

Stats 1 - June 2007

① a) From calc: $r = -0.525443...$

b) Weak negative linear correlation between length and maximum diameter of honeydew melons.

② a) i) $7/50$

ii) $\frac{14+8}{50} = \frac{22}{50}$

iii) $1 - \frac{22}{50} = \frac{28}{50}$

iv) TOTAL BACKS = 23
BACKS $\times$ IRISH = 6 $\rightarrow \frac{6}{23}$

v) TOTAL NOT SCOTTISH = 46
FORWARD $\times$ NOT SCOTTISH = 25 $\rightarrow \frac{25}{46}$

b) $P(\text{English}) = 22/50$

$$P(4 - \text{without replacement}) = \frac{22}{50} \times \frac{21}{49} \times \frac{20}{48} \times \frac{19}{47} = 0.03176$$

③ a) $\bar{x} = 234$ $s = 25.1$ $n = 50$

95% multiplier (2 tailed) = 1.96

$$N = \bar{x} \pm z \times s/\sqrt{n}$$

$$N = 234 \pm 1.96 \times 25.1/\sqrt{50}$$

$$N = 234 \pm 6.9573...$$

$$= (227.04, 240.96)$$

b) Customers likely to choose big potatoes!

④ a) i) MODE = 2

$$\text{RANGE} = 15 - 0 = 15$$

ii) Cumulative frequency:

Books	0	1	2	3	4	5-9	10-14	15
CF	4	17	41	58	73	84	89	95

$$\text{Median} = \frac{95+1}{2} = 48^{\text{th}} \text{ person} = 3 \text{ books}$$

$$LQ = \frac{95+1}{4} = 24^{\text{th}} \text{ person} = 2 \text{ books}$$

$$UQ = \frac{3(95+1)}{4} = 72^{\text{nd}} \text{ person} = 4 \text{ books}$$

$$IQR = UQ - LQ = 4 - 2 = 2 \text{ books}$$

iii) Use midpoints for Σx values: $5-9 = 7$, $10-14 = 12$

$$\text{From calc: } \Sigma x^2 = 3111, \quad \Sigma x = 399$$

$$\rightarrow \bar{x} = 4.2, \quad s = 3.9074$$

b) i) $\bar{x}$ and s are estimated using midpoints for 2 groups. These unknown values have no impact on median or IQR.

ii) Mean & SD use all available data.
Mode & range do not.

5) a) Time taken depends on temperature.

$$b) \text{ From calc: } a = 5.950909...$$

$$b = -0.0872727...$$

$$\rightarrow y = 5.95 - 0.087x$$

c) i) Each 10 increase in temperature leads to a 0.087 minute decrease in the time taken to dissolve.

ii) a is the value when $x = 0$
water is frozen at this temperature!

$$d) i) x = 30 \rightarrow y = 5.95 - 0.087(30) = 3.33 \text{ mins}$$

$$ii) \text{ when } x = 75 \rightarrow y = 5.95 - 0.087(75) = -0.575$$

It is impossible for time to be negative.

⑥ a) $T \sim B(10, 0.4)$

$P(T \leq 3) = 0.3823$ (from tables)

ii) $T \sim B(40, 0.4)$

$P(10 < T < 20)$

can be: 11, 12, 13 ... 18, 19

$\Rightarrow P(T \leq 19) - P(T \leq 10)$

$= 0.8702 - 0.0352 = 0.835$

b) i) mean = $np = 0.4 \times 5 = 2$

var = $np(1-p) = 0.4 \times 0.6 \times 5 = 1.2$

$\Rightarrow SD = \sqrt{1.2} = 1.09544...$

ii) From calc: $\sum x^2 = 68$, $\sum x = 26$

$\bar{x} = 2$

$S = 1.154700...$

iii) Mean & standard deviations are very similar.

$\therefore$ the claim appears valid.

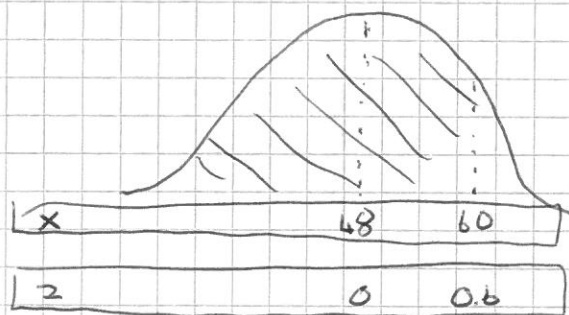
⑦ a) $X \sim N(48, 20^2)$

i) $P(X < 60)$

$= P(Z < \frac{60-48}{20})$

$= P(Z < 0.6)$

$= 0.72575$

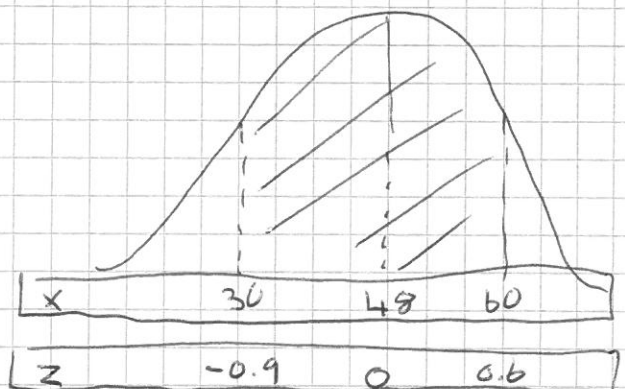


ii) $P(30 < X < 60)$

$= P(X < 60) - P(X \leq 30)$

$= P(Z < 0.6) - P(Z < \frac{30-48}{20})$

$= P(Z < 0.6) - P(Z < -0.9)$



$$\begin{aligned}
 &= P(Z < 0.6) - [1 - P(Z < 0.9)] \\
 &= 0.72575 - [1 - 0.81594] \\
 &= 0.72575 - 0.18406 \\
 &= 0.54169
 \end{aligned}$$

iii) $P(X < K) = 0.9$

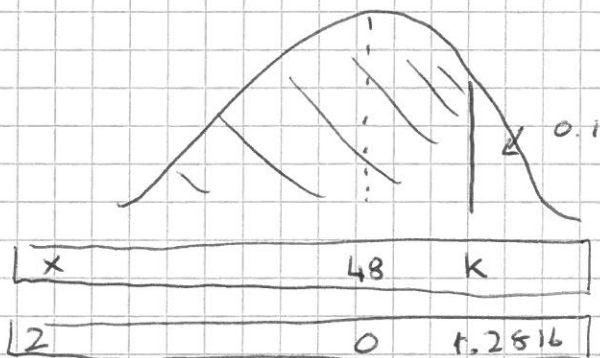
Look up z of 0.9

$$= 1.2816$$

Now standardize:

$$\frac{K - 48}{20} = 1.2816$$

$$\begin{aligned}
 \rightarrow K &= 1.2816 \times 20 + 48 \\
 &= 73.632
 \end{aligned}$$



b) $Y \sim N(37, 25^2)$

i) Large standard deviation,

So, if we do 2 sds from mean we get:

$$37 - 2(25) = -13, \text{ which implies negative times}$$

ii) Central Limit Theorem can be used as $n > 30$

iii) $\bar{Y} \sim N(37, 25^2/35)$

$$P(\bar{Y} > 40)$$

$$= P\left(Z > \frac{40 - 37}{25/\sqrt{35}}\right)$$

$$= P(Z > 0.70492)$$

$$= 1 - P(Z < 0.70492)$$

$$= 1 - P(Z < 0.71)$$

$$= 1 - 0.76115$$

$$= 0.23885$$

