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Subject :-

Biostatistics

Date :- 22. ob. 2020

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Q No1 (A) Calculate the Correlation between X and Y

⇒

X	Y	X^2	Y^2	XY
3	75	9	625	96
4	24	16	576	100
5	20	25	400	120
6	20	36	400	138
7	19	49	36	136
8	17	64	289	144
9	16	81	256	130
10	13	100	189	110
11	10	121	100	.
12	8	144	64	96
75	172	645	3240	1140

⇒ $n = 10$

$\Sigma x = 75$

$\Sigma y = 172$

$\Sigma x^2 = 645$

$\Sigma y^2 = 3240$

$\Sigma xy = 1140$

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★ Formula for finding r ★

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

$$r = \frac{1140 - [(75)(172)]/10}{\sqrt{[645 - (75)^2/10][3246 - (172)^2/10]}}$$

$$r = \frac{1140 - 1290}{\sqrt{[645 - 5625/10][3246 - 2958.4]}}$$

$$= \frac{150}{(82.5)(287.6}$$

$$= \frac{-150}{23727}$$

$$= \boxed{-0.01}$$

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Q4 B – (a)

Determine the equation of the least squares regression line of y and x on y.

	x	y	x^2	y^2	x y
	20	5	400	25	100
	11	15	121	225	165
	15	14	225	196	216
	10	17	100	289	170
	17	8	289	64	136
	18	9	324	81	162
	21	12	441	144	252
	25	16	625	256	400
	28	18	784	324	504
Total	165	124	3309	1604	2099

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

$$b = \frac{9(2099) - (165)(124)}{9(3309) - (165)^2}$$

$$b = \frac{18891 - 20460}{29781 - 27225}$$

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$$b = \frac{1569}{2556}$$

$$b = -0.6$$

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

$$a = 124 - \frac{(-0.6)(165)}{9}$$

$$= 124 - (99)$$

$$a = 24.7.$$

Here the required regression line is given by

$$y^n = a + bx$$

$$\Rightarrow \boxed{y^n = 24.7 - 0.6x}$$

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Regression line x on y

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

$$b = \frac{9(2099) - (165)(124)}{9(1604) - (124)^2}$$

$$b = \frac{18891 - 20460}{14436 - 15376}$$

$$b = \frac{1569}{940}$$

$$b = \boxed{1.7}$$

$$a = \frac{\Sigma x - b\Sigma y}{n}$$

$$= \frac{165 - (1.7)(124)}{9}$$

$$a = \frac{165 - 210.8}{9}$$

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(b)

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$$a = \frac{45.8}{9}$$

$$a = 5.1$$

The required regression line is given by

$$\hat{X} = a_1 + bY$$

$$\hat{X} = -5.1 + 1.7Y$$

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(2) B.

Find the predicated values of y for x = 20, 11, 15, 25, 28 and x for y = 5, 15, 9, 12, 16, 18.

$$y = 24.7 - 0.6x$$

$$x = -5.1 + 1.7y$$

X	Y	$\hat{Y} = 24.7 - 0.6X$	$\hat{X} = -5.1 + 1.7Y$
20	5	12.7	3.4
11	15	18.1	20.4
15	9	15.7	10.2
25	12	9.7	15.3
28	16	7.9	22.1
	18		25.5

These are the regression predicated values.

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Q No 2.

A pair Coins is tossed 5 times Find the Probability of obtaning Various Number of heads.

Ans 3

(1) Each toss of Coin has two two Possible outcomes, head and tail.

(2) The Probability of a head is $P = 1/2$ and remain the same for Sucessive tosses.

(3) The Sucessive tosses of Coins are independent.

(4) The Coin is tossed 5 times.

$\Rightarrow$ Therefore the r.v X which denotes the numbers of heads (Sucesses) 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.

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Hence :-

$$P(\text{No head}) = P(X=0)$$

$$= \binom{5}{0}\left[\frac{1}{2}\right]^0\left[\frac{1}{2}\right]^5 = 1 \times \left[\frac{1}{2}\right]^5 = \frac{1}{32}$$

$$P(1 \text{ head}) = P(X=1)$$

$$= \binom{5}{1}\left[\frac{1}{2}\right]^1\left[\frac{1}{2}\right]^{5-1} = 5 \times \left[\frac{1}{2}\right]^5 = \frac{5}{32}$$

$$P(2 \text{ head}) = P(X=2)$$

$$= \binom{5}{2}\left[\frac{1}{2}\right]^2\left[\frac{1}{2}\right]^{5-2} = 10 \times \left[\frac{1}{2}\right]^5 = \frac{10}{32}$$

$$P(3 \text{ heads}) = P(X=3)$$

$$= \binom{5}{3}\left[\frac{1}{2}\right]^3\left[\frac{1}{2}\right]^{5-3} = 10 \times \left[\frac{1}{2}\right]^5 = \frac{10}{32}$$

$$P(4 \text{ heads}) = P(X=4)$$

$$= \binom{5}{4}\left[\frac{1}{2}\right]^4\left[\frac{1}{2}\right]^{5-4} = 5 \times \left[\frac{1}{2}\right]^5 = \frac{5}{32}$$

$$P(5 \text{ heads}) = P(X=5)$$

$$= \binom{5}{5}\left[\frac{1}{2}\right]^5\left[\frac{1}{2}\right]^0 = 1 \times \left[\frac{1}{2}\right]^5 = \frac{1}{32}$$

These probabilities can also be obtained by expanding the binomial $\left(\frac{1}{2} + \frac{1}{2}\right)^5$

The binomial p.d ⟩ar numbers ⟨ heads obtained in 5 tosses ⟨ ⟩air coins is.

X	0	1	2	3	4	5
f(x)	1/32	5/32	10/32	10/32	5/32	1/32

Q No 8

$$P(x \geq 4) = ?$$

$$= 1 - P(x < 4)$$

$$= 1 - \left[\sum_{x=0}^{4} \binom{10}{x} \left(\frac{2}{3}\right)^{x} \left(\frac{1}{3}\right)^{10-x} \right.$$

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

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

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

$$= 1 - \left[0.0002 + 0.0003 + 45\,(0.444)\,[0.0002 + 120\,(0.296)\,(0.0005 \right]$$

$$= 1 - \left[0.0002 + 0.0003 + 0.004 + 0.017 \right]$$

$$= 1 - \left[0.0215 \right]$$

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$= P(x \geq 4) = 0.97$

(2) $P(x = 4/16 = ?$

$P(x = 4/16) = f(4/16) = 0$

Because of a r.v x with a binomial distribution takes only one of the values 0, 1, 2, 3 ..... and so on.

(3) $P(x = 11) = ?$

$P(x = 11) = f(6) = 0$

Because of x can take only value of 1, 2, 3 --- and 10 so on.

(4) $P(x \geq 6) = ?$

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

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

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

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

$$= \left[210\,(0.097)\,(0.012) + 86\,(0.058)\right.$$

$$(0.037) + 45\,(0.039)\,(0.111) + 10$$

$$\left.(0.026)\,(0.333) + 1\,(0.017)\,1\right]$$

$$= [0.219241 + 0.17168 + 0.195 + 0.08658 + 0.017]$$

$$P = (x \geq 6) = 0.6725$$

So This is the required solution for the probability.

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Q No 3

The following figures give the Number of the children born to 50 Women.

Given Data.

2	6	1	5	4	3	3	8	10	1
4	3	3	0	5	2	1	4	16	3
5	3	3	6	3	3	2	2	7	4
1	4	2	4	4	4	6	8	16	7
7	5	6	5	3	2	3	9	2	2

(A) Construct the ungrouped frequency distribution of data

Number	Tally Marks	Frequency	C. Frequency
0	I	1	1
1	II II	4	5
2	IIII III	8	13
3	IIII IIII I	11	24
4	IIII III	8	32
5	IIII	5	37
6	III	4	41
7	III	3	44
8	II	2	46
9	I	1	47
10	III	3	50

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Q No3 Part - B.

Given Data

2	6	1	8	4	3	3	8	10	1
4	3	3	9	5	2	1	4	16	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

Construct grouped frequency distribution of these data.

N = 50

X_o = 1

X_m = 10

Range = $X_m - X_o$

R = 10 - 1

= 9

$\Rightarrow$ $K = 1 + 3.3 \log(50)$

$= 1 + 3.3 (1.698)$

$= 1 + 5.6066$

$\Rightarrow$ $K = 6.6066 = \boxed{6}$

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h = class interval

$$= \frac{\text{Rang}}{K}$$

$$h = 9/7$$

$$= 1.285$$

$$= \boxed{2}$$

(Thank Sir g)