Stats 1 – May / June 2006

① a) i) From Calculator: $r = 0.14308\ldots$

ii) Very weak positive linear correlation.

Suggests there is no relationship between the prize and the number of pages.

iii) The author / popularity

b) Very strong positive linear correlation.

The sale prize appears to be determined by the number of pages.

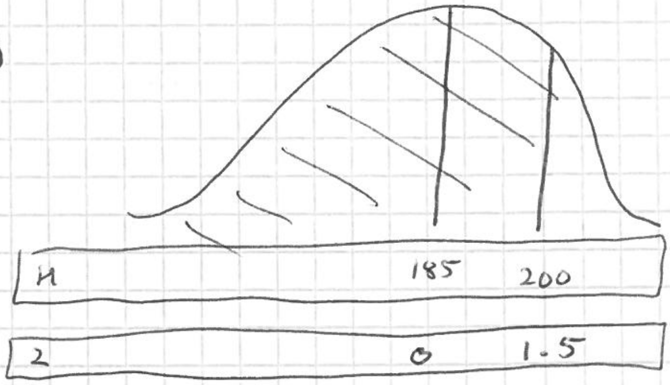
② $H \sim N(185, 10^2)$

a) i) $P(H < 200)$

$= P\left(Z < \frac{200 - 185}{10}\right)$

$= P(Z < 1.5)$

$= 0.93319$



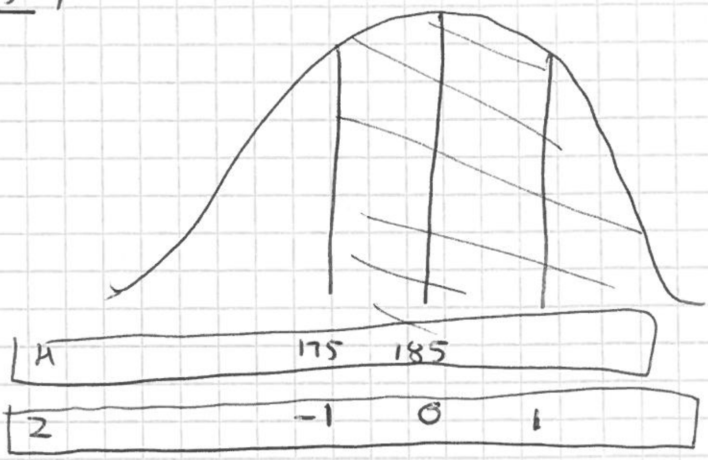
ii) $P(H > 175)$

$= P\left(Z > \frac{175 - 185}{10}\right)$

$= P(Z > -1)$

$= P(Z < 1)$

$= 0.84134$



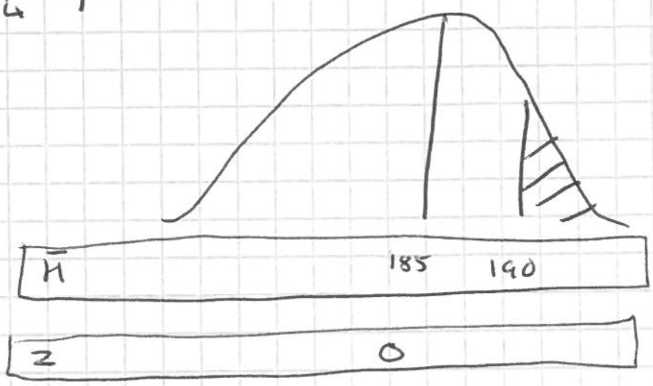
iii) $P(175 < H < 200)$

$= P(H < 200) - P(H < 175)$

using previous answers

$= 0.93319 - [1 - 0.84134] = 0.77453$

b) $\bar{H} \sim N\left(185, \frac{10^2}{4}\right)$



$P(\bar{H} > 190)$

$= P\left(Z > \frac{190 - 185}{10/\sqrt{4}}\right)$

$= P(Z > 1)$

$= 1 - P(Z < 1)$

$= 1 - 0.84134$

$= 0.15866$

(3) a) i) From Calculator: $a = 262.888...$ (intercept)

$b = -3.25$ (gradient)

$\rightarrow y = 262.\dot{8} - 3.25x$

ii) $b = -3.25$ $\rightarrow$ Each extra month (x) has a decrease in pressure of 3.25 kPa

iii) $a = 262.8$ $\rightarrow$ The initial pressure of the tyre is $262.\dot{8}$ kPa

b) i) $2 \times -3.25 = -6.5$ (2 × gradient)

ii) $x = 8$

$\rightarrow y = 265 + -6.5(8)$

$= 213$, which < 220

(4) a) i) From Calculator: $\bar{x} = 505.2$ $n = 10$

$s = 5.95911...$

99% CI (2 tailed) $\rightarrow z = 2.5758$

99% CI $\rightarrow \mu = \bar{x} \pm z \times \frac{s}{\sqrt{n}}$

$\mu = 505.2 \pm 2.5758 \times \frac{5.95411}{\sqrt{10}}$

$\Rightarrow \mu = 505.2 \pm 4.854$

$\Rightarrow \mu = (500.3, \quad 510.\cancel{071}1) \qquad (1dp)$

ii) The weights of packets were normally distributed.

iii) $\boxed{\text{SAMPLE}}$ $3/10$ or 30% of packets below 500g

$\boxed{\text{CI}}$ 500g outside (below) 99% confidence interval

$\therefore$ weight seems to be more than 500g

Claim does not seem justified

b) 1% (100% - 99%)

(5) a) $K \sim B(15, 0.3)$

i) $P(K = 5) \rightarrow {}^{15}C_5 \times 0.3^5 \times 0.7^{10}$

$= 0.20613...$

ii) $P(K \leq 7) = 0.95$ (from tables)

iii) $P(2 < K < 7)$

CAN BE: 3, 4, 5, 6

$\rightarrow P(K \leq 6) - P(K \leq 2)$

$= \cancel{0.9884} - \cancel{0.4534} =$

$0.8689 - 0.1268 = 0.7421$

b) i) MEAN $= np = 15 \times 0.4 = 6$

SD $= \sqrt{np(1-p)} = \sqrt{15 \times 0.4 \times 0.6} = \sqrt{3.6}$

$= 1.897...$

ii) From calculator: $\bar{x} = 6$

$s = 2.9814$

iii) Means are the same

Standard deviations are different

We have reasons to doubt Kirk's claims

(6) a) i) $P(D) = 120/320$

ii) $P(D \cap R) = \dfrac{24}{320}$

iii) $P(D \cup T) = \dfrac{120 + 88}{320} = \dfrac{208}{320}$

iv) $P(D \mid R) = \dfrac{24}{64}$ 64 = house with 0 kids

v) $P(R \mid D') = \dfrac{40}{200}$ 200 = houses not detached

b) i) R & S, R & T or S & T

ii) If independent $P(D \mid R) = P(D)$

$P(D \mid R) = 24/64 = 0.375$

$P(D) = 120/320 = 0.375$

∴ D & R are Independent

c) i) $D' \cup T$ = A semi-detached house, or a house with 2 children, or both

ii) $D \cap (R \cup S)$ = A detatched house that has less than 2 children.