FINAL TERM

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Section: "B"

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Subject: Probability & Statistics

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01 7855 Question # 01

Q#01 Compute and analyse the results of the least squares regression equation and co-efficient of correlation of Y on X for following data. compare your manual results with the outcome of SPSS?

Item	53	62	57	71	78	55	86	87	96	91	94	94
Cmips per min	20	32	45	60	80	100	120	140	160	180	200	210

Solution:

X	Y	XY	X^2
53	20	1060	2809
62	32	1984	3844
57	45	2565	3249
71	60	4260	5041
78	80	6240	6084
55	100	5500	3025
86	120	10320	7396
87	140	12180	7569
96	160	15360	9216
91	180	16380	8281
94	200	18800	8836
94	210	11280	8836
Σ924	Σ1347	Σ105929	Σ74186

02 7855 Question # 01

$$y = a + bx \quad \text{—— (i)}$$

$$a = \bar{y} - b\bar{x} \quad \text{—— (ii)}$$

So

$$\bar{y} = \frac{\Sigma y}{n} = \frac{1347}{12} = 112.25 \quad \text{—— (iii)}$$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{924}{12} = 77 \longrightarrow \text{(iv)}$$

where

$$b = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{12[105929] - [624628]}{12[74186] - [853776]}$$

$$\boxed{b = 0.775} \quad \text{—— (v)}$$

Putting eqn (iii), (iv) & (v) in eqn (ii)

03 7855 Question #01

$$a = \bar{y} - b\bar{x}$$

$$a = 112.25 - (0.775)\,77$$

$$\boxed{a = 52.57}$$

Hence the desired estimated regression line Y on x is

$$\hat{Y} = 52.57 + 0.775x$$

The estimated regression co-efficient $b = 0.775$, which indicates that the values of Y increases by 0.775 units for a unit increase in x

04 7855 Question # 02

Part(A) Q#02 A box contain 4 red, 4 white and 5 green balls. Three balls are drawn from the box together. Find the Probability that they may be (i) all of different colours (ii) All of the same colours.

Solution:

$$n(S) = \binom{13}{3} = 286$$

$$\begin{bmatrix} 4 - R \\ 4 - W \\ 4 - G \\ \hline 13 - \text{balls} \end{bmatrix}$$

Let A = Denote all balls are of different colours

$$n(A) = \binom{4}{1}\binom{4}{1}\binom{5}{1} = 4 \times 4 \times 5 = 80$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{80}{286} = 0.28$$

$2 \times 2 \times 2 = 8$	$3 \times 2 \times 2 = 12$	$3 \times 3 \times 2 = 18$
even x even x even = even	odd x even x even = even	odd x odd x even = even

05 7855 Question # 02

Interpretation: There are 28% chances that all the balls are of different colours.

(ii) Let B = Denote all balls of same colours

Red white Green

$$n(B) = \binom{4}{3} \text{ or } \binom{4}{3} \text{ or } \binom{5}{3}$$

$$= \binom{4}{3} + \binom{4}{3} + \binom{5}{3} = 4 + 4 + 10 = 18$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{18}{286} = 0.063$$

Interpretation: There are 6.3% chances that all balls of same colours.

06 7855 Question #02

Part(B) Q#02 Of 12 eggs in refrigerator, 2 are bad. From these 4 eggs are choosen at random to make a cake. What are the probabilities that (i) exactly one is bad? (ii) At least one is bad.

Solution:

$$n(S) = \binom{12}{4} = 495$$

2 – B
10 – G
12 Eggs

Let A = denote the event that exactly one egg is bad

$$n(A) = \binom{2}{1}\binom{10}{3} = 2 \times 120 = 240$$

$$P(A) = \frac{n(A)}{n(S)} = \frac{240}{495} = 0.48$$

Interpretation: There are 48% chances that exactly one egg is bad.

07 Question # 02 7855

(ii) Let B = be the event that at least one bad egg is selected.

$$n(B) = \binom{2}{1}\binom{10}{3} + \binom{2}{2}\binom{10}{2}$$

$$= 2 \times 120 + 1 \times 45 = 240 + 45 = 285$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{285}{495} = 0.58$$

Interpretation: There are 58% chances that at least one egg is bad.

08 7855 Question # 03

Q#3 Following are the score made by batsman A, B. and C

A	12	15	6	73	7	55	199	36	84	29	
B	47	12	76	48	4	55	37	48	13	3	
C	15	23	52	4	24	55	74	52	13	4	

(a) Find the range of batsman A, B & C?

(b) who is more constant player?

(c) compare A with B, B with C and A with C?

Solution:

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
55	55	55
199	37	74
36	48	52
84	13	13
29	3	4

091 7855 Question #03

Range = $x_m - x_0$

Range of A = $x_m - x_0$

= 199 - 6

= 193

Range of B = $x_m - x_0$

= 55 - 3

= 52

Rang of C = $x_m - x_0$

= 55 - 4

= 51

P.T.O

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Batsman A		Batsman B		Batsman C	
x	x^2	y	y^2	z	z^2
12	144	47	2209	15	225
15	225	12	144	23	529
6	36	76	5776	52	2704
73	5329	48	2304	4	16
7	49	4	16	24	576
55	3025	55	3025	55	3025
199	39601	37	1369	74	5476
86	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 516$	$\Sigma x^2 = 57601$	$\Sigma y = 347$	$\Sigma y^2 = 17325$	$\Sigma z = 316$	$\Sigma z = 15440$

11 7855 Question # 03

Batsman A=

$$\bar{x} = \frac{\Sigma x}{n} \qquad \therefore n = 10$$

$$= \frac{516}{10} = 51.6$$

$$S_x = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

$$= \sqrt{\frac{57601}{10} - \left(\frac{516}{10}\right)^2}$$

$$S_x = \sqrt{3097.54}$$

$$= 55.65$$

$$C.V = \frac{S}{\bar{x}}$$

$$= \frac{55.65}{51.6} \times 100$$

C.V = 107.8

12 7855 Question #03

Batsman B

$$\bar{y} = \frac{\Sigma y}{n} = \frac{347}{10} = 34.7$$

$$s_y = \sqrt{\frac{\Sigma y^2}{n} - \left(\frac{\Sigma y}{n}\right)^2}$$

$$s_y = \sqrt{\frac{17325}{10} - \left(\frac{347}{10}\right)^2}$$

$$= \sqrt{1732.5 - 1204.09}$$

$$= \sqrt{528.41}$$

$$= 22.98$$

$$C.V = \frac{22.98}{34.7} \times 100$$

$$\boxed{C.V = 66.22}$$

13 7855 Question # 03

Batsman C

$$\bar{z} = \frac{\Sigma z}{n} = \frac{316}{10} = 31.6$$

$$S_z = \sqrt{\frac{\Sigma z^2}{n} - \left(\frac{\Sigma z}{n}\right)^2}$$

$$= \sqrt{\frac{15440}{10} - \left(\frac{316}{10}\right)^2}$$

$$= \sqrt{545.44}$$

$S_z = 23.35$

$C.V = \frac{S_z}{\bar{z}}$

$= \frac{23.35}{31.6} \times 100$

$= 73.89$

Batsman B is more constant as it value of co-efficient of variance is smallest.

Compare A with B

B is constant

Compare B with A

B is more constant

Compare A with C

C is more constant