

# FINAL TERM EXAM

Name: Aazaz Ahmad

ID NO: 7705

Section: B

Dept: BEC(E)

Batch: 2016

Subject: Statistics and Probability

Submitted to: Sir Anwar Shamim

Date: 23/9/2020

Question 1) Compute and analyse the results of the least squares regression equation and coefficient of correlation of Y on X for the following data. Compare your manual Results with the outcome of SPSS?

Sol: X = Temp | 53 | 62 | 57 | 73 | 78 | 05 | 86 | 87 | 96 | 91 | 94 | 94  
 Y = Chirps per Minute | 20 | 32 | 45 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 230

The estimated regression line of Y on X is:

$$\hat{Y} = a - bX$$

and the two normal equations are

$$\sum Y = na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

To compute the necessary arrange the computations in the table below.

X	Y	XY	X <sup>2</sup>
53	20	1060	2809
62	32	1984	3844
57	45	2565	3249
71	60	4260	2601
78	80	6240	6084
05	100	500	25
86	120	10320	7396
87	140	12180	7469
96	160	15360	9210
91	180	16380	8281
94	200	18800	8836
94	210	19740	8836
<hr/>			
$\sum$ 874	1347	169389	68640

Now

②

$$\bar{X} = \frac{\sum X}{n} = \frac{874}{5} = 174.8$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{1347}{5} = 269.4$$

$$b = \frac{n \sum XY - (\sum X)(\sum Y)}{n \sum X^2 - (\sum X)^2}$$

$$= \frac{(5)(109389) - (874)(1347)}{(5)(\sum X^2) - (874)^2}$$

$$= \frac{546945 - 1177278}{(5)(68640) - 763876}$$

$$= \frac{630333}{343200 - 763876}$$

$$= \frac{-630333}{-420676} = 1.49$$

$$\boxed{b = 1.49}$$

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

$$a = 269.4 - 1.49(174.8)$$

$$a = 269.4 - 260.45$$

$$\boxed{a = 8.95}$$

Hence the desired estimated regression line of Y on X is

$$\hat{Y} = (a + b^{\textcircled{3}}x) = (8.95) + 1.49x$$

$$\hat{Y} = 1.49x + 8.95$$

Hence  $\hat{Y} = 1.49x + 8.95$  is the estimated regression equation appropriate for predicting the  $Y$  given the  $X$ .



## Question 2)

(4)

Part a): A box contains 4 red, 4 White and 5 green balls. Three balls are drawn from the box together. Find the probability that they may be

(i) all of different colours

(ii) all of same colours

Solution: The total number of possible equally outcomes in S is  $n(S) = \binom{13}{3}$

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

$$n(S) = 280$$

(i) Let X represents "All of different colours"

$$n(X) = (4)(4)(5)$$

$$n(X) = (4)(4)(5)$$

$$n(X) = 80$$

So the probability is;

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

$$P(X) = \frac{80}{280}$$

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

Solution (ii) Let  $y$  represents "All of same colour"

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

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

$$n(y) = 4 + 4 + 10$$

$$n(y) = 18$$

So probability is;

$$p(y) = \frac{n(y)}{n(s)}$$

$$p(y) = \frac{18}{280}$$

$$p(y) = 0.063$$

## Question 2)

(6)

Part b) of 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 (i):** The total number of possible equally likely outcomes in  $S$  is:

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

$$n(S) = \frac{12!}{4!(12-4)!} = 495$$

(i) Let  $X$  represents "Exactly one is bad".

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

$$n(X) = \left( \frac{2!}{1!(2-1)!} \right) \left( \frac{10!}{3!(10-3)!} \right)$$

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

$$n(X) = 240$$

So the probability is:

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

$P(X) = 0.48$

Solution(ii)

(7)

Let  $X$  represent "At least one is bad".

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

$$n(X) = \left( \frac{10!}{3!(10-3)!} \right) \left( \frac{2!}{1!(2-1)!} \right) + \left( \frac{10!}{2!(10-2)!} \right) \left( \frac{2!}{2!(2-2)!} \right)$$

$$n(X) = \binom{120}{2} + \binom{45}{1}$$

$$n(X) = 240 + 45$$

$$n(X) = 285$$

So the probability is;

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

$$P(X) = \frac{285}{495}$$

$$P(X) = 0.58$$



① ②

Q3

Following are the score made by  
Batsman A, B, and C.

A	22	15	6	73	7	05	199	36	84	29
B	47	12	76	48	4	05	37	48	13	34
C	15	23	52	4	21	05	74	52	13	4

Find range of A, B and C  
who is more consistant

Compare A with B, B with C and A with C.

83

⑧

⑨

⑩

Sol:-

A

B

C

12

47

15

15

12

23

6

76

52

73

48

4

7

41

24

05

05

05

199

37

74

36

48

52

84

13

13

29

3

4

Q 10

Batsman A

Batsman B

Batsman C

X	$X^2$
12	144
15	225
6	36
73	5329
7	49
05	25
199	39601
36	1296
84	7056
29	841

Y	$Y^2$
47	2209
12	144
76	5776
48	2304
4	16
05	25
37	1369
48	2304
13	169
3	9

Z	$Z^2$
15	225
23	529
52	2704
4	16
24	576
05	25
74	5476
52	2704
13	169
4	16

$\Sigma X = 466$	$\Sigma X^2 = 54602$	$\Sigma Y = 393$	$\Sigma Y^2 = 11325$	$\Sigma Z = 266$	$\Sigma Z^2 = 12440$
------------------	----------------------	------------------	----------------------	------------------	----------------------

$$\text{Range} = X_m - X_o$$

$$\begin{aligned}\text{Range A} &= X_m - X_o \\ &= 199 - 05 \\ &= 194\end{aligned}$$

$$\begin{aligned}\text{Range B} &= X_m - X_o \\ &= 76 - 3 \\ &= 73\end{aligned}$$

$$\begin{aligned}\text{Range C} &= X_m - X_o \\ &= 74 - 4 \\ &= 70\end{aligned}$$



Batsman A =

Q12

$$\bar{X} = \frac{\sum x}{n} \quad \therefore n = 10$$

$$\bar{X} = \frac{466}{10} = 46.6$$

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

$$= \sqrt{\frac{54609}{10} - \left(\frac{466}{10}\right)^2}$$

$$S\bar{x} = 57.34$$

$$C.V = \frac{57.34}{\bar{X}} \times 100 = \frac{57.34}{46.6}$$

$$C.V = 1.230 \times 100$$

$$C.V = 123$$

Batsman B

(13)

$$\bar{Y} = \frac{\sum Y}{n} = \frac{293}{10} = 29.3$$

$$\bar{Y} = 29.3$$

$$SY = \sqrt{\frac{\sum Y^2}{n} - \left(\frac{\sum Y}{n}\right)^2}$$
$$= \sqrt{\frac{14525}{10} - \left(\frac{293}{10}\right)^2}$$

$$SY = 23.95$$

$$C.V = \frac{23.95}{29.3} \times 100$$

$$C.V = 81.74$$

Batsman C

(14)

$$\bar{Z} = \frac{\sum Z}{n} = \frac{266}{10} = 26.6$$

$$\bar{Z} = 26.6$$

$$S_Z = \sqrt{\frac{\sum Z^2}{n} - \left(\frac{\sum Z}{n}\right)^2}$$
$$= \sqrt{\frac{12440}{10} - \left(\frac{266}{10}\right)^2}$$

$$S_Z = 23.16$$

$$C.V. = \frac{S_Z}{\bar{Z}} \times 100 = \frac{23.16}{26.6} \times 100$$

$$C.V. = 87.06$$

(8) (15)

Between B is more consistent as its value of co-efficient of variance is smallest.

Compare A with B

B is consistent

Compare B with A

B is more consistent

Compare A with C

C is more consistent