

Stats I - January 2008

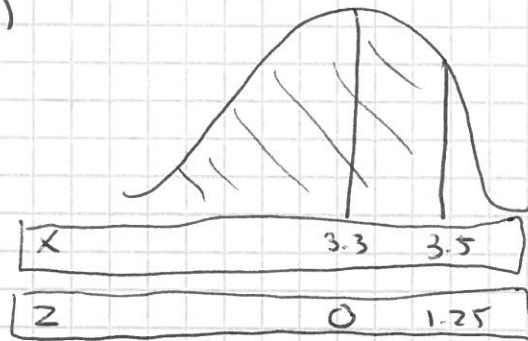
① a) $X \sim N(3.3, 0.16^2)$

i) $P(X < 3.5)$

$$= P\left(Z < \frac{3.5 - 3.3}{0.16}\right)$$

$$= P(Z < 1.25)$$

$$= 0.89435$$



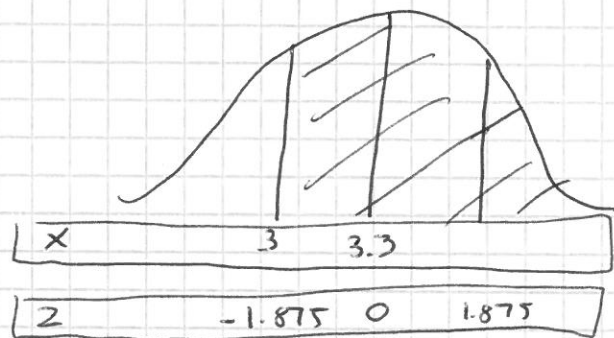
ii) $P(X > 3)$

$$= P\left(Z > \frac{3 - 3.3}{0.16}\right)$$

$$= P(Z > -1.875)$$

$$= 1 - P(Z < -1.875)$$

$$= 0.96995 \quad [\text{look up } 1.88]$$



iii) $P(3 < X < 3.5)$

$$= P(-1.875 < Z < 1.25)$$

$$= P(Z < 1.25) - P(Z < -1.875)$$

$$= 0.89435 - [1 - 0.96995]$$

$$= 0.89435 - 0.03005$$

$$= 0.8643$$



b) $X \sim N(\mu, 0.16^2)$

Look up Z value for 0.975

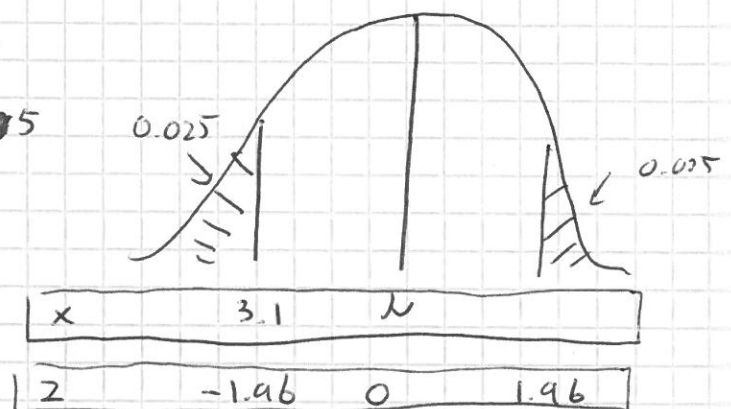
$$= 1.96$$

$$\therefore \frac{3.1 - \mu}{0.16} = -1.96$$

$$3.1 - \mu = -0.3136$$

$$\mu = 3.1 + 0.3136$$

$$= 3.4136$$

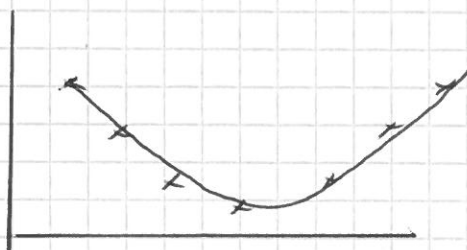


$$(2) a) r = \frac{S_{xy}}{\sqrt{S_{xx} \times S_{yy}}} = \frac{416.3}{\sqrt{1280.55 \times 281.8}} = 0.693...$$

b) Fairly strong, positive, linear correlation between head/body & tail length of dormice

c) Still 0.693 as units make no difference

d) There might be a non-linear relationship



(3) a) Assumption: 12 elephants are selected at random

From calculator: $\sum x = 39.24$

$$\bar{x} = 3.27 \quad s = 0.2 \quad n = 12$$

Z value for 98% (2 tail) = 2.3263

$$\therefore 98\% \text{ CI for } \mu = \bar{x} \pm z \times \frac{s}{\sqrt{n}}$$

$$= 3.27 \pm 2.3263 \times \frac{0.2}{\sqrt{12}}$$

$$= 3.27 \pm 0.13430...$$

$$= (3.136, 3.404)$$

b) 2.90 lies outside of confidence interval

$\therefore$ this suggests mean height of the two types of elephant are different.

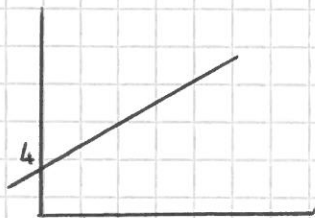
(4) a) See Mark Scheme for scatter diagram

b) From calculator: $a = 3.94049...$ (intercept)

$b = 1.19065...$ (gradient)

$$\rightarrow y = 3.95 + 1.19x$$

c)

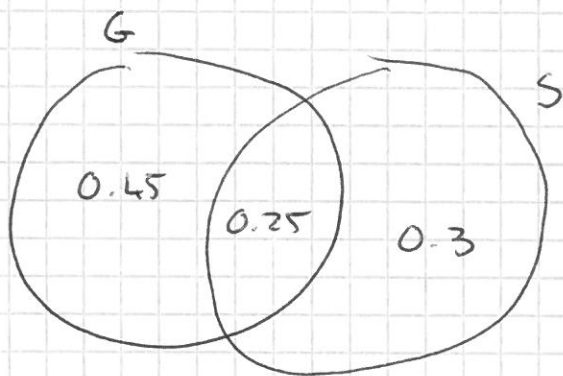


$$d170c = 15$$

$$\rightarrow y = 3.95 + 1.19(15) \\ = 21.8 \text{ hours}$$

ii) Points are widely scattered, which suggests estimate is not very reliable.

5)



$$a) i) P(G') = 0.3$$

$$ii) P(G \cap S) = 0.45$$

$$iii) P(1 \text{ only}) = 0.45 + 0.3 \\ = 0.75$$

$$b) P(G' \text{ 4 times}) = 0.3^4 = 0.0081$$

$$c) \left. \begin{array}{l} P(A, H) = 0.7 \times 0.6 = 0.42 \\ P(A', H) = 0.3 \times 0.1 = 0.03 \end{array} \right\} + \\ \hline 0.45$$

$$d) P(G) = 0.45, P(S) = 0.35$$

$$\therefore \text{Prob of any other} = 1 - (0.45 + 0.35) = 0.2$$

$$6) a) i) \text{Median} = \frac{380+1}{2} = 190.5 \text{M} = 2 \text{ goals}$$

$$LQ = \frac{380+1}{4} = 95.25 \text{M} = 1$$

$$UQ = \frac{3(380+1)}{4} = 285.75 \text{M} = 4$$

$$\therefore IQR = 4 - 1 = 3 \text{ goals}$$

$$b) ii) \text{From calculator: } \sum x = 976, \quad \sum x^2 = 3546$$

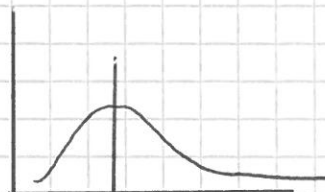
$$\bar{x} = 2.56315...$$

$$s = 1.66405...$$

b) i) Average roughly similar amount of goals scored
SPREAD greater in 2004/5

ii) This rule only applies when data is Normally Distributed.

We can see that 2005/6 data is positively skewed.



⑦ a) $C \sim B(50, 0.08)$

$$\begin{aligned} \text{i) } P(C \geq 2) &= 1 - P(C \leq 1) \\ &= 1 - 0.0827 = 0.9173 \quad (\text{from table}) \end{aligned}$$

$$\begin{aligned} \text{ii) } P(C \geq 3) &= 1 - P(C \leq 2) \\ &= 1 - 0.2260 = 0.7740 \end{aligned}$$

b) $M \sim B(15, 0.025)$

$$\begin{aligned} \text{i) } P(\text{All turn up}) &= (1 - 0.025)^{15} \\ &= 0.68402... \end{aligned}$$

$$\begin{aligned} \text{ii) } P(M \geq 1) &= 1 - P(M = 0) \\ &= 1 - 0.68402... = 0.31597 \end{aligned}$$

c) Enough seats if:

$$\begin{aligned} \text{①} \quad &\begin{array}{ll} \text{One or more doesn't get Mini-Bus} & (\text{bii}) \\ \text{Two or more don't get Coach} & (\text{aii}) \end{array} \\ &= 0.917 \times 0.316 = 0.2891... \end{aligned}$$

$$\begin{aligned} \text{②} \quad &\begin{array}{ll} \text{All get Mini-Bus} & (\text{bi}) \\ \text{Three or more don't get Coach} & (\text{aii}) \end{array} \\ &= 0.68402 \times 0.7740 = 0.52943 \end{aligned}$$

$$\therefore \text{Probability} = 0.2897 + 0.52943 = 0.819$$