

# Stats 1. June 05.

i.	A	B	d.	$d^2$
1	4	3	9	
2	1	1	1	
3	3	0	0	
4	2	2	4	
5	5	0	0	
			$\Sigma$ 14	

$$\begin{aligned}
 R_s &= 1 - \frac{6 \sum d^2}{n(n^2-1)} = 1 - \frac{6 \times 14}{5(24)} \\
 &= 1 - \frac{84}{120} \\
 &= 3/10 = \underline{\underline{0.3}}.
 \end{aligned}$$

ii  $R_s = -1 \Rightarrow$  perfect negative correlation

ie	B	C
	4	2
	1	5
	3	3
	2	4
	5	1

2.  $P(\alpha \text{ particle}) = 0.14 \quad T \sim \text{Geo}(0.14)$ .

i a  $P(T=5) = (1-0.14)^4 \times 0.14$   
 $= 0.07658$ .

b.  $P(T < 8) \Rightarrow$  haven't had ffffff  
 $= (1-0.14)^7$   
 $= 0.34792$ .  
 not  $= 1 - 0.34792$   
 $= 0.652$

ii  $E(T) = 1/0.14 = 7\frac{1}{7}$  or  $7.142557$

3.  $X =$  no of people who buy.

i  $X \sim B(16, 0.35)$

a  $P(X \geq 8) = 1 - P(X \leq 7)$  from tables.  
 $= 1 - 0.8406 = 0.159$ .

b  $P(4 \leq X \leq 9) = P(X \leq 9) - P(X \leq 3)$   
 $= 0.9771 - 0.1339$   
 $= 0.843$ .

ii  $X \sim B(16, 0.38)$ .

$$P(X=6) = {}^{16}C_6 \times 0.38^6 \times (1-0.38)^{10} \\ = 0.202.$$

4. i	x	y	$x^2$	$y^2$	$xy$
	52.5	58.2			
	44.4	58.7			
	55.8	53.3			
	60	47.8			
	52.3	56.6			
	$\sum x = 265$	$\sum y = 274.6$	$\sum x^2 = 14176.54$	$\sum y^2 = 15162.22$	$\sum xy = 14464.10$

$$S_{xx} = \sum x^2 - \frac{(\sum x)^2}{n} = 131.54$$

$$S_{yy} = \sum y^2 - \frac{(\sum y)^2}{n} = 81.188$$

$$S_{xy} = \sum xy - \frac{(\sum x)(\sum y)}{n} = -89.7$$

$$r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = -0.868$$

ii No difference - Each value would have been moved by same ratio

iii Predict y based on x so y on x line.  
 $y = a + bx$        $b = \frac{S_{xy}}{S_{xx}}$        $a = \bar{y} - b\bar{x}$

$$\bar{y} = 274.6 \div 5 = 54.92$$

$$\bar{x} = 265 \div 5 = 53$$

$$b = \frac{-89.7}{131.54} = -0.682$$

$$a = 54.92 - (-0.682 \times 53) = 91.06$$

$$y = 91.06 + 0.682 x$$

$$x = 60.4 \quad y = \underline{91.87}$$

$$\begin{array}{rclcl}
 5. \quad LQ & -300 & \rightarrow & 45 \\
 M & -600 & \rightarrow & \\
 UQ & -900 & \rightarrow & 69.
 \end{array}$$

$$IQR = 69 - 45 = \underline{24}$$

ii 40% of candidates scored more than  $x$ .

$$\text{ie top 40\% ie } 1200 - 480 = 720.$$

64 marks.

iii more than 68 marks. 860 candidates

$$\text{ie } 1200 - 860 = 340.$$

Choose 5 prob of more than 68 =  $\frac{340}{1200} = \frac{17}{60}$ .

$$\text{iv } \left(\frac{17}{60}\right)^5 = 0.00183.$$

v Line should be straight. ie LQ becomes 42  
 $IQR = 69 - 42 = 27$  ie higher.

$$6. \text{ i } a = 4/5 \quad b = 1/5 \quad c = 1/4 \quad d = 3/4 \quad e = 3/4 \quad f = 1/4$$

$$\begin{aligned}
 \text{ii } P(R=2) &= R R G = \frac{1}{2} \times \frac{4}{5} \times \frac{1}{2} = \frac{1}{5} \\
 &R G R = \frac{1}{2} \times \frac{1}{5} \times \frac{1}{4} = \frac{1}{40} \\
 \text{or } G R R &= \frac{1}{2} \times \frac{3}{5} \times \frac{3}{4} = \frac{9}{40}.
 \end{aligned}$$

$$\text{iii } 1 - \left(\frac{1}{10} + \frac{9}{20} + \frac{1}{5}\right) = \frac{1}{4} = k.$$

$$\begin{aligned}
 \text{iv } \text{Mean} = \mu &= \sum x_i p_i \Rightarrow 0 \times \frac{1}{10} \\
 &+ 1 \times \frac{1}{4} \\
 &+ 2 \times \frac{9}{20} \\
 &+ 3 \times \frac{1}{5} = 1\frac{3}{4}.
 \end{aligned}$$

$$\begin{aligned}
 \text{Variance} &= \sum x_i^2 p_i - \mu^2 \Rightarrow 0^2 \times \frac{1}{10} \\
 &+ 1^2 \times \frac{1}{4} \\
 &+ 2^2 \times \frac{9}{20} \\
 &+ 3^2 \times \frac{1}{5} = 3\frac{7}{20} - \mu^2 \\
 &= \frac{63}{80}.
 \end{aligned}$$

$$7. \quad i \quad 18C7 = 31824$$

$$18 \Rightarrow 5G \quad 6H \quad 7W.$$

$$ii \quad \begin{array}{ccc} 5C2 & \times & 6C2 & \times & 7C3 & = & \frac{5250}{31824} & = & \frac{875}{5304} \end{array}$$

$\downarrow \quad \quad \quad \downarrow \quad \quad \quad \downarrow$   
 $2G \quad \quad \quad 2H \quad \quad \quad 3W$

$$iii \quad \begin{array}{ccc} 7C5 & \times & 11C2 & = & \frac{1155}{31824} & = & \frac{385}{10608} \end{array}$$

$\downarrow \quad \quad \quad \downarrow$   
 $5W \quad \quad \quad 2(G \text{ or } H).$

$$iv. \quad \begin{array}{llll} 2G & 2H & 3W & = 5C2 \times 6C2 \times 7C3 = 5250 \\ \text{or } 2G & 3H & 2W & = 5C2 \times 6C3 \times 7C2 = 4200 \\ \text{or } 3G & 2H & 2W & = 5C3 \times 6C2 \times 7C2 = 3150 \end{array}$$

$$= \frac{12600}{31824} = \frac{175}{442}.$$