Name	Sajid Saleem
ID #	7793
Section	A
Submitted to	Sir Anwar
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Ans 1

Estimated Regression

Y on X

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

$$\bar{x} = \frac{\Sigma x}{n}$$

$$\bar{y} = \frac{\Sigma y}{n}$$

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

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

$$\Sigma y = na + b\Sigma x$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

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

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

x	y	xy	x^2	y^2
53	20	1060	2809	400
62	32	1984	3844	1024
57	45	2565	3249	2025
71	60	4260	5041	3600
78	80	6240	6084	6400
93	100	9300	8649	10000
86	120	10320	7396	14400
87	140	12180	7569	19600
96	160	15360	9216	25600
91	180	16380	8281	32400
94	200	18800	8836	40000
94	210	19740	8836	44100
962	1067	118189	79810	$\Sigma y^2 = 199549$

B

Now $\bar{x} = \frac{\Sigma x}{n}$

$\bar{x} = \frac{962}{12}$

$\bar{x} = 80.16$

Now $\bar{y} = \frac{\Sigma y}{n}$

$\bar{y} = \frac{1067}{12}$

$\bar{y} = 88.91$

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

$$b = \frac{12(118189) - (962)(1067)}{12(79810) - (962)^2}$$

$$b = \frac{1418268 - 1026454}{957720 - 925444}$$

$$b = \frac{391814}{32276}$$

$$\boxed{b = 12.13}$$

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

$$a = 88.91 - (12.13)(80.16)$$

$$a = 88.91 - 972.34$$

$$a = -883.43$$

Co-efficient of correlation

$$r = \frac{n\Sigma xy - \Sigma x \Sigma y}{\sqrt{n\Sigma x^2 - (\Sigma x)^2 \left(n\left(\Sigma y^2 - (\Sigma y)^2\right)\right.}}$$

$$r = \frac{12(118189) - (962)(1067)}{\sqrt{12(79810) - (962)^2 (12)(199549) - (1067)^2}}$$

$$\gamma = \frac{14118268 - 1023568}{\sqrt{957720 - 925444\,(2394588) - 13661868}}$$

$$\gamma = \frac{394700}{\sqrt{957720 - 2.216 \times 10^{12} - 13661868}}$$

$$\gamma = \frac{394700}{\sqrt{957720 - 13661868}}$$

$$\gamma = \frac{394700}{\sqrt{-12704148}}$$

$$\gamma = \frac{394700}{3564.28}$$

$$\boxed{\gamma = 110.73}$$

(a) A box Contain 4 red, 4 white & 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

Ans Solution

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

4	–	R
4	–	W
5	–	G
13	–	balls

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

Interpretation

There are 28% chances that all balls are of different Colours

P = 6

ii Let B = Denote all balls of Same Colour

Red White Green

$n(B) = \binom{4}{3}$ or $\binom{4}{3}$ 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 Colour.

$P = 5 + 2 = 7$

(2) Ans

There are 10 goods & 2 bad eggs in the refrigerator

S can occur in $\binom{12}{4} = 495$ ways, the numbers of ways in which 4 eggs can be choosen from 12 eggs

Let A donate the event that exactly one egg is bad & B donate the event that at least one egg bad Then

(i) A can occur $\binom{2}{1}\binom{10}{3} = 240$ ways

Hence $P(A) \quad \frac{240}{495} = \frac{16}{33}$

(ii) $P(B) = 1 - P(\text{no egg is bad}) =$

$1 - P(B)$, where B can occur in $\binom{10}{4} = 210$ ways

$$P(B) = 1 - \frac{210}{495} = \frac{285}{495} = \frac{19}{33}$$

(b) The Carton Contain 3 bad eggs & 9 good eggs S can occur in $\binom{12}{3}$ = 220 ways. the number of ways in which 3 eggs can be choosen from 12 eggs

(i) Let A donate the event that no bad egg (ie. all good eggs) is choosen from 12 eggs then $n(A) = \binom{9}{3} = 84$

$$P(A) = \frac{84}{220} = 0.38$$

(ii) At least one bad egg is the Complement of the event that no bad egg is choosen therefor

$$P(\text{at least one bad egg}) = 1 - P(\text{no of bad egg})$$

$$= 1 - 0.38 = 0.62$$

(iii) Let B be the event that exactly 2 bad eggs are choosen

Then $n(B) = \binom{3}{2}\binom{9}{1} = 27$

$$P(B) = \frac{27}{220} = 0.12$$

P = 9

Ans 3

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
ID last digit 93	93	93
199	37	74
36	48	52
84	13	13
29	3	4

Range = $X_m - X_0$

Range of A = 199 − 6 = 193

Range of B = 93 − 3 = 90

Range of C = 93 − 4 = 89

P = 10 .C

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
93	8649	93	8649	93	8649
199	39601	37	1369	74	5476
~~156~~	~~48~~	~~2304~~	~~52~~		
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma X =$	$\Sigma X^2 =$	ΣY	ΣY^2	$\Sigma Z =$	$\Sigma Z^2 =$
554	63226	385	22949	354	21064

2. p = 11

Batsman A

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

$$= \frac{554}{10} = 55.4$$

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

$$= \sqrt{\frac{63226}{10} - \left(\frac{554}{10}\right)^2}$$

$$S_{\bar{x}} = \sqrt{6322.6 - 3069.16}$$

$$S_{\bar{x}} = \sqrt{3253.4}$$

$$SX = 57.0389$$

$$C.V = \frac{57.03 \times 100}{\bar{x}} =$$

$$C.V = 1.029 \times 100$$

$$CV = 102.94$$

P = 12

Batsman B

$$\bar{Y} = \frac{\Sigma y}{n} = \frac{385}{10} = 38.5$$

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

$$S_y = \sqrt{\frac{22949}{10} - \left(\frac{385}{10}\right)^2}$$

$$S_y = \sqrt{2294.9 - 1482.25}$$

$$S_y = \sqrt{812.65}$$

$$S_y = 28.50$$

$$C.V = \frac{28.50}{38.5} \times 100$$

$$= 74.02\%$$

ε $p = 13$

Batsman C

$$\bar{z} = \frac{\Sigma z}{n} = \frac{354}{10} = 35.4$$

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

$$= \sqrt{\frac{21064}{10} - \left(\frac{354}{10}\right)^2}$$

$$= \sqrt{2106.4 - 1482.25}$$

$$= \sqrt{624.15}$$

$$=$$

$$S_z = 24.998$$

$$C.V = \frac{24.98}{35.4} \times 100 = 70.56$$

Batsman C is more consistant as it value of Co-efficient of Varience is smallest

Compare A with B

B is Consistant

Compare B with A

B is Consistant

Compare A with C

C is move Consistant.