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programm	BS(MLT)
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Q NO 1 :

part (a) Calculate Correlation Co-efficient b/w x & Y

Solution : Given that

price (x)	Demand (Y)	xy	x^2	y^2
3	25	75	9	625
4	24	96	16	576
5	20	100	25	400
6	20	120	36	400
7	19	133	49	361
8	17	136	64	289
9	16	144	81	256
10	13	130	100	169
11	10	110	121	100
13	8	104	169	64
76		1148	670	3240

Now we need to find

$n\sum xy = ?$, $\sum x \sum y = ?$

$n\sum x^2 = ?$, $(\sum x)^2 = ?$

$n\sum y^2 = ?$, $(\sum y)^2 = ?$

$\Rightarrow \sum xy = 1148$, $\sum x^2 = 670$

$\sum y^2 = 3240$

$(\sum x) = 76$, $n = 10$

$\sum y = 172$

putting in formula.

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

$$r_{xy} = \frac{(10)(1148) - (76)(172)}{\sqrt{[(10)(670) - (76)^2][(10)(3240) - (172)^2]}}$$

$$r_{xy} = \frac{-1592}{\sqrt{(924)(2816)}}$$

$$r_{xy} = \frac{-1592}{1613.0666}$$

$$r_{xy} = -0.986$$

<u>Interpretation</u> :- Hence we have the $r_{xy} =$ $r_{xy} = -0.986$, which tell ~~us~~ us that, there is strong negative correlation b/w x and y.

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Q NO 1 :-

Part "B"

Solution :- Given that

x	y	xy	x^2	y^2
20	5	100	400	25
11	15	165	121	225
15	14	210	225	196
10	17	170	100	289
17	8	136	289	64
18	9	162	324	81
21	12	252	441	144
25	16	400	625	256
28	18	504	784	324
165	114	2099	3309	1604

(i) Determine the equation of least squares regression line of y on x & x on y.

→ As we know that for y on x we have

$$\hat{Y} = a_{yx} + b_{yx}X$$ and

$$\rightarrow \quad b_{y \cdot x} = \frac{n\Sigma xy - \Sigma x \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

~~→ acycal~~

$$\rightarrow \quad a_{y \cdot x} = \frac{\Sigma y}{n} - b_{y \cdot x}\left(\frac{\Sigma x}{n}\right) \quad \text{or}$$

$$\rightarrow \quad a_{y \cdot x} = \bar{y} - b_{y \cdot x}\,\bar{x}$$

$$b_{y \cdot x} = \frac{9(2099) - (165)(114)}{9(3309) - (165)^2}$$

$$b_{y \cdot x} = \frac{81}{2556}$$

$$\boxed{b_{y \cdot x} = 0.03169}$$

Now

$$a_{y \cdot x} = \frac{114}{9} - (0.03169)\left(\frac{165}{9}\right)$$

$$= 12.67 - (0.580983)$$

$$\boxed{a_{y \cdot x} = 12.089017}$$

Now the least Square regression line equation of y on x is

$$\hat{y} = 12.089017 + (0.03169)x$$

* Now find the equation of x on y.

for these we have

$$\hat{x} = a + by$$

and

$$b_{x \cdot y} = \frac{n\sum xy - \sum x \sum y}{n\sum y^2 - (\sum y)^2}$$

$$a_{x \cdot y} = \bar{x} - b_{x \cdot y}\,\bar{y}$$

By putting value.

$$b_{x \cdot y} = \frac{9(2099)-(165)(114)}{9(1604)-(114)^2}$$

$$b_{x \cdot y} = \frac{81}{1440} = 0.05625$$

$$\boxed{b_{x \cdot y} = 0.05625}$$

and

$$a_{x \cdot y} = \frac{165}{9} - (0.05625)\left(\frac{114}{9}\right)$$

$$a_{xy} = 18.33 - 0.7125$$

$$\boxed{a_{x \cdot y} = 17.6175}$$

Hence the equation of least square regression line is

$$\hat{x} = 17.6175 + (0.05625)y$$

(ii) Now to the predicted values of y for $x = 20, 11, 15, 25, 28$

x	$\hat{y}$
20	12.723
11	12.438
15	12.565
25	12.8813
28	12.976

And the predicted values of x for y are given below as.

Y	$\hat{x}$
5	17.89875
15	18.46125
9	18.12375
12	18.2925
16	18.5175
18	18.63

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Q NO # 2

* (a) A fair coin is tossed 5 times. Find the probabality of obtainin various number of heads?

Solution :-

Therefore the r.v X which denotes the number of heads (Successes) has a binomial probability distribution with $p = 1/2$ and $n = 5$. The possible value of x are. 0, 1, 2, 3, 4 and 5. Hence.

$$\rightarrow P(\text{no head}) = P(x=0) = \binom{5}{0}\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^5 =$$

$$1 \times \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

$$\rightarrow P(1\text{ head}) = P(x=1) = \binom{5}{1}\left(\frac{1}{2}\right)^1\left(\frac{1}{2}\right)^{5-1} = 5 \times \left(\frac{1}{2}\right)^5 = \frac{5}{32}$$

$$\rightarrow P(2\text{ head}) = P(x=2) = \binom{5}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{5-2} = 10 \times \left[\frac{1}{2}\right]^5 = \frac{10}{32}$$

$\rightarrow P(3\text{ head}) = P(x=3) = \begin{bmatrix}5\\3\end{bmatrix}\begin{bmatrix}\frac{1}{2}\end{bmatrix}^3\begin{bmatrix}\frac{1}{2}\end{bmatrix}^{5-3} = 10\times\begin{bmatrix}\frac{1}{2}\end{bmatrix}^5 = \frac{10}{32}$

$\rightarrow P(4\text{ head}) = P(x=4) = \begin{bmatrix}5\\4\end{bmatrix}\begin{bmatrix}\frac{1}{2}\end{bmatrix}^4\begin{bmatrix}\frac{1}{2}\end{bmatrix}^{5-4} = 5\times\left(\frac{1}{2}\right)^5 = \frac{5}{32}$

$\rightarrow P(5\text{ head}) = P(x=5) = \begin{bmatrix}5\\5\end{bmatrix}\begin{bmatrix}\frac{1}{2}\end{bmatrix}^5\begin{bmatrix}\frac{1}{2}\end{bmatrix}^{0} = 1\times\left(\frac{1}{2}\right)^5 = \frac{1}{32}$

x	0	1	2	3	4	5
$f(x)$	$\frac{1}{32}$	$\frac{5}{32}$	$\frac{10}{32}$	$\frac{10}{32}$	$\frac{5}{32}$	$\frac{1}{32}$

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Q NO = 2 part "B"

Solution :- Here

Therefore the Binomial probability dist with $n = 10$

$P = 2/3$

$q = 1 - P$

$q = 1 - 2/3$

$q = 1/3$

let X denote the number of won by A. then.

(i) $P(X \geq 4) = 1 - P(X < 4)$

$$= 1 - \sum_{x=0}^{3} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

$$= 1 - \left[\left(\frac{1}{3}\right)^{10} + 10\left(\frac{2}{3}\right)^1\left(\frac{1}{3}\right)^9 + 45\left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^8 + 120\left(\frac{2}{3}\right)^3\left(\frac{1}{3}\right)^7\right]$$

$\rightarrow \quad 1 - \frac{1}{59049}\left[1 + 20 + 180 + 960\right]$

$\rightarrow \quad 1 - 0.0197$

$$\boxed{P(x \geq 4) = 0.9803}$$

(ii) $P(x=4) = \binom{10}{4}\left(\frac{2}{3}\right)^4\left(\frac{1}{3}\right)^6$

$= 210\left(\frac{16}{81}\right)\left(\frac{1}{729}\right)$

$= \frac{3360}{59049}$

$$\boxed{P(x=4) = 0.056}$$

(iii) $P(x=11) = f(0) =$ because X can take only value

$0, 1, 2, 3, \ldots, 10.$

(iv) 6 or more games

$$P(x \geq 6) = \sum_{x=6}^{10} \binom{10}{x} \left(\frac{2}{3}\right)^{x} \left(\frac{1}{3}\right)^{10-x}$$

$$= \binom{10}{6}\left(\frac{2}{3}\right)^{6}\left(\frac{1}{3}\right)^{4} + \binom{10}{7}\left(\frac{2}{3}\right)^{7}\left(\frac{1}{3}\right)^{3} +$$

$$+ \binom{10}{8}\left(\frac{2}{3}\right)^{8}\left(\frac{1}{3}\right)^{2} + \binom{10}{9}\left(\frac{2}{3}\right)^{9}\left(\frac{1}{3}\right)^{1}$$

$$+ \binom{10}{10}\left(\frac{2}{3}\right)^{10}\left(\frac{1}{3}\right)^{0}$$

$$= 0.228 + 0.261 + 0.196 + 0.087 + 0.018$$

$$\boxed{P(x \geq 6) = 0.79}$$

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QNO # 3

2	6	1	5	4	3	3	8	10	1
4	3	3	0	5	2	1	4	10	3
5	3	3	6	3	3	2	2	7	4
1	4	2	4	4	4	6	8	10	7
7	5	6	5	3	2	3	9	2	2

(a) : Construct the ungrouped frequency distribution of the data.

(b) : Construct the grouped frequency distribution of these data.

Solution :

Given that

① X_0 (minimum value) $= 0$

X_m (maxi: value) $= 10$

② Range $= X_m - X_0$

$= 10 - 0$

$= 10$

=

3) let the number of classes = 06

4) The class magnitude = $10/7 = 1.5$

$= 2.00$

Now (a) the ungrouped (Discrete) data

Children Born x_i	f	Tally Bar
0	1	I
1	4	IIII
2	8	~~IIII~~ IIII
3	11	~~IIII~~ ~~IIII~~ I
5	5	~~IIII~~
6	4	IIII
7	3	III
8	2	II
9	1	I
10	3	III
	50	

Now (b) the grouped (frequency) data

children born Groups	f
0 – 1	5
2 – 3	19
4 – 5	13
6 – 7	7
8 – 9	3
10 – 11	3
	50

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The END