

NAME INAM UL HASSAN

ID 7693

PROBABILITY FINAL TERM PAPER

Q. NO :- 1

Solution:-

The Estimated regression Line of Y on X is.

$$\hat{Y} = a + bx$$

and the two normal equations are :-

$$\sum Y = na + b\sum x$$

$$\sum XY = a\sum x + b\sum x^2$$

To compare the necessary summation we arrange the computation in the table below,

X	Y	XY	X <sup>2</sup>
53	20	1060	2809
62	32	1984	3844
57	45	2565	3249
71	60	4260	5041
78	80	6240	6084
46	100	4600	2116
86	120	10320	7396

87	140	12180	7569
96	160	15360	9216
91	180	16380	8281
94	200	18800	8836
94	210	11280	8836
$\Sigma X = 915$	$\Sigma Y = 1347$	$\Sigma XY = 113489$	$\Sigma X^2 = 73277$

$$\bar{X} = \frac{\Sigma X}{n} = \frac{915}{12} = 76.25$$

$$\bar{Y} = \frac{\Sigma Y}{n} = \frac{1347}{12} = 112.25$$

$$b = \frac{n \Sigma XY - (\Sigma X)(\Sigma Y)}{n \Sigma X^2 - (\Sigma X)^2}$$

$$b = \frac{12(113489) - (915)(1347)}{12(73277) - (915)^2}$$

$$b = 0.172$$

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

$$a = 112.25 - (0.172)(76.25)$$

$$a = 99.135$$

Hence the desired estimated regression line of  $Y$  on  $x$  is

$$\hat{Y} = 99.135 + 0.172x$$

The estimated regression co-efficient  $b = 0.172$ , which indicates that the value of  $Y$  increases by 0.172 units for a unit increase in  $x$ .

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co-efficient Correlation  $Y$  on  $x$ :-

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{n \sum x^2 - (\sum x)^2} \sqrt{n \sum y^2 - (\sum y)^2}}$$

$$r = \frac{12(113489) - (915)(1347)}{\sqrt{12(73277) - (915)^2} \sqrt{12(1814409) - (1814409)}}$$

Q. NO:-2

Part:- a.

Solution:-

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

Let, A = Denote all balls are of different colours.

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

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

$$2 \times 2 \times 2 = 8$$

$$3 \times 2 \times 2 = 12$$

$$3 \times 3 \times 2 = 18$$

Interpretation:-

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

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.

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Part:- b.

Solution:-

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

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.

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 bad egg is selected.

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Q. NO :- 3

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Solution :-

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	46
46	46	46 (ID)
199	37	74
36	48	52
84	13	13
29	3	4

$$\text{Rang} = X_m - X_0$$

$$\text{Rang for A} = 199 - 6 = 193$$

$$\text{Rang for B} = 46 - 3 = 43$$



Range for C =  $46 - 4 = 42$

Batsman A		Batsman B		Batsman C	
X	X <sup>2</sup>	Y	Y <sup>2</sup>	Z	Z <sup>2</sup>
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
46	2116	46	2116	46	2116
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma X = 507$	$\Sigma X^2 = 56693$	$\Sigma Y = 334$	$\Sigma Y^2 = 16416$	$\Sigma Z = 307$	$\Sigma Z^2 = 14531$

Batsman A =  $\bar{X} = \frac{\Sigma X}{n}$   
 $= \frac{507}{10} = 50.7$

$$\begin{aligned} \text{Batsman B} = \bar{Y} &= \frac{\sum Y}{n} \\ &= \frac{334}{10} = 33.4 \end{aligned}$$

$$\begin{aligned} \text{Batsman C} = \bar{Z} &= \frac{\sum Z}{n} \\ &= \frac{307}{10} = 30.7 \end{aligned}$$

For Batsman A:-

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

$$S_x = \sqrt{\frac{56693}{10} - \left(\frac{507}{10}\right)^2}$$

$$S_x = 55.7$$

$$C.V = \frac{55.7}{\bar{X}} \times 100$$

$$C.V = \frac{55.7}{50.7} \times 100 = 10.97$$

For Batsman B :-

$$S_y = \sqrt{\frac{\sum Y^2}{n} - \left(\frac{\sum Y}{n}\right)^2}$$

$$S_y = \sqrt{\frac{16416}{10} - \left(\frac{334}{10}\right)^2}$$

$$S_y = 22.935$$

$$C.V = \frac{22.935}{\bar{Y}} \times 100$$

$$C.V = \frac{22.935}{33.4} \times 100 = 6.866$$

For Batsman C :-

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

$$S_z = \sqrt{\frac{14531}{10} - \left(\frac{307}{10}\right)^2} = 22.596$$

$$C.V = \frac{22.596}{307} \times 100$$

$$C.V = 7.360$$

Batsman B is more co-efficient as its value of co-efficient of variance is smaller.

compare A with B

B is constant.

compare B with A

B is more constant

compare A with C

C is more constant.

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