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Date: ___/___/20

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B.S DT 6th

PAPER. BIOSTATISTICS.

SUBMITTED TO:

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Q No 1 (a)

Calculate the correlation (10%) coefficient between X and Y.

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

Let us change the origin of X and Y.

Hence:

$U = X-7$, and $V = Y-19$

Then $r_{xy} = r_{uv}$ the calculation needed to find r and given in the table

X	Y	X^2	Y^2	XY
3	25	9	625	75
4	24	16	576	96
5	20	25	400	100
6	20	36	400	120
7	19	49	361	133
8	17	64	289	136
9	16	81	256	144
10	13	100	169	130
11	10	121	100	110
13	8	169	64	104
$\Sigma = 76$	$\Sigma = 172$	$\Sigma = 670$	$\Sigma = 3240$	$\Sigma = 1148$

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Formula for Correlation Coefficient

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

For $n = 10$

$$r = \frac{(10)(1148) - (76)(172)}{\sqrt{\{(10)(670) - (76)^2\}\{(10)(3240) - (172)^2\}}}$$

$$r = \frac{11480 - 13072}{\sqrt{\{670 - 5776)(32400 - 29584)}}$$

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

$$r = \frac{-1592}{\sqrt{2601984}}$$

$$r = \frac{-1592}{1613.06}$$

$$\boxed{r = -0.98}$$

Ans.

③

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Q No 1 (b)

X	Y	X^2	Y^2	XY
20	5	400	25	100
11	15	121	225	165
15	14	225	196	210
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
Σ165	Σ=114	Σ=3309	Σ=1604	Σ=2099

(a) ⇒ Formula for least square regression line for y on x.

$$y = a + bx$$

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

$$b = \frac{(9)(2099) - (165)(114)}{(9)(3309) - (165)^2}$$

$$b = \frac{18891 - 18810}{29781 - 27225}$$

$$b = \frac{81}{2556} \Rightarrow \boxed{b = 0.031}$$

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Now

$$a = \frac{1}{n}\{\Sigma y - b\Sigma x\}$$

$$a = \frac{1}{9}\{114 - (0.031)(165)\}$$

$$a = \frac{1}{9}\{114 - 5.115\}$$

$$a = \frac{1}{9}\{108.8\}$$

$$\boxed{a = 12.09}$$

Hence

$$y = a + bx$$

$$y = 12.09 + 0.031x$$

least Square regression line for X on Y.

$$X = a + by$$

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

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

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

$$\boxed{b = 0.056}$$

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Now $a = \frac{1}{n}\{\Sigma x - b\Sigma y\}$

$a = \frac{1}{9}\{165 - (0.056)(114)\}$

$a = \frac{1}{9}\{165 - 6.384\}$

$a = \frac{1}{9}\{158.6\}$

$\boxed{a = 17.62}$

Hence $X = a + bY$

$X = 17.62 + 0.056Y$.

(6) Find the predicted values of Y for X = 20, 11, 15, 25, 28 and

X for Y = 5, 15, 9, 12, 16, 18.

X	Y	$Y = 12.09 + 0.031X$	$X = 17.62 + 0.056Y$
20	5	$= 12.09 + (0.031)(20) = 12.71$	$17.62 + 0.056(5) = 17.9$
11	15	$= 12.09 + (0.031)(11) = 12.4$	$17.62 + 0.056(15) = 18.4$
15	14	$= 12.09 + (0.031)(15) = 12.5$	$17.62 + 0.056(9) = 18.1$
10	17	$= 12.09 + (0.031)(25) = 12.8$	$17.62 + 0.056(12) = 18.2$
17	8	$12.09 + (0.031)(28) = 12.9$	$17.62 + 0.056(16) = 18.5$
18	9		$17.62 + 0.056(18) = 18.6$
21	12		
25	16		
28	18		

Q. No 1 Complete.

Q NO "2" (a)

⇒ A fair coin is tossed 5 times find the probabilities of obtaining various number of heads.

Solution:-

let us regard the tossing of a coin as an experiment. then we observe that

1 Each toss of coin has two possible outcomes, head and trail.

2 The probability of head success is $P = 1/2$ and remaining the same for successive tosses.

3 The successive tosses of the coin are independent.

4 The coin is tosses five times

⇒ Therefore the r.v X which denotes the numbers of heads (Successes) has a bionomial probability distribution with $P = 1/2$ and $n = 5$ the Possible value of x are 0, 1, 2, 3, 4, and 5

Hence:

$$P(\text{no head}) = P(x=0) = \binom{5}{0}\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^5 = 1 \times \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

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

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

$$P(3 \text{ heads}) = P(X=3) = \binom{5}{3}\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^{5-3} = 10 \times \left(\frac{1}{2}\right)^5 = \frac{10}{32}.$$

$$P(4 \text{ heads}) = P(x=4) = \binom{5}{4}\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)^{5-4} = 5 \times \left(\frac{1}{2}\right)^5 = \frac{5}{32}$$

and

$$P(5 \text{ heads}) = P(x=5) \binom{5}{5}\left(\frac{1}{2}\right)^5\left(\frac{1}{2}\right)^0 = 1 \times \left(\frac{1}{2}\right)^5 = \frac{1}{32}.$$

These probabilities can also be obtained by expending the bionomial $(1/2 + 1/2)^5$ the bionomial P.d for the number of head obtained in 5 tosses of fair coin is

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

QNO 2. (b)

A and B play a game in which A's probability of wining is 2/3 in a series of games what is the probability that A will win (i) At least four games. (ii) Exactly equall to 4/10 games. (iii) Exactly equall to 11 games (iv) 6 or more games

Solution:-

The bionomial probability distribution

$$n = 10$$

$$P = 2/3 \quad , \quad q = 1-P .$$

$$q = 1 - 2/3 \Rightarrow q = 1/3$$

let x denote the number of won by A then

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

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

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

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

$$1 - 0.0197 \Rightarrow \boxed{P(X \geq 4) = 0.9803}$$

(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) $P(x=11) = f(0) = 0$ because x can takes only value $0, 1, 2, 3, \ldots\ldots 10$.

iv) 6 or more games

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

$$= \binom{10}{6}\left(\frac{2}{3}\right)^{6}\left(\frac{1}{3}\right)^{4} + \binom{10}{7}\left(\frac{2}{3}\right)^{7}\left(\frac{1}{3}\right)^{3} + \binom{10}{8}\left(\frac{2}{3}\right)^{8}\left(\frac{1}{3}\right)^{2} + \binom{10}{9}\left(\frac{2}{3}\right)^{9}\left(\frac{1}{3}\right)^{1} + \binom{10}{10}\left(\frac{2}{3}\right)^{10}\left(\frac{1}{3}\right)^{0}$$

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

$$P(x \geq 6) = 0.79$$

Q No 2. completed.

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Q NO 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

The following figures give the number of children born to 50 women.

(a) → Construct the ungrouped frequency distribution of these data

Solution:

(1) - X_0 (minimum value) = 0
X_m (maximum value) = 10.

(2) - Range = $X_m - X_0$.
= 10 − 0
= 10

(3) - Let the number of classes
= 06

(4) = The class magnitude = $\frac{10}{7}$ = 1.5 = 2.00

(12)

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Now a ⇒ (The ungrouped)(discrete)

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

(B) Construct the grouped frequency distribution of these data

Children Born grouped	f.
0–1	5
2–3	19
4–5	13
6–7	7
8–9	3
10–11	3
	50