Syed Jawwad

Probability and Statistics

Q # 1

Solution:-

(i) (A) least square Regression Equation.

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

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

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

	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
I.D	86	100	8600	7396	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
	$\Sigma x = 955$	$\Sigma y = 1347$	$\Sigma xy = 117489$	$\Sigma x^2 = 78557$	$\Sigma y^2 = 199549$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{955}{12} = 79.58 \qquad \therefore n = 12$$

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

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

$$b = \frac{12(117489) - (955)(1347)}{12(78557) - (955)^2}$$

$$b = \frac{1409868 - 128685}{942684 - 912025}$$

$$= \frac{123483}{3059}$$

$$b = 4.02$$

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

$$a = 112.25 - 4.02(79.58)$$

$$= 112.25 - 320.518$$

$$a = -208.268$$

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

$$\bar{Y} = -208.268 + 4.02$$

Regression line Equation

Co-Efficient Correlation Y on x :-

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

$$\gamma = \frac{12(11489) - (955)(1347)}{\sqrt{12(78557) - (955)^2}\, 12(199549) - (1347)^2}$$

$$\gamma = \frac{140988 - 1286385}{(942684 - 912025)(2394588 - 1814409)}$$

$$\gamma = \frac{123483}{(30659)(580179}$$

$$\gamma = \frac{123483}{1.778770796 \times 10^{10}}$$

$$\gamma = 6.942041111 \times 10^{-6}$$

Hence the estimated Regression coffient $b = 6.94 \times 10^{-6}$ which indicate that value of y increase by 6.94×10^{-6} units of increases in x

Q#2(a)

Solution

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

Let A = Denote all balls are of different Colors.

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

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

4-R
4-W
5-G
13-balls

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

Interpretation:-

There are 28% Chances that all the 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 are of Same colours.

Q # 2(b)

Solution :-

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

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

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

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

Interpretation :-

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

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

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

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

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

Interpretation :-

There are 58% Chances that at least one bad egg is selected.

Q #3

The following scores are made by three batsmen A, B and C in a series of innings.

A	B	C
12	47	15
15	12	23
6	76	52
73	48	4
7	4	24
86	86	86
199	37	74
36	48	52
84	13	13
29	3	4

Range of A. $x_m - x_0$
$= 199 - 6$
$= 193$

Range of B : $x_m - x_0$
$= 86 - 3$
$= 83$

Range of C : $x_m - x_0$
$= 86 - 4$
$= 82.$

Batsmen A		Batsmen B		Batsmen 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
86	7396	86	7396	86	7396
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 547$	$\Sigma x^2 = 61973$	$\Sigma y = 374$	$\Sigma y^2 = 21696$	$\Sigma z = 347$	$\Sigma z^2 = 19811$

Batsmen A

$$\bar{x} = \frac{\Sigma x}{n} \quad \because n = 10$$

$$= \frac{547}{10} = 54.7$$

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

$$= \sqrt{\frac{61973}{10} - \left(\frac{547}{10}\right)^2}$$

$$= 56.614$$

$$C.V = \frac{56.614 \times 100}{\bar{x}} = \frac{56.614}{54.7}$$

$$C.V = 1.03 \times 100$$

$$= 103.54$$

Batsman B

$$\bar{y} = \frac{\Sigma y}{n} = \frac{374}{10} = 37.4$$

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

$$= \sqrt{\frac{21696}{10} - \left(\frac{374}{10}\right)^2}$$

$$= 27.76$$

$$C.V = \frac{27.76}{37.4} \times 100$$

$$= 74.22\%$$

Batsmen C :-

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

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

$$= \sqrt{\frac{19811}{10} - \left(\frac{347}{10}\right)^2}$$

$$= 27.87$$

$$C.V = \frac{S_z}{\bar{z}} \times 100$$

$$= \frac{27.87}{34.9} \times 100$$

$$= 79.85$$

Between B is more consistent as its value of Co-efficient of variance is smallest.

Compare A with B
B is Consistant

Compare B with C
B is more Consistant

Compare A with C
C is more ~~Consistant~~ Consistant