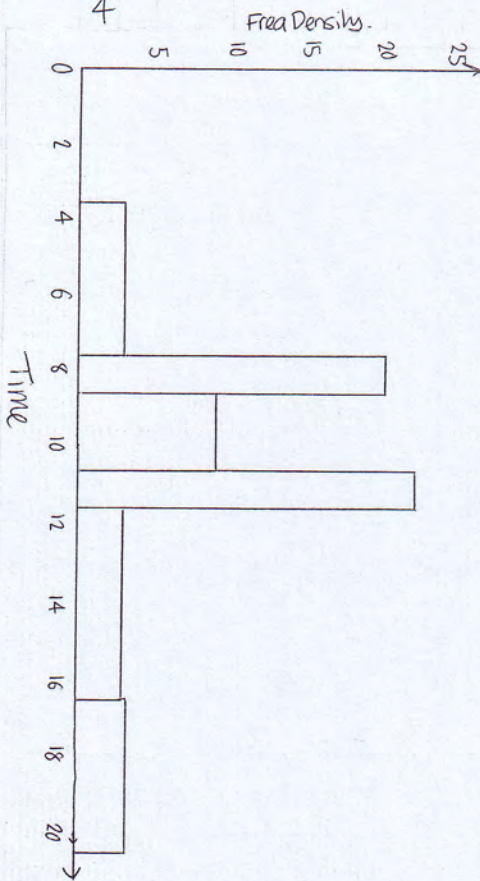


S1 Solution June 03

Q1 Freq. Densities: $\frac{12}{4} = 3, \frac{20}{1} = 20, \frac{18}{2} = 9, \frac{22}{1} = 22$
 $\frac{15}{5} = 3, \frac{13}{4} = 3.25$



3) b) $r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}} = \frac{-157.86}{\sqrt{155.92 \times 214.96}} = -0.862$ (3sf)

c) $\Rightarrow -0.862$ (coding does not effect PMCC)

\Rightarrow Negative correlation i.e as the sales increase for one petrol station, the sales decrease for the other.

Q4 a)

x	4	5	6
$P(X=x)$	$\frac{7}{50}$	$\frac{16}{50}$	$\frac{27}{50}$

$7k + 16k + 27k = 1$
 $50k = 1 \quad k = \frac{1}{50}$

b) $E(X) = 4 \times \frac{7}{50} + 5 \times \frac{16}{50} + 6 \times \frac{27}{50} = 5.4$

$E(X^2) = 16 \times \frac{7}{50} + 25 \times \frac{16}{50} + 36 \times \frac{27}{50} = 29.68$

$Var(X) = E(X^2) - (E(X))^2 = 29.68 - 5.4^2 = 0.52$

2) Q2. $X = \text{life time of batteries} \quad X \sim N(12, 3^2)$

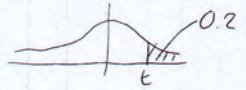
$P(X > t) = 0.2$

$P(Z > \frac{t-12}{3}) = 0.2$

$P(Z < \frac{t-12}{3}) = 0.8$

$\Phi(\frac{t-12}{3}) = 0.8$

$\frac{t-12}{3} = 0.84 \quad t = 14.52 \text{ hrs}$



Q3 a) $S_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 204.95 - \frac{48.1 \times 52.8}{7} = -157.86142 = -157.86$ (2d)

$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 486.44 - \frac{48.1^2}{7} = 155.92428 = 155.92$ (2dp)

$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 613.22 - \frac{52.8^2}{7} = 214.957143 = 214.96$ (2dp)

4) c) $Var(2X-3) = 2^2 Var(X) = 4 \times 0.52 = 2.08$

5. a) discrete uniform distribution

b)

x	1	2	3	4	5	6
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$P(X=x) = \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{6}$

$E(X) = \frac{n+1}{2} = \frac{6+1}{2} = 3.5$
 $Var(X) = \frac{(n+1)(n-1)}{12} = \frac{5 \times 5}{12} = 2.917$

c) $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{216}$

d) $6+6+4, 6+4+6, 4+6+6$
 $5+5+6, 5+6+5, 6+5+5$

e) $\frac{1}{216} \times 6 = \frac{6}{216} = \frac{1}{36}$

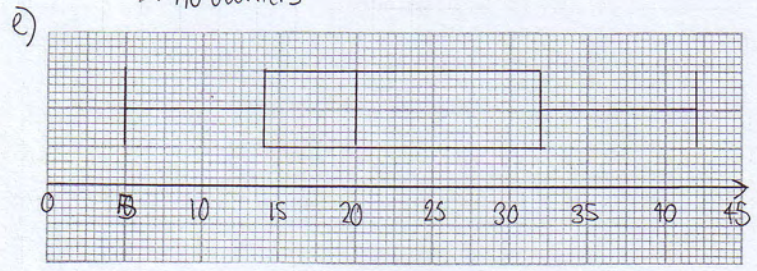
5) Q6. a) $\frac{312}{14} = 22.2857... = \underline{\underline{22.3}}$

b)

0	5
1	0 1 3 5 7
2	0 0 5
3	0 1 3
4	0 2

c) $\frac{14+1}{2} = 7.5$ $Q_2 = \underline{\underline{20}}$
 $\frac{14+1}{4} = 3.75$ $Q_1 = \frac{13+15}{2} = \underline{\underline{14}}$
 $3\frac{(14+1)}{4} = 11.25$ $Q_3 = \frac{31+33}{2} = \underline{\underline{32}}$

d) $UOL = 1.5 \times (Q_3 - Q_2) = 1.5(32-14) = 32 + 27 = 59$
 $LOL = Q_1 - 1.5 \times (Q_3 - Q_2) = 14 - 27 = -13$
 \therefore no outliers
 \therefore no outliers



7) e) $p = 2.23 + 1.41 \times 15 = \underline{\underline{23.38}}$

6) f) There is a positive skew as $Q_2 - Q_1 < Q_3 - Q_2$
OR mean > median.

Q7 a) maths is the explanatory variable.

b)

c) $\Sigma p = 156$ $\Sigma m = 98$ $\Sigma m^2 = 1348$ $\Sigma mp = 2119$

$S_{mp} = \Sigma mp - \frac{\Sigma m \Sigma p}{n} = 2119 - \frac{156 \times 98}{8} = \underline{\underline{208}}$

$S_{mm} = \Sigma m^2 - \frac{(\Sigma m)^2}{n} = 1348 - \frac{98^2}{8} = \underline{\underline{147.5}}$

$y = a + bx$

$b = \frac{S_{mp}}{S_{mm}} = \frac{208}{147.5} = 1.410169$

$a = \bar{y} - b\bar{x} = \frac{156}{8} - \frac{98}{8} \times 1.410169 = 2.22542$

$p = 2.23 + 1.41m$