Stats 1 – January 2008

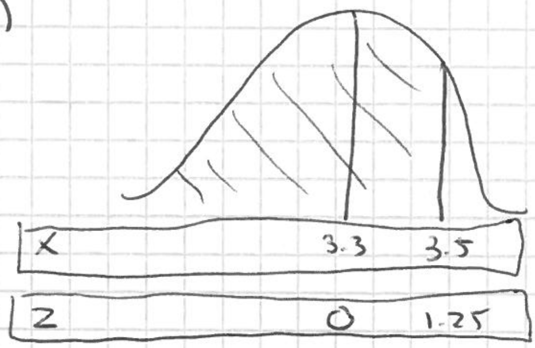
① a) $X \sim N(3.3,\ 0.16^2)$

i) $P(X < 3.5)$

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

$= P(Z < 1.25)$

$= 0.89435$



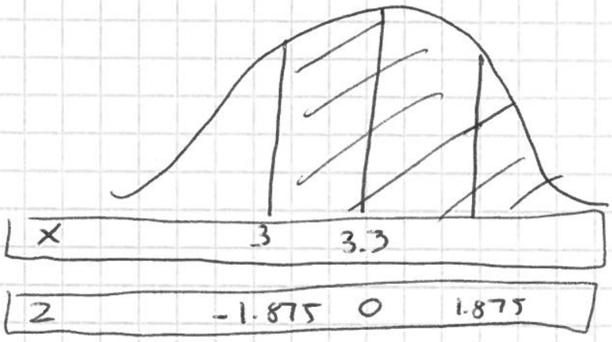
ii) $P(X > 3)$

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

$= P(Z > -1.875)$

$= P(Z < 1.875)$

$= 0.96995$ [look up 1.88]



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

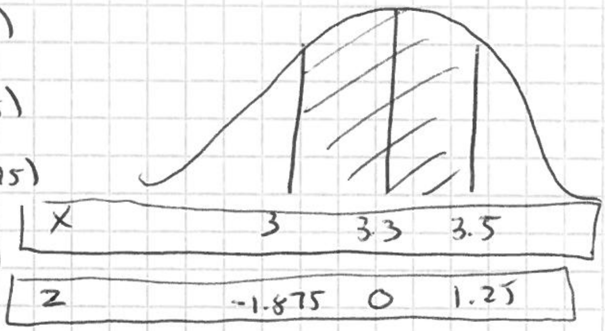
$= P(-1.875 < Z < 1.25)$

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

$= 0.89435 - [1 - 0.96995]$

$= 0.89435 - 0.03005$

$= 0.8643$



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

Look up Z value for 0.975

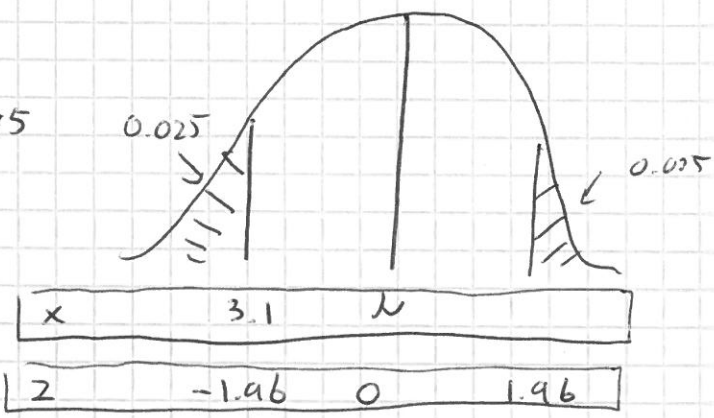
$= 1.96$

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

$3.1 - \mu = -0.3136$

$\mu = 3.1 + 0.3136$

$= 3.4136$



(2) a) $r = \dfrac{S_{xy}}{\sqrt{S_{xx} \times S_{yy}}} = \dfrac{416.3}{\sqrt{1280.55 \times 281.8}} = 0.6$

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: $\sum x = 39.24$

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

z value for 98% (2 tail) = 2.3263

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

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

$= 3.27 \pm 0.13430...$

$= (3.136, 3.404)$

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: $a = 3.94449...$ (intercept)

$b = 1.19065...$ (gradient)

$\rightarrow y = 3.95 + 1.19x$

c)

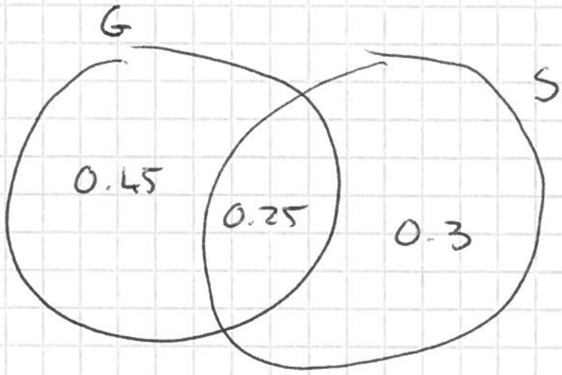
d) i) $x = 15$

$\rightarrow y = 3.95 + 1.19(15)$

$= 21.8$ 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) $P(A, H) = 0.7 \times 0.6 = 0.42$

$P(A', H) = 0.3 \times 0.1 = 0.03$ } +

$\underline{\underline{0.45}}$

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

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

(6) a) i) Median $= \dfrac{380+1}{2} = 190.5$th $= 2$ goals

LQ $= \dfrac{380+1}{4} = 95.25$th $= 1$

UQ $= \dfrac{3(380+1)}{4} = 285.75$th $= 4$

$\therefore$ IQR $= 4 - 1 = 3$ goals

ii) From calculator: $\Sigma x = 974$, $\Sigma x^2 = 3546$

$\bar{x} = 2.56315\ldots$

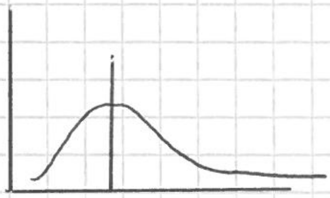
$s = 1.66405\ldots$

b) i) $\boxed{\text{Average}}$ roughly similar amount of goals sco[red]

$\boxed{\text{SPREAD}}$ 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) $C \sim B(50, 0.08)$

i) $P(C \geq 2) = 1 - P(C \leq 1)$

$= 1 - 0.0827 = 0.9173$ (from tables)

ii) $P(C \geq 3) = 1 - P(C \leq 2)$

$= 1 - 0.2260 = 0.7740$

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

i) $P(\text{All turn up}) = (1 - 0.025)^{15}$

$= 0.68402\ldots$

ii) $P(M \geq 1) = 1 - P(M = 0)$

$= 1 - 0.68402.. = 0.31597$

c) Enough seats if:

1 One or more doesn't get Mini-Bus (b ii)
& Two or more don't get Coach (a i)

$= 0.917 \times 0.316 = 0.2897\ldots$

2 All get Mini-Bus (b i)
& Three or more don't get coach (a ii)

$= \cancel{0.7740}\ 0.68402 \times 0.7740 = 0.52943$

$\therefore$ Probability $= 0.2897 + 0.52943 = 0.819$