0505-1-1

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I.D :- 7690

Semester :- Summer 2020

Subject :- Probability & Statistics

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Date :- 23-9-2020

Deptt :- BE (Civil)

Question :- 01

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

Solution :-

(i) (A) least Squar 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	90	100	9000	8100	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
	$\Sigma x = 959$	$\Sigma y = 1347$	$\Sigma xy = 117889$	$\Sigma x^2 = 79261$	$\Sigma y^2 = 199549$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{959}{12} = 79.92$$

$\therefore n = 12$

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

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

$$b = \frac{12(117889) - (959)(1347)}{12(79261) - (959)^2}$$

$$b = \frac{1414668 - 1291773}{951132 - 919681}$$

$$b = \frac{122895}{3145}$$

$$\boxed{b = 3.90}$$

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

$$a = 112.25 - 3.90(79.92)$$

$$a = 112.25 - 31168.8$$

$$\boxed{a = -31056.65}$$

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

$$\bar{y} = -31056.65 + 3.90\,x$$

Regression line equation.

(B) Coeffict Correlation Y on X :-

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

$$r = \frac{12(117889) - (959)(1347)}{\sqrt{12(79261) - (959)^2}\sqrt{12(199549) - (1347)^2}}$$

$$r = \frac{1414668 - 1291773}{\sqrt{(951132 - 919681)(2394588 - 1814409)}}$$

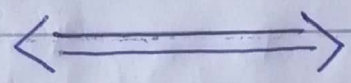
$$r = \frac{122895}{\sqrt{18247209729}}$$

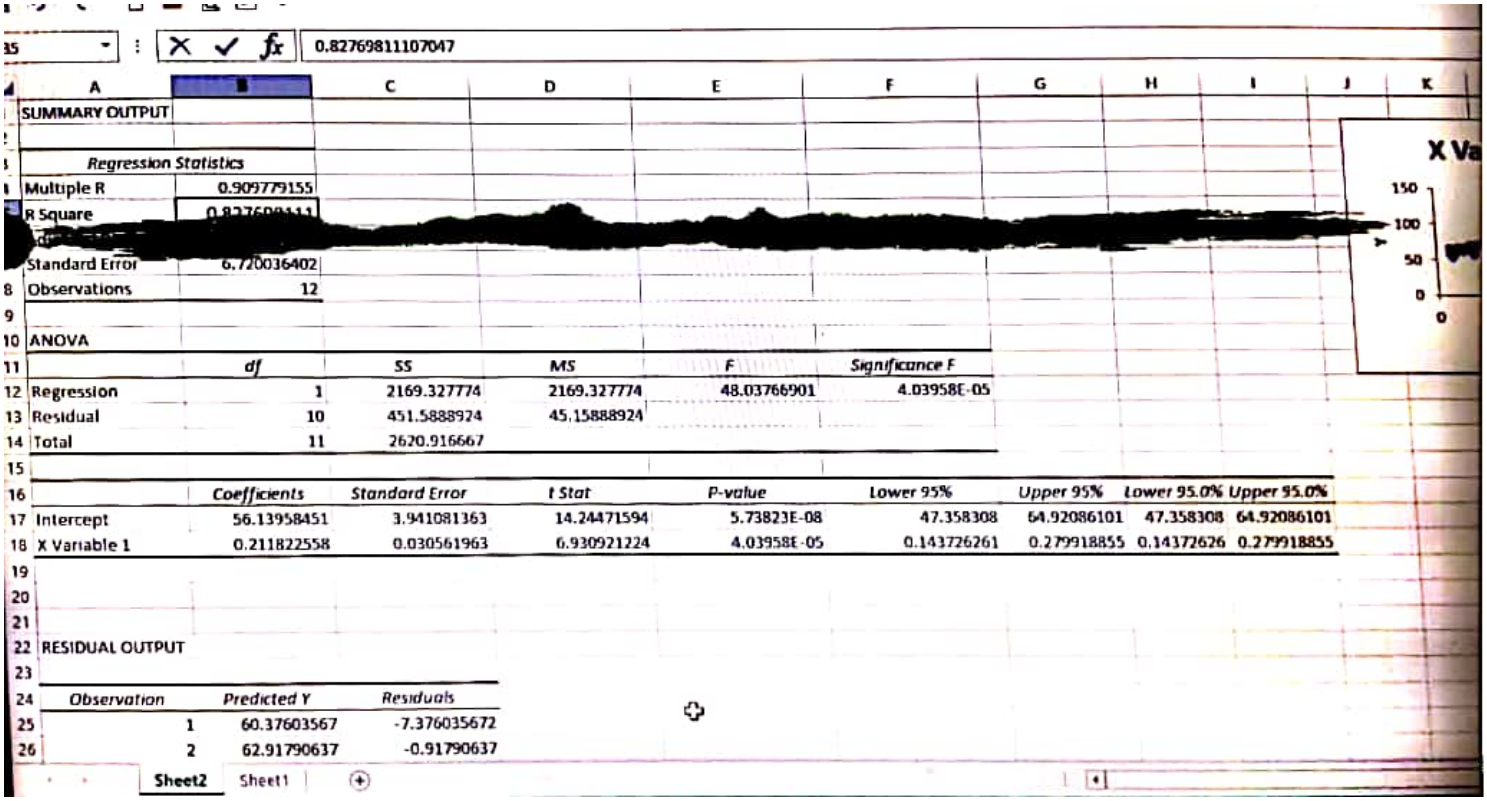
$$r = \frac{122895}{135082.23}$$

$r = 0.90$

* Hence the estimated regression coefficient $b = 3.90$ which indicate that the value of y increase by 3.90.

Units of increses in X





0.82769811107047

SUMMARY OUTPUT									
Regression Statistics									
Multiple R	0.909779155								
R Square	0.827698111								
Standard Error	6.720036402								
Observations	12								
ANOVA									
	df	*SS*	*MS*	*F*	*Significance F*				
Regression	1	2169.327774	2169.327774	48.03766901	4.03958E-05				
Residual	10	451.5888924	45.15888924						
Total	11	2620.916667							
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*	
Intercept	56.13958451	3.941081363	14.24471594	5.73823E-08	47.358308	64.92086101	47.358308	64.92086101	
X Variable 1	0.211822558	0.030561963	6.930921224	4.03958E-05	0.143726261	0.279918855	0.14372626	0.279918855	

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*
1	60.37603567	-7.376035672
2	62.91790637	-0.91790637

Sheet2 Sheet1

Question :- 02

(a) A box contains 4 red, 4 white and 5 green Three balls are drawn ----- colours.

Solution :-

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

Let A = Denote all balls are of different colour.

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

Red - 4
white - 4
Green - 5
balls - 13

$$n = (A) = 4 \times 4 \times 5$$

$$n = (A) = 80$$

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

$2 \times 2 \times 2 = 8$	$3 \times 2 \times 2 = 12$	$3 \times 3 \times 2 = 18$
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

(ii) Let B = Denote all balls of same colours.

$$n(B) = \underset{\text{Red}}{\binom{4}{3}} \text{ or } \underset{\text{white}}{\binom{4}{3}} \text{ or } \underset{\text{Green}}{\binom{5}{3}}$$

$$= \binom{4}{3} + \binom{4}{3} + \binom{5}{3} = 4+4+10$$

$$= 18$$

$$P(B) = \frac{n(B)}{n(S)} = \frac{18}{286} = 0.063$$

Interpretation :-

There are 6.3% chances that all balls of same colour's

(b) Off 12 eggs in a refrigerator, 2 are bad. Form these 4 eggs ------ bad?

Solution :-

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

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

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

2 - Bad
10 - Good
12 - Eggs

$= 240$

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

Interpretation :-

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

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

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

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

$$= 240 + 45$$

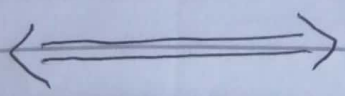
$$= 285$$

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

$$\boxed{P(B) = 0.58}$$

Interpretation :-

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



Question :- 03

Following are the ~~sum~~ score made by batsman A, B and C.

(i) Find range of A, B, and C

(ii) who is more consistant

(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
I-D	90	90	90
	199	37	74
	36	48	52
	84	13	13
	29	3	4

Range = $X_m - X_0$

Range of A = $X_m - X_0$

$A = 199 - 6$

$\boxed{A = 193}$

Range of B = $X_m - X_0$

$B = 90 - 3$

$B = 87$

Range of C = $X_m - X_0$

$C = 90 - 4$

$C = 86$

Batsman A		Batsman 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	54	2704
73	5329	48	2304	4	16
7	49	4	16	24	576
90	8100	90	8100	90	8100
199	39601	37	1369	74	5476
36	1296	48	2304	57	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma x = 551$	$\Sigma x^2 = 62677$	$\Sigma Y = 378$	$\Sigma Y^2 = 22400$	$\Sigma Z = 351$	$\Sigma Z^2 = 20515$

Batsman A :

$$\bar{X} = \frac{\Sigma x}{n} \qquad \therefore n = 16$$

$$\bar{X} = \frac{551}{10}$$

$$\boxed{\bar{X} = 55.1}$$

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

$$S_x = \sqrt{\frac{62677}{10} - \left(\frac{551}{10}\right)^2}$$

$$S_x = \sqrt{6267.7 - (55.1)^2}$$

$$S_x = \sqrt{6267.7 - 3036.01}$$

$$S_x = \sqrt{3231.69}$$

$$S_x = 56.84$$

~~$C.V = \frac{56.84}{\bar{x}} \times 100$~~

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

$$CV = \frac{56.84}{55.1} \times 100$$

$$\boxed{CV_x = 103.15}$$

Batsman B

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

$$\bar{Y} = \frac{378}{10}$$

$$\boxed{\bar{Y} = 37.8}$$

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

$$S_Y = \sqrt{\frac{22400}{10} - \left(\frac{378}{10}\right)^2}$$

$$S_Y = \sqrt{2240 - (37.8)^2}$$

$$S_y = \sqrt{2240 - 1428.84}$$

$$S_y \sqrt{811.16}$$

$$\boxed{S_y = 28.48}$$

$$CV = \frac{S_y}{\bar{y}} \times 100$$

$$CV = \frac{28.48}{37.8} \times 100$$

$$\boxed{CV_y = 75.34}$$

⇒ Bats-man C :-

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

$$\bar{z} = \frac{351}{10}$$

$$\boxed{\bar{z} = 35.1}$$

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

$$S_z = \sqrt{\frac{20515}{10} - \left(\frac{351}{10}\right)^2}$$

$$S_z = \sqrt{2051.5 - (35.1)^2}$$

$$S_z = \sqrt{2051.5 - 1232.01}$$

$$S_z = \sqrt{819.49}$$

$S_z = 28.62$

$$CV = \frac{S_z}{\bar{z}} \times 100$$

$$CV = \frac{28.62}{35.1} \times 100$$

$CV_z = 81.53$

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

⇒ Compare A with B
B is more consistant

⇒ Compare B with A
B is more consistant

⇒ Compare A with C
C is more consistant.