1) $n = 27$ mode $= \underline{56}$

b) $Q_1 \Rightarrow \frac{1}{4}n = 6.75 \Rightarrow x_7 = Q_1 = \underline{35}$

$Q_2 \Rightarrow \frac{2}{4}n = 13.5 \Rightarrow x_{14} = Q_2 = \underline{52}$

$Q_3 \Rightarrow \frac{3}{4}n = 20.25 \Rightarrow x_{21} = Q_3 = \underline{60}$

c) $\Sigma x = 1355 \quad \Sigma x^2 = 71801$

Mean $= \frac{\Sigma x}{n} = \frac{1355}{27} = \underline{50.2}$

$(\text{standard deviation})^2 = \frac{\Sigma x^2}{n} - \text{mean}^2 = \frac{71801}{27} - 50.2^2$

Variance $= 139.26 \Rightarrow$ s.d. $= \sqrt{139.26} = \underline{11.86}$

d) Skew $= \frac{\text{mean} - \text{mode}}{\text{s.d.}} = \frac{50.2 - 56}{11.86} = \underline{-0.49}$

hence negative skew.

e) $Q_2 - Q_1 = 17 \quad Q_3 - Q_2 = 12 \quad Q_2 - Q_1 > Q_3 - Q_2$ negative skew.

mean $= 50.2$ median $= 52$ mode $= 56$

mean < median < mode $\Rightarrow$ negative skew

2)

x	1	2	3	4	5
p	0.1	p	0.2	q	0.3

$\Sigma P = 1$

$\Rightarrow 0.6 + p + q =$

$p + q = 0.4$

$E(x) = 0.1 + 2p + 0.6 + 4q + 1.5$

$3.5 = 2.2 + 2p + 4q \Rightarrow$

$2p + 4q = 1.3$

$\underline{2p + 2q = 0.8}$

$2q = 0.5$

$\underline{q = 0.25}$

$\underline{p = 0.15}$

c)

x^2	1^2	2^2	3^2	4^2	5^2
p	0.1	0.15	0.2	0.25	0.3

$E(X^2) = 0.1 + 0.6 + 1.8 + 4 + 7.5 = 14$

$V(x) = E(x^2) - E(x)^2 = 14 - 3.5^2 = \underline{1.75}$

d) $V(3 - 2X) = (-2)^2 Var(x) = 4 \times 1.75 = \underline{7}$

3) b) Evidence to suggest positive correlation

c) $S_{xy} = \Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n} = 8354 - \frac{(106)(704)}{10} = 891.6$

$S_{xx} = \Sigma x^2 - \frac{(\Sigma x)^2}{n} = 1352 - \frac{106^2}{10} = 228.4$

$b = \frac{S_{xy}}{S_{xx}} = \frac{891.6}{228.4} = 3.90 \quad a = \bar{y} - b\bar{x}$

$a = 70.4 - 3.90 \times 10.6$

$a = 29.02$

$\underline{y = 29 + 3.9x}$

d) $b = 3.9 \Rightarrow 3.9$ ml evaporates each week.

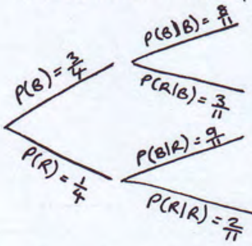
e) i) $x = 19 \quad y = 29 + 3.9 \times 19 = 103.1$ ml

ii) $x = 35 \quad y = 29 + 3.9 \times 35 = 165.52$ ml

i) reasonably reliable just outside data range

ii) unreliable $\Rightarrow$ too far outside data range

4)



$P(B \cap B) = \frac{24}{44}$

$P(B \cap R) = \frac{9}{44}$

$P(R \cap B) = \frac{9}{44}$

$P(R \cap R) = \frac{2}{44}$

b) 2nd Red

$= \frac{9}{44} + \frac{2}{44} = \frac{11}{44}$

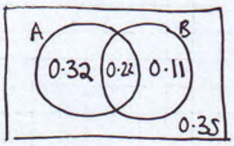
$= \underline{\frac{1}{4}}$

c) $P(R \cap R \mid 2^{nd}\text{ Red}) = \frac{\left(\frac{2}{44}\right)}{\left(\frac{11}{44}\right)} = \underline{\frac{2}{11}}$

5)
- Cheaper / Quicker
- use them to help solve 'real world' problems
- Predict future outcomes

i) height / weight ii) rolling a fair dice

6)



$A \cap B = 0.65 - 0.32 - 0.11 = \underline{0.22}$

b) $P(A) = \underline{0.54}$ c) $P(B) = \underline{0.33}$

c) $P(A|B') = \frac{P(A \cap B')}{P(B')} = \frac{0.32}{0.67} = \underline{\frac{32}{67}}$

d) $P(A) \times P(B) = 0.1782$

$P(A \cap B) = 0.22 \quad P(A) \times P(B) \neq P(A \cap B)$ not Independent

7) $h \sim N(180, 5.2^2) \quad W \sim N(85, 7.1^2)$

$P(h > 188) \Rightarrow P\left(Z > \frac{188 - 180}{5.2}\right) = P(Z > 1.54) = 1 - \Phi(1.54)$

$= \underline{0.0618}$

b) $P(W < 97) \Rightarrow P\left(Z < \frac{97 - 85}{7.1}\right) = P(Z < 1.69) = \Phi(1.69)$

$= \underline{0.9545}$

c) $0.0618 \times 0.0455 = \underline{0.0028}$

d) height and weight are often dependent on one another.