Day. M T W T F S

Date: __/__/__

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Subject probability and statistics

Instructor Anwar Shamim

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Q1 Compute and analyse the results of the least Squares regression equation and Coefficient of Correlation of Y and X for the following data. Compare your manual results with the outcomes of Spss?

Temp	53	62	57	71	78	1D	86	87	96	91	94	94
Chirps per min	20	32	45	60	80	100	120	140	160	180	200	210

Solution least Square regression equation

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

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

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

	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
1D	25	100	2500	625	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

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$\Sigma x = 894, \Sigma y = 1347, \Sigma xy = 111389, \Sigma x^2 = 71786, \Sigma y^2 = 199549$

$$\bar{x} = \frac{\Sigma x}{n} = \frac{894}{12} = 74.5$$

$\therefore n = 12$

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

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

$$b = \frac{12(111389) - (894)(1347)}{12(71786) - (894)^2}$$

$$b = \frac{132450}{62196}$$

$$\boxed{b = 2.12}$$

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

$$a = 112.25 - 2.12(74.5)$$

$$a = 112.25 - 157.94$$

$$\boxed{a = -45.69}$$

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

$$\boxed{\hat{y} = -45.69 + 2.12x}$$

(B) Regression Line equation

Coefficient Correlation Y on X :-

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

$$r = \frac{12(111389) - (894)(1347)}{\sqrt{12(71786) - (894)^2 \, 12(199549) - (1347)^2}}$$

$$r = \frac{132450}{\sqrt{18256631472}}$$

$$r = \frac{132450}{145071.31}$$

$$r = 0.92$$

Q2 A box Contain 4 red, 4 White and 5 green balls. Three balls are drawn from The box Together. Find The probability That may be

(a) exactly one is Red

(i) all of the different Colours

(ii) all of The Same Colour.

Solution :-

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

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

Let A = Denote all balls are of different Colour

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

$$n(A) = 80$$

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

$$\boxed{P(A) = 0.28}$$

$2 \times 1 \times 2 = 8$ even x even x even = even

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

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

Interpretation:-

There are 28% of Chances that all balls are of different Colours.

Let B = Denote all balls of Same Colours

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 Colours.

(b) 12 eggs in a refrigerator 2 are bad from these, 4 eggs are chosen at random to make a cake.
What are the probabilities that
(i) exactly one is bad?
(ii) At least one is bad?

Solution:-

2	B
10	G
12	Eggs

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

Let A = denoted the event that exactly one egg is bad

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

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

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.

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

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

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

Interpretation:

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

Q3 The following are the Score made by three batsmen A, B and C in a series of innings

A	12	15	6	73	7	25	199	36	84	29
B	47	12	76	48	4	25	37	48	13	3
C	15	23	52	4	24	25	74	52	13	4

(a) Find the range of batsmen A, B and C?
(b) Who is more Consistent player?
(c) 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
25	25	88
199	37	74
36	48	52
84	13	13
29	3	4

Range $= X_m - X_0$

Range of A $= X_m - X_0$
$= 199 - 6$
$= 193$

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Range of B = $X_m - X_0$

= 76 - 3

= 73

Range of C = 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
25	625	25	625	25	625
199	39601	37	1369	74	5476
36	1296	48	2304	52	2704
84	7056	13	169	13	169
29	841	3	9	4	16
$\Sigma X = 486$	$\Sigma X^2 = 55202$	$\Sigma y = 313$	$\Sigma y^2 = 14925$	$\Sigma z = 286$	$\Sigma z^2 = 13040$

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Batsman A

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

$$= \frac{486}{10} = 48.6$$

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

$$= \sqrt{\frac{55202}{10} - \left(\frac{486}{10}\right)^2}$$

$$\boxed{S\bar{x} = 56.19}$$

$$C.V = \frac{56.19 \times 100}{\bar{X}} = \frac{56.19}{48.6} \times 100$$

$$\boxed{C.V = 115.61}$$

Batsman B :-

$$\bar{y} = \frac{\Sigma y}{n} = \frac{313}{10} = 31.3$$

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

$$= \sqrt{\frac{14925}{10} - \left(\frac{313}{10}\right)^2}$$

$$= 22.64$$

$$C.V = \frac{22.64}{31.3} \times 100$$

$$= 72.33$$

Batsman C :

$$\bar{Z} = \frac{\Sigma Z}{n} = \frac{286}{10} = 28.6$$

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

$$S_Z = \sqrt{\frac{13040}{10} - \left(\frac{286}{10}\right)^2}$$

$$\boxed{S_Z = 22.04}$$

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

$$= \frac{22.04 \times 100}{28.6}$$

$$\boxed{= 77.06}$$

So

Batsman B 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 more Consistant

Compare A with C

C is more Consistant.