Name :- Muhammad Imran

ID :- 7847

Sec :- B

subject :- Probability & Statistics

Teacher :- Engr. Shamim

Question No :- 01

compute and analyse the result of the least squares regression equation and coefficient of correlation of Y on X for the following date. compare your manual results with the outcome of SPSS ?

Solution

X	X	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
47	100	4700	2209	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	11280	8836	44100
Σ 916	Σ 1347	Σ 105129	Σ 73370	Σ 199549

$$y = a + bx \quad - (i)$$

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

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

$\bar{x} = \frac{\Sigma x}{n} = \frac{916}{12} = 76.33$ (iv)

where

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

$$b = \frac{12\,(105129) - (1233852)}{12\,(73370) - (839056)}$$

$$\boxed{b = 0.669} \quad - (v)$$

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

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

$$= 112.25 - 0.669\,(66.9)$$

$$\boxed{a = 45.35}$$

Hence the desired estimated regression line Y on x is

$$\hat{Y} = 45.35 + 0.669$$

The estimated regression co-efficient $b = 0.669$ which indicate that the value of y by 0.669 units for unit increase in x

Now co-efficient for co-relation:

As we know

$$r = \frac{\Sigma xy - (\Sigma x)(\Sigma Y)/n}{\sqrt{\left[(\Sigma x^2) - (\Sigma x)^2/n\right]\left[\Sigma Y^2 - (\Sigma Y)^2/n\right]}}$$

$$\gamma = \frac{(105129) - \frac{(916)(1347)}{12}}{\sqrt{(75005) - \left[\frac{(916)^2}{12}\right]\left[199549 - \frac{(1347)^2}{12}\right]}}$$

$$= \frac{2308}{(75005) - (69921.3)(199549 - 151200.75)}$$

$$= \frac{2308}{245787998.525}$$

$$\boxed{\gamma = 9.3 \times 10^{-6}}$$

Question No:- 02 (a)

A box contains 4 red, 4 white and 5 green balls. Tree 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.

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

Solution :-

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

Let A Denote all balls are of different colours.

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

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

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

Interpretation :-

There are 28% chance 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% chance that all balls of same colours.

Question No : 02 (b)

Of 12 eggs in a refrigerator. 2 are bed. From these 4 eggs are chosen at random to make a cake. what are the Probabilities, that
(i) exactly one is bed (ii) At least one is bad ?

2 -	B
10 -	G
12 -	Eggs

solution:

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

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

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

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

Interpretation :-

There are 48% chance 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% chance that at least one bad egg is selected.

Question No (03)

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

Solution :-

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

Range $= X_m - X_o$

Range of A $= X_m - X_o$

$= 199 - 6$

$= 193$

Range of B = $X_m - X_o$

= 76 - 3

= 73

Range of C = $X_m - X_o$

= 74 - 4

= 70

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
47	2209	47	2209	47	2209
199	36901	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 508$	$\Sigma x^2 = 54086$	$\Sigma Y = 335$	$\Sigma Y^2 = 16509$	$\Sigma Z = 308$	$\Sigma Z^2 = 14624$

Batsman A

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

$$\bar{x} = \frac{508}{10} = 50.8$$

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

$$= \sqrt{\frac{54086}{10} - \left(\frac{508}{10}\right)^2}$$

$$S_x = 53.17$$

$$C.V = \frac{53.17}{\bar{X}} \times 100 = \frac{53.17}{50.8} \times 100$$

$$= 1.046 \times 100$$

$$C.V = 104.6$$

Batsman B

$$Y = \frac{\Sigma Y}{n} = \frac{335}{10} = 33.5$$

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

$$= \sqrt{\frac{16509}{10} - \left(\frac{335}{10}\right)^2}$$

$$= \sqrt{528.65}$$

$$S_Y = 22.99$$

$$C.V = \frac{22.99}{33.5} \times 100$$

$$C.V = 68.62$$

Batsman C :-

$$\bar{Z} = \frac{\Sigma Z}{n} = \frac{308}{10} = 30.8$$

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

$$= \sqrt{\frac{14624}{10} - \left(\frac{308}{10}\right)^2}$$

$$= \sqrt{513.76}$$

$$S_Z = 22.66$$

$$C.V = \frac{SZ}{Z} \times 100$$

$$= \frac{22.66}{30.8} \times 100$$

$$C.V = 73.57$$

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

→ compare A with B

B is consistant.

→ compare B with A

B is more consistant.

→ compare A with C

C is more consistant.
