NAME:

Osama Asghar Khan

ID #

7820

Section: 4

Subject:

Probability & Statistics

Question No. 1

Solution:-

Estimated Regresion

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

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

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

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

Y on x

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

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

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

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

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

=

P.T.O

| 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 |
| 20 | 100 | 2000 | 2400 | 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 |
| | 1067 | 110889 | 70661 | $\Sigma y^2 = 1995$ |

Now $\bar{x} = \frac{\Sigma x}{n} = \frac{889}{12}$

$= 74.08$

Now $\bar{y} = \frac{\Sigma y}{n}$

$= \frac{1067}{12}$

$= 88.91$

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

$$b = \frac{12(110889) - (889)(1067)}{12(70611) - (889)^2}$$

$$= \frac{1330668 - 948583}{847932 - 790321}$$

$$= \frac{382105}{57611} = \boxed{6.99}$$

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

$$= 88.91 - (6.99)(74.08)$$

$$= 88.91 - 517.81$$

$$a = -428.9$$

Coefficient of Correlation

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

$$= \frac{12(110889) - (889)(1067)}{\sqrt{12(70661) - (889)^2 (12)(199549) - 11067)^2}}$$

$$r = \frac{1330,668 - 948563}{\sqrt{847932 - 790321(12)(199549) - 13661869}}$$

$$= \frac{382105}{\sqrt{168540.81}}$$

$$\boxed{r = 181.25}$$

# Question No.2

(a) A box contains 4 red, 4 white and 5 green balls. Three balls are drawn from the box together. Find the probability that may be (i) all of different colours. (ii) all of the same colours.

Solution:-

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

Let A = Donote all balls are of different colours.

$$n(A) = \binom{4}{1}\binom{4}{2}\binom{5}{1} = 4 \times 4 \times 5 = 80$$

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

$\Rightarrow$ There are 28% chances that all balls are of different colours.

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

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

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

$$= 4 + 4 + 10$$

$$= 18$$

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

$\Rightarrow$ There are 6.3% chances that all balls of same colours.

ID # 7020

Q.No.2

Part (b):. Of 12 eggs in a refrigerator, 2 are bad. From these, 4 eggs are choosen at random to make a cake. What are the probabilities that (i) exactly one is bad? (ii) Atleast one is bad?

Solution:.

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

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

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

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

(ii) let B = be the event that atleast

bad egg is selected.

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

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

$$= 240 + 45$$

$$= 285$$

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

$$= 0.58$$

$\Rightarrow$ There are 58% Chances that atleast

bad egg is selected.

ID # 7820

## Question No. 3 :-

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

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| A | 12 | 15 | 6 | 73 | 7 | 20 | 199 | 36 | 84 | 29 |
| B | 47 | 12 | 76 | 48 | 4 | 20 | 37 | 48 | 13 | 3 |
| C | 15 | 23 | 52 | 4 | 24 | 20 | 74 | 52 | 13 | 4 |

(a) Find the range of batsmen A, B & C ?

(b) Who is more consistent player ?

(c) Compare A with B, B with C & A with C

SOLUTION:-

| A | B | C |
|---|---|---|
| 12 | 47 | 15 |
| 15 | 12 | 23 |
| 6 | 76 | 52 |
| 73 | 48 | 4 |
| 7 | 4 | 24 |
| 20 | 20 | 20 |
| 199 | 37 | 74 |
| 36 | 48 | 52 |
| 84 | 13 | 15 |
| 29 | 3 | 4 |

Range $= X_m - X_0$

Range of $A = X_m - X_0$

$= 199 - 6$

$= 193$

Range of $B = X_m - X_0$

$= 76 - 3$

$= 73$

Range of C $= X_m - X_0$

$= 74 - 4$

$= 70$

| 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 |
| 20 | 400 | 20 | 400 | 20 | 400 |
| 199 | 39601 | 37 | 1369 | 74 | 5476 |
| 36 | 1296 | 48 | 2304 | 52 | 2704 |
| 84 | 7056 | 13 | 169 | 13 | 169 |
| 29 | 841 | 3 | 9 | 4 | 16 |
| $\Sigma x = 481$ | $\Sigma x^2 = 54,977$ | $\Sigma Y = 308$ | $\Sigma Y^2 = 14,700$ | $\Sigma Z = 281$ | $\Sigma Z^2 = 12815$ |

Variable is smallest.

Batsman A :-

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

$$= \frac{481}{10} = 48.1$$

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

$$= \sqrt{\frac{54977}{10} - \left(\frac{481}{10}\right)^2}$$

$$= \sqrt{\frac{54977}{10} - \frac{231361}{100}}$$

$$= \sqrt{5497.7 - 2313.61}$$

$$= \sqrt{3184.09}$$

$$S_{\bar{x}} = 56.42$$

$$C.V = \frac{56.42}{\bar{x}} \times 100 = \frac{56.42}{48.1}$$

C.V = 117.01

Batsman B :-

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

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

$$= \sqrt{\frac{14700}{10} - \left(\frac{308}{10}\right)^2}$$

$$= \sqrt{1470 - 948.64}$$

$$= \sqrt{521.36}$$

$$= 22.83$$

$$C.V = \frac{22.83}{30.8} \times 100$$

$$= 0.741 \times 100$$

$$= 74.1\ \%$$

atsman C :-

$$\bar{z} = \frac{\Sigma z}{n} = \frac{281}{10} = 28.1$$

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

$$= \sqrt{\frac{12815}{10} - \left(\frac{281}{10}\right)^2}$$

$$= \sqrt{1281.5 - 789.61}$$

$$= \sqrt{491.89}$$

$$= 22.17$$

$$C.V = \frac{\sigma_z}{\bar{z}} = \frac{22.17}{28.1} \times 100$$

$$= 78.8\ \%$$

Batsman B is more consistant as its value of Coefficient of Variance is smallest.

3) 7)

Compare A with B

B is consistent

Compare B with A

B is more consistent

Compare A with C

C is more consistent.