Q1) Compute and analysis of the result of the least square regression equation and co-efficient of correlation of Y on X for the following data. compare your manual results with the outcome of spss?

Temperature	53	62	57	71	78	45	86	87	96	91	94	94
chips per minute	20	32	45	60	80	100	120	140	160	180	200	210

sol:-

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

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

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

x	y	xy	x^2
53	20	1060	2809
62	32	1984	3844
57	45	2565	3249
71	60	4260	5041
78	86	6240	6084
45	100	4500	2025
86	120	10320	7396
87	140	12180	7569
96	160	15360	9216
91	180	16380	8281
94	200	18800	8836
94	210	19740	8836
Total	914	1347	113,389	65186

$$\bar{X} = \frac{\Sigma x}{n} = \frac{914}{12} = 76.16$$

$$\bar{Y} = \frac{\Sigma y}{n} = \frac{1347}{12} = 112.2$$

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

$$b = \frac{12(113\,389) - (914)(1347)}{12(65186) - (914)^2}$$

$b = -2.43$

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

$a = 112.2 - (-2.43)(76.16)$

$a = 112.2 + (2.43)(76.16)$

$a = 112.2 + 185.06$

$a = 297.26$

$\hat{Y} = a + bu$

$\hat{Y} = 297.26 + (-2.43)X$

$\hat{Y} = 297.26 - 2.43X$ Ans.

The coefficient is $b = 2.43$ which indicates the value of Y increases by 2.43 units for a unit increases in (X).

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Correlations

[DataSet0]

Correlations

		X	Y
X	Pearson Correlation	1	.822**
	Sig. (2-tailed)		.001
	N	12	12
Y	Pearson Correlation	.822**	1
	Sig. (2-tailed)	.001	
	N	12	12

** Correlation is significant at the 0.01 level (2-tailed).

	X	Y	var	var
1	53.0	20.0		
2	62.0	32.0		
3	57.0	45.0		
4	.71.0	60.0		
5	78.0	80.0		
6	45.0	100.0		
7	86.0	120.0		
8	87.0	140.0		
9	96.0	160.0		
10	91.0	180.0		
11	94.0	200.0		
12	94.0	210.0		

Q2 (a) A box contain 4 red, 4 white 5 green balls. Three balls are drawn from the box together. find probability that they may be.

(i) all of different colours.

(ii) all of the same colours.

Sol:-

i) All of different colours:-

As we know

$$n = 13 \quad , \quad r = 3$$

$$n(S) = \binom{13}{3} = \frac{13!}{3!\,(13-3)!}$$

$$= \frac{13 \times 12 \times 11 \times 10!}{3 \times 2 \times 1\ (10)!}$$

$$= \frac{13 \times 6 \times 11}{3}$$

$$n(S) = 286$$

We will use A to denote different colours

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

$$= \frac{4!}{1!(4-1)!} \times \frac{4!}{1!(4-1)!} \times \frac{5!}{1!(5-1)!}$$

$$= \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} \times \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1} \times \frac{5 \times 4 \times 3 \times 2 \times 1}{4 \times 3 \times 2 \times 1}$$

$$= 4 \times 4 \times 5$$

$n(A) = 80$ probability of getting A.

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

$P(A) = 0.279$ Ans.

(iii) All of Same colours:-

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

$$= \frac{4!}{3!(4-3)!} * \frac{4!}{3!(4-3)!} + \frac{5!}{3!(5-3)!}$$

$$= \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1 \times 1} + \frac{4 \times 3 \times 2 \times 1}{3 \times 2 \times 1 \times 1} + \frac{5 \times 4 \times 3 \times 2 \times 1}{3 \times 2 \times 1 \times 2 \times 1}$$

$$= 4 + 4 + (5 \times 2)$$

$$= 4 + 4 + 10$$

$n(B) = 18$

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

$P(B) = 0.062$ Ans.

Q2 (b)

of 12 eggs in refrigerator, 2 are bad, from These 4 eggs are chosen at random to make a cake. what are the probabilities that

(1) Exactly one is bad (2) Atleast one is bad.

(1) Exactly one is bad :-

As we know $n = 12$, $u = 4$

$$n(S) = \binom{12}{4} = \frac{12!}{4!\,(12-4)!}$$

$$= \frac{12 \times 11 \times 10 \times 9 \times 8!}{4 \times 3 \times 2 \times 1 \times 8!}$$

$$= 3 \times 11 \times 5 \times 3$$

$n(S) = 495$

we will use A to denote exactly one is bad.

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

$$= \frac{2!}{1!(2-1)!} \times \frac{10!}{3!(10-3)!}$$

$$= \frac{2 \times 1}{1} \times \frac{10 \times 9 \times 8 \times 7!}{3 \times 2 \times 1 \times 7!}$$

$$= 2 \times 10 \times 3 \times 4$$

$$= 2 \times 120$$

$$n(A) = 240$$

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

$$P(A) = 0.484 \text{ Ans.}$$

(ii) **At least one is bad:-**

Here B will denote at least one is bad.

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

$$= \frac{2!}{1!(2-1)!} \times \frac{10!}{3!(10-3)!} + \frac{2!}{1!(2-2)!} \times \frac{10!}{2!(10-2)!}$$

$$= \frac{2 \times 1}{1} \times \frac{10 \times 9 \times 8 \times 7!}{2 \times 1 \times 7!} + \frac{2 \times 1}{2 \times 1} \times \frac{10 \times 9 \times 8!}{2 \times 1 \times 8!}$$

$$= 2 \times (10 \times 3 \times 4) + 1 \times (5 \times 9)$$

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

$= 240 + 45$

$n(B) = 285$

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

$$= \frac{285}{495}$$

$P(B) = 0.58$ Answer

Q3) find the range of batsman A, B, C?

(ii) who is more consistent player?

(iii) 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
45	45	45
199	37	74
36	48	52
84	13	13
29	3	4

Range = $X_m - X_0$

Range of A = $X_m - X_0$

= 199 - 6

= 193

Range of B = $X_m - X_0$

= 45 - 3

= 42

Range of C = $X_m - X_0$

= 45 - 4

= 41

Batsman A

x	x^2
12	144
15	225
6	36
73	5329
7	49
45	2025
199	39601
36	1296
84	7056
29	841
$\Sigma x = 506$	$\Sigma x^2 = 56602$

Batsman B

y	y^2
47	2209
12	144
76	5776
48	2304
4	16
45	2025
37	1369
48	2304
13	169
3	9
$\Sigma y = 333$	$\Sigma y^2 = 71325$

Batsman C

z	z^2
15	225
23	529
52	2704
4	16
24	576
45	2025
74	5476
52	2704
13	169
4	16
$\Sigma z = 306$	$\Sigma z^2 = 14490$

*) Batsman A :-

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

$$= \frac{506}{10} \qquad = 50.6$$

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

$$= \sqrt{\frac{56602}{10} - \left(\frac{506}{10}\right)^2}$$

$$S_{\bar{x}} = 55.67$$

$$C.V = \frac{55.67}{\bar{x}} \times 100 = \frac{55.67}{50.6}$$

$$C.V = 1.10 \times 100$$

$$C.V = 110.01$$

*) Batsman B :-

$$\bar{y} = \frac{\Sigma y}{n} = \frac{333}{10} = 33.3$$

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

$$= \sqrt{\frac{71325}{10} - \left(\frac{333}{10}\right)^2}$$

$S_y = 77.6$

$$C.V = \frac{77.6 \times 100}{33.3}$$

$$= 2.33\%$$

*) Batsman C :-

$$\bar{z} = \frac{\Sigma z}{n} = \frac{306}{10} = 30.6$$

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

$$= \sqrt{\frac{14440}{10} - \left(\frac{306}{10}\right)^2}$$

$$= 22.53$$

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

$$= \frac{22.53}{30.6} \times 100$$

$$= 73.62$$

Batsman B is more consistent as it 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 consistent.