(Y < 152) = 0.05 \Rightarrow \dfrac{152-\mu}{\sigma} = -1.6449$	M1 A1
	$\mathrm{P}(Y > 180) = 0.40 \Rightarrow \dfrac{180-\mu}{\sigma} = 0.2533$	A1
	$28 = 1.8982\sigma$	dM1
	$\sigma = 14.75...$ and $\mu = 176.26...$	A1
		(5)
	Notes	**Total 15**

Question Number	Scheme	Marks
2. (a)	(The event that) the integer selected is prime **and** ends in a 3 (and is between 1 and 50 inclusive)	**B1** **(1)**
(b)	$\dfrac{15}{50}$ (or equivalent e.g. 0.30) [condone 30%]	**B1** **(1)**
(c)	$\dfrac{12}{50}$ (or equivalent e.g. 0.24) [condone 24%]	**B1** **(1)**
(d)	$\left[\mathrm{P}(A \mid C) =\right] \dfrac{\mathrm{P}(A \cap C)}{\mathrm{P}(C)} = \dfrac{\frac{7}{50}}{\frac{30}{50}} =, \ \dfrac{7}{30}$	**M1, A1** **(2)**
(e)	$\dfrac{15}{50} \neq \dfrac{7}{30}$, so not independent.	**M1, A1** **(2)**
(f)	$\left[\mathrm{P}(B \mid (A \cap C)) =\right] \dfrac{\mathrm{P}(B \cap A \cap C)}{\mathrm{P}(A \cap C)} = \dfrac{\frac{2}{50}}{\frac{7}{50}} =, \ \dfrac{2}{7}$	**M1, A1** **(2)** **[9 marks]**