

Stats paper Jan '08

1) i) ABCDEF - how many arrangements?

a) $5! = 120$

ii) b) in how many arrangements are A & B next to each other?

treat AB as one so (AB)CDE

$= 4! \times 2! = 48$

ii) find probability that A & B are selected from the letters

$P(A) \times P(B|A)$ or $P(B) \times P(A|B)$

$\frac{1}{5} \times \frac{1}{4} + \frac{1}{5} \times \frac{1}{4} = \frac{2}{20} = \frac{1}{10}$

2) i) $\frac{1}{5} \times \frac{1}{5}$

i) $P(T=4) = \frac{4^3}{5} \times \frac{1}{5} = 0.1024$

ii) $P(T > 4) = \frac{4^4}{5} = 0.4096$

iii) $E(T) = \frac{1}{1/5} = 5$

3) $n=5$ $\sum x=24$ $\sum x^2=130$ $\sum y=39$ $\sum y^2=361$
 $\sum xy=212$

i) $S_{xx} = 130 - \frac{24^2}{5} = 14.8$

$S_{yy} = 361 - \frac{39^2}{5} = 56.8$

$S_{xy} = 212 - \frac{24 \times 39}{5} = 24.8$

$r = \frac{24.8}{\sqrt{14.8 \times 56.8}} = 0.855$ to 3 sig fig

(ONLY TWO MARKS?)

ii) $r_s = 0.7$

C - changing the data to ranks will

effect the final correlation so

therefore you cannot tell. Some

data would be lost by converting

to ranks see p168.

iii) The values would stay the same as PMS doesn't have any scale

4) 40% eggzot 12% are brown eggz from eggzot

i) prob the egg is brown given it's from eggzot

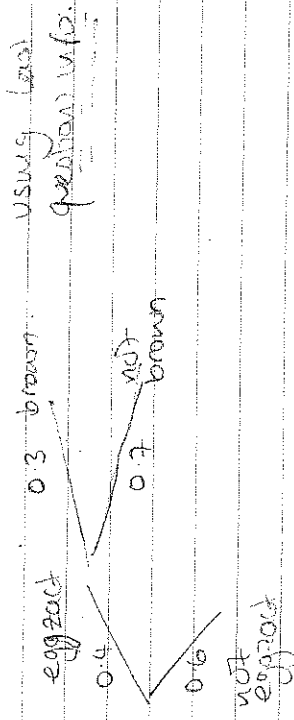
$P(A \cap B) = P(A) \times P(B|A)$

$P(A \cap B) = 0.12$

$P(A) = 0.4$

$\frac{0.12}{0.4} = 0.3$

ii) prob that egg from eggcart but is not brown



$$0.4 \times 0.7 = \underline{0.28}$$

5) 20% support residents party
12 people picked at random
out of the 12 the number that support residents party is Y

a) $P(Y \leq 5)$

$$Y \sim \text{Bin}(12, 0.2)$$

using the tables = 0.9806

$$\begin{aligned} \text{b) } P(Y \geq 3) &= 1 - P(Y \leq 2) \\ &= 1 - 0.5583 \\ &= \underline{0.4417} \end{aligned}$$

ii) 30% support the commerce party
15 people are picked at random. Those who support party are denoted by Y

5bii) cont $X \sim \text{Bin}(15, 0.3)$

$$\begin{aligned} P(Y=4) &= \binom{15}{4} \times 0.3^4 \times 0.7^{11} \\ &= 1365 \times 0.0081 \times 0.0198 \\ &= \underline{0.22} \end{aligned}$$

6) Y | 1 2 3
 $P(Y=y)$ | 0.2 0.3 0.5

i) $E(Y)$ & $\text{Var}(Y)$

$$Y.P = 0.2 | 0.6 | 1.5 \quad \text{total} = \underline{2.3} = E(Y)$$

$$\begin{aligned} Y^2.P &= 1 \quad 4 \quad 9 \\ Y.P &= 0.2 \quad 1.2 \quad 4.5 \quad \text{total} = \underline{5.9} \end{aligned}$$

$$5.9 - 2.3^2 = \underline{0.61} = \text{Var}(Y)$$

ii) Z | 1 2 3
 $P(Z=z)$ | 0.1 0.25 0.65

$$\begin{aligned} Y+Z &= 3? \quad Y(1) \times Z(2) \text{ or } Y(2) \times Z(1) \\ &0.2 \times 0.25 + 0.1 \times 0.3 \\ &= \underline{0.08} \end{aligned}$$

iii) $Y \times Z$ is even

3	0	0	0	$1 - (0.2 \times 0.1 + 0.2 \times 0.65 + 0.5 \times 0.1)$
2	0	0	0	$+ 0.5 \times 0.65$
1	0	0	0	$= 1 - 0.525$
X	1	2	3	$= \underline{0.475}$

⇒ i) andrew plays 10 matches. In each match he wins or loses.

a) each match is independent of any other the prob. of winning plays constant.

b) $X \sim \text{Bin}(10, p)$

ii) $X \sim \text{Bin}(21, p)$

given $P(X=10) = P(X=9)$ find p .

$$\binom{21}{10} p^{10} q^1 = \binom{21}{9} p^9 q^{12}$$

$$3527169q = 293930$$

$$\frac{pq}{1-p} = \frac{0.83}{0.83} = \frac{5}{6}$$

$$p = \frac{5}{6} - \frac{5}{6}p$$

$$6p = 5 - 5p$$

$$11p = 5$$

$$p = \frac{5}{11}$$

8) i) find median & interquartile range from box plot

Number of bits of data is even 22 bits

medians between 11th 12th = 26.5 = median

lower quartile = 12

upper quartile = 39

interquartile range = 27

ii) smaller spread - males ^{younger} ~~but~~ on average - but females less spread out

iii) the median is less affected by a large spread than the mean

iv) $n=49$ $\sum(x-200) = 245$ $\sum(x-200)^2 = 9849$

$$\text{mean} = \frac{\sum(x-200)}{49} + 200$$

$$= \frac{245}{49} + 200 = \underline{\underline{205}}$$

$$s.d = \frac{\sum(x-200)^2}{n} - \left(\frac{\sum(x-200)}{49} \right)^2$$

$$= \frac{9849}{49} - \left(\frac{245}{49} \right)^2 = \underline{\underline{176}}$$