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Q NO: 01.

Part (a): calculate the correlation co-efficient between X and Y.

Price	3	4	5	6	7	8	9	10	11	13
Demand	25	24	20	20	19	17	16	13	10	8

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	172	1148	670	3240

Sol:- Correlation co-efficient.

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

$$= \frac{11480 - 13072}{\sqrt{[10(670) - (76)^2][10(3240 - (172)^2]}}$$

$$= \frac{11480 - 13072}{\sqrt{(6700 - 5776)(32400 - 29584)}}$$

$$r = \frac{-1590}{\sqrt{(924)(2816)}} = \frac{1590}{\sqrt{2601984}}$$

$$= \frac{1590}{1613} \quad \boxed{= -0.985740}$$

part (b): Given the following set of values:

x	20	11	15	10	17	18	21	25	28
y	5	15	14	17	8	9	12	16	18

(a) Determine the equation the least squares regression of y on x and x on y?

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	8	504	784	324
165	114	2099	3309	1604

Sol:- $\boxed{y \text{ on } x} = y = a + bx$

$$\hat{y}_x = \bar{y} - b\bar{x}$$

$$= 12.6 - (0.031)(18.3)$$

$$\hat{y}_x = 12.6 - 0.5673$$

$\overset{a}{y}_x = 12.03$

$\overset{b}{y}_x = \dfrac{n\Sigma xy - \Sigma x \Sigma y}{[n\Sigma x^2 - (\Sigma x)^2]}$

$\bar{X} = \dfrac{\Sigma x}{n} = \dfrac{165}{9} = 18.3$

$\bar{y} = \dfrac{\Sigma x}{n} = \dfrac{144}{9} = 12.6$

$\overset{b}{y}_x = \dfrac{9(2099) - (165)(114)}{9(3309 - (165)^2}$

$\overset{b}{y}_x = \dfrac{18891 - 18810}{(29781 - 27225}$

$\overset{b}{y}_x = \dfrac{81}{2556} = 0.031$

$\overset{b}{y}_x = 0.031$

$\hat{y} = a + b\hat{x}$

$\hat{y} = 1203 + 0.031 \hat{x}$

$\hat{y} = a + b\hat{x}$

$\hat{y} = +12.26 + 0.031\ (20) = 12.86$

$\hat{y} + 12.26 + 0.031\ (11) = 12.59$

$\hat{y} = +12.26 + 0.031\ (15) = 12.71$

$\hat{y} = +12.26 + 0.031\ (25) = 13.01$

$\hat{y} = +12.26 + 0.031\ (28) = 13.1$

(ii) x on y ?

x on y $\Rightarrow$ $x = a + by$

$\hat{x}_y = \bar{x} - b\bar{y}$

$\hat{x}_y = 18.3 - 0.056(12.6)$

$\hat{x}_y = 18.3 - 0.706$

$\hat{x} = a + b\hat{y}$

$\hat{x} = 17.594 + 0.056\hat{y}$

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

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

$= \frac{18891 - 18810}{14436 - 12996}$

$= \frac{81}{1440} = 0.056$

$\bar{x} = 18.3$

$\bar{y} = 12.6$

(b) Find the predicted value of y on for x = 20, 11, 15, 25, 28 & x for y = 5, 15, 19, 12, 16, 18.

$y = 5 \quad \hat{x} = 17.594 + 0.056(5) = 17.87$

$y = 15 \quad \hat{x} = 17.594 + 0.056(15) = 18.43$

$y = 9 \quad \hat{x} = 17.594 + 0.056(9) = 18.09$

$y = 12 \quad \hat{x} = 17.594 + 0.056(12) = 18.26$

$y = 16 \quad \hat{x} = 17.594 + 0.056(16) = 18.49$

$y = 18 \quad \hat{x} = 17.594 + 0.056(18) = 18.60$

Question NO: 03.

The following figures given to the number of childem born of to 30 womens.

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) Contruct the ungrouped frequency Distribution of these Data.

Ungrouped frequency Distribution:

x	f
0	1
1	4
2	8
3	11
4	8
5	5
6	4
7	3
8	1
9	2
10	3

(b) Construct the grouped frequency distribution of these data?

Group Frequency Distribution.

classes	Frequency.
0 – 3	24
4 – 7	20
8 – 10	6
	50

Question NO : 02.

Find the following.

(a) A fair coin is tossed 5 times. Find the probabilities of obtaining various numbers of heads.

Sol:- Therefore, the r.v. x which is denoted the numbers of heads (success) has a bionomical probability distribution with $p = 1/2$ and $x = 5$ possible values is 0, 1, 2, 3, 4, 5.

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

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

P.T.O

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

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

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

$$= 10 \times \left(\frac{1}{2}\right)^5 = \frac{10}{32}.$$

$$P(3 \text{ heads}) = P(x=3) = \binom{5}{3}\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^{5-3}$$

$$= 10 \times \left(\frac{1}{2}\right)^5 = \frac{10}{32}$$

$$P(4 \text{ heads}) = P(x=4) = \binom{5}{4}\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)^{5-4}.$$

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

$$P(5 \text{ heads}) = P(x=5) = \binom{5}{5}\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^6$$

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

part (b):

A and B play a game in which A, s probability ——— ? e

Sol:

$p \rightarrow$ Win the game $= \frac{2}{3}$

$n = 10.$

$x = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.$

$p = 2/3, \quad q = 1 - p = \frac{1-2}{3} = \frac{1}{3}$

At least 4 games.

(i) $P(x \geq 4) = {}^{n}C_{x}\, p^{x} q^{n-x}.$

$= {}^{10}C_{4} \left(\frac{2}{3}\right)^{4} \left(\frac{1}{3}\right)^{10-4} + \overset{10}{C}_{5} \left(\frac{2}{3}\right)^{5} \left(\frac{1}{3}\right)^{10-5} +$

${}^{10}C_{6} \left(\frac{2}{3}\right)^{6} \left(\frac{1}{3}\right)^{10-6} + \overset{10}{C}_{7} \left(\frac{2}{3}\right)^{7} \left(\frac{1}{3}\right)^{10-7} +$

${}^{10}C_{8} \left(\frac{2}{3}\right)^{8} \left(\frac{1}{3}\right)^{10-8} + \overset{10}{C}_{9} \left(\frac{2}{3}\right)^{9} \left(\frac{1}{3}\right)^{10-9} +$

$\overset{10}{C}_{10} \left(\frac{2}{3}\right)^{10} \left(\frac{1}{3}\right)^{10-10} =$

(ii) Exactly 4 will win.

$P(x = 4) = \overset{n}{C}_{x}\, p^{n} q^{n-x}.$

$\overset{10}{C}_{4} \left(\frac{2}{3}\right)^{4} \left(\frac{1}{3}\right)^{10-4}.$