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Section

A

Subject

probability and Statistics

Submitted to

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## Q No 1

Compute and analyse the result of the least square regression equation and coefficient and coefficient of correlation of  $Y$  on  $X$  for the following data.  
Compute your manual results with outcome of SPSS?

X	Temp	53	62	57	71	78	98	86	87	96	91	94	94
Y	chirps/min	20	32	45	60	80	100	120	140	160	180	200	210

The estimated regression line of  $Y$  on  $X$  is

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

and two normal equations are

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

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

To compute the necessary summations we arrange the computations in given table -

X	Y	XY	X <sup>2</sup>	Y <sup>2</sup>
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
98	100	9800	9604	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	340000
94	210	19740	8836	44100
967	1347	80765	118689	199549

Now  $\bar{X} = \frac{\sum X}{n} = \frac{967}{12} = 80.53$

$\bar{Y} = \frac{\sum Y}{n} = \frac{1347}{12} = 112.25$

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

3

$$= \frac{12(118679) - (967)(1347)}{12(80765) - (967)^2}$$

$$= \frac{1424268 - 1302549}{969180 - 935089}$$

$$= \frac{121719}{34091} = \boxed{3.57}$$

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

$$= 11.225 - (3.57)(80.53)$$

$$= -175.2$$

Hence the described estimated regression line of  $\bar{y}$  on  $x$

$$\hat{y} = -175.2 + 3.57x \Rightarrow r = \frac{\sum xy - (\sum x)(\sum y)}{n}$$

B

$$r = \frac{\sum xy - (\sum x)(\sum y)/n}{\sqrt{[\sum x^2 - (\sum x)^2/n][\sum y^2 - (\sum y)^2/n]}}$$

$$= \frac{118689 - (967)(1347)/12}{\sqrt{[80765 - (967)^2/12][199549 - (1347)^2/12]}}$$

$$= \frac{10143.25}{\sqrt{2840.917 \times 48348.25}}$$

$$= \frac{10143.25}{\sqrt{137353365.3}}$$

$$= \frac{10143.25}{11719.78} \Rightarrow r = \boxed{0.86} \text{ coefficient of correlation}$$

Q No 2 (A) (4)

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

Solution :- The total number of possible equally outcomes in S is

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

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

$$n(S) = 286$$

(i) Let X represent "All of different colour"

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

$$n(X) = \left( \frac{4!}{1!(4-1)!} \right) \left( \frac{4!}{1!(4-1)!} \right) \left( \frac{5!}{1!(5-1)!} \right)$$

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

$$n(X) = 80$$

So the probability is

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

$$P(X) = \frac{80}{286}$$

$$P(X) = 0.28$$

(ii) let  $Y$  represent "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

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

$$P(Y) = \frac{18}{286}$$

$$P(Y) = 0.063$$

## Q No 2 (B) (1)

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? At least one is bad.

### Solution:-

The total number of possible equally likely outcomes is  $S$  is,

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

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

(ii) let  $X$  represent "Exactly one is bad"

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

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

$$n(X) = (2)(120)$$

$$n(X) = 240$$

So the probability is

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

$$P(X) = 0.48$$

(ii) Let  $Y$  represent (At least one ...)

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

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

$$n(Y) = (120)(2) + (45)(1)$$

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

$$n(Y) = 285$$

So the probability is

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

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

$$P(Y) = 0.58$$



Q3

The following are the scores made by three batsman A, B and C in a Series of Innings.

A	12	15	6	73	7	98	199	36	84	29
B	47	12	76	48	4	98	37	48	13	3
C	15	23	52	4	24	98	74	52	13	4

(A)

Range of A

$$A = 12, 15, 6, 73, 7, 98, 199, 36, 84, 29$$

$$\text{Largest value in data} = L = 199$$

$$\text{Smallest value in data} = S = 6$$

$$\begin{aligned} \text{Range} &= \text{Largest} - \text{Smallest} \\ &= 199 - 6 \end{aligned}$$

$$\text{Range of row B} = \boxed{193}$$

$$B = 47, 12, 76, 48, 4, 98, 37, 48, 13, 3$$

$$\text{Largest value} = 98$$

$$\text{Smallest value} = 3$$

$$\text{Range} = \text{Largest} - \text{Smallest}$$

$$\begin{aligned} &= 98 - 3 \\ &= \boxed{95} \end{aligned}$$

## Range of C

$$C = 15, 23, 52, 4, 24, 98, 74, 52, 13, 4$$

$$\text{Largest value} = 98$$

$$\text{Smallest value} = 4$$

$$\text{Range} = \text{Largest value} - \text{Smallest value.}$$

$$= 98 - 4$$

$$\boxed{= 94}$$

(b) More consistence player?

$x$	$x_i - w$	$(x_i - w)^2$
12	-4.9	19.21
15	-4.9	16.81
6	-4.9	16.81
73	17.1	292.41
7	-4.9	239.21
98	42.1	1772.41
199	143.1	20477.61
36	-9.9	396.01
84	27.1	789.61
29	-26.9	723.61
559		31024.962

$$w = \frac{\sum x}{n} = \frac{559}{10} = 55.9$$

$$s^2 = \frac{\sum (x_i - w)^2}{N}$$

$$= \frac{310.24 - 9621}{10}$$

$$\text{Group A} = 3102.496$$

Group B

$x_i$	$x_i - w$	$(x_i - w)^2$
47	8.4	70.56
12	-26.4	707.56
76	37.4	1398.76
48	9.4	88.36
4	-34.6	1197.16
98	59.4	3528.36
37	16	256
48	9.4	88.36
13	-25.8	665.64
3	-35.6	1267.36
586		9004.4

$$w = \frac{\sum x_i}{n} = \frac{386}{10}$$

$$= 38.6$$

$$s^2 = \frac{\sum (x_i - w)^2}{n}$$

$$= \frac{9004.4}{10}$$

$$\text{Group B} = 900.44$$

## Group C

⑦

$x_i$	$x_i - w$	$(x_i - w)^2$
15	21	441
23	-13	169
52	16	256
4	-32	1024
24	-12	144
98	62	3844
74	-32	1444
52	-67	256
13	-23	529
4	-57	1024
359		9131

$$w = \frac{359}{10} = 35.9 = 36$$

$$s^2 = \frac{\sum (x_i - w)^2}{N}$$

$$= \frac{9131}{10} =$$

$$\text{Group C} = 913.1$$

Group B is more consistent

## Q No 3

(10)

### part C

#### A with B

Group B is more consistent as compare to group A

#### B with C

Group B is more consistent is compare to group C

#### A with C

Group C is more consistent is compare to group A.

#### C.V of Group A

$$C.V = \frac{55.70}{55.9} \times 100 = 99.1\%$$

#### C.V of group B

$$C.V = \frac{30}{38.6} \times 100 = 77.1\%$$

#### C.V of group C

$$C.V = \frac{30.2}{36} \times 100 = 83.1\%$$