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Program

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Department :-

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Subject

Biostate.

Submitted to :-

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Q1 :- Part A

Calculate the correlation 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

Solution:-

Let us change the origin of X & Y

$u = X - 7$, $V = Y - 19$

X	Y	u	V	u^2	V^2	uV
3	25	-4	6	-16	-256	64
4	24	-3	5	-9	-225	45
5	20	-2	1	-4	-196	28
6	20	-1	1	-1	-169	13
7	19	0	0	0	-144	0
8	17	1	-2	1	-121	-11
9	16	2	-3	4	-100	-20
10	13	3	-6	9	-81	-27
11	10	4	-9	16	-64	-32
13	8	6	-11	36	-36	-36
Total 76	172	6	-18	36	-1392	24

(3)

$$r = \frac{\Sigma uv - (\Sigma u)(\Sigma v)/n}{\sqrt{\left[\Sigma u^2 - \frac{(\Sigma u)^2}{n}\right]\left[\Sigma v^2 - \frac{(\Sigma v)^2}{n}\right]}}$$

$$r = \frac{24 - (6)\left(-\frac{18}{10}\right)}{\sqrt{\left[(36) - \frac{(36)}{10}\right]\left[-1392 - \frac{(-18)^2}{10}\right]}}$$

$$r = \frac{24 + 10.8}{\sqrt{(36 - 3.6)[-1392 + 32.4]}}$$

$$r = \frac{34.8}{\sqrt{(32.4)(-1359.6)}}$$

$$r \; \frac{34.8}{\sqrt{+44051.04}}$$

$$r = \frac{34.8}{209.8} \Rightarrow 0.165 \text{ Ans}$$

Hence the correlation b/w x and y is 0.165

(4)

Q1 Part B(A)

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 of the least square regression line of y on x & y on y.

Solution

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	1404
25	16	400	625	256
28	18	504	784	324
165	114	2099	3309	1604

(5)

$\hat{Y} = a + bx$ —— (1)

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

$$b_{yx} = \frac{9 \times 2099 - 165 \times 114}{9 \times 3{,}309 - (165)^2}$$

$$b_{yx} = \frac{81}{2556} = 0.0316$$

$a = \bar{y} - b\bar{x}$ —— (2)

$$\bar{X} = \frac{\sum x}{n} = \frac{165}{9} = 18.33$$

$$\bar{Y} = \frac{\sum Y}{n} = \frac{114}{9} = 12.66$$

$a = 12.66 - 0.0316 \times 18.33$

$a = 12.081$

$\hat{y} = a + bx$

$\hat{y} = 12.081 + 0.0316x.$

$x = a + by$

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

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

(6)

$b_{xy} = \frac{81}{1440} \Rightarrow 0.05625$

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

$a = 12.66 - 0.05625 \times 18.33$

$a = 11.62$

$x = a + by$

$x = \boxed{11.62 + 0.5625y.}$

B) Find the predicted values of Y for X = 20, 11, 15, 25, 28 and x for Y = 5, 15, 9, 13, 16, 18.

Solution

Let us Now

Y	X	XY	X^2
5	20	160	400
15	11	165	121
14	15	210	225
17	10	170	100
8	17	136	289
9	18	162	324
12	21	252	441
16	25	400	625
18	28	504	784
114	165	2,099	3,309

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

$$b = \frac{9 \times 2{,}099 - 165 \times 114}{9 \times 3309 - (165)^2}$$

$$b = \frac{81}{2556} \Rightarrow 0.0316$$

$$\bar{x} = \frac{\sum x}{n} = \frac{165}{9} = 18.33$$

$$\bar{y} = \frac{\sum y}{n} = \frac{114}{9} = 12.66$$

$$a = 12.66 - 0.579$$

$$a = 12.081$$

The estimated regression model

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

$$\hat{y} = 12.08 + 0.0316x$$

Prediction of y when $x = 20+11+15+25+28$

$$\hat{y} = 12.081 + 0.0316(99)$$

$$\hat{y} = 12.081 + 3.128$$

$$\boxed{\hat{y} = 15.209}$$

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Q2 :- Part = A

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

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

i) each toss of a coin (i.e. each trial) has two possible outcomes, head (success) and tails (Failure).

ii) The probability of a head (success) is $P = \frac{1}{2}$ and remains the same for successive tosses.

iii) The successive tosses of the coin are independents

iv) The coin is tossed 5 times.

=> Therefore the r.v. which denotes the number of heads (successes) has a binomial probability distribution with $P = \frac{1}{2}$ and $n = 5$ the possible value of X are 0, 1, 2, 3, 4 and 5. Hence.

Hence:

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

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

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

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

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

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

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

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

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

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

$P(5\text{ heads}) = P(X=5) = \binom{5}{5}\left(\frac{1}{2}\right)^5\left(\frac{1}{2}\right)^0$

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

These Probabilities can also be obtained by expanding the binomal $\left(\frac{1}{2}+\frac{1}{2}\right)^5$. The binomial probabilities distribution for the number of heads obtained in 5 tosses of a fair coin is

x	0	1	2	3	4	5
$P(x)$	$1/32$	$5/32$	$10/32$	$10/32$	$5/32$	$1/32$

Q2(b):-

Proof:-

winning player A

$P = 2/3$ and $q = 1-P$

$q = 1 - 2/3 \Rightarrow q = \frac{3-2}{3} = 1/3$

$q = 1/3$

(i) At least 4 games

$$P(X \geq 4) = P(X=4) + P(X=5) + P(X=6) + P(X=7) + P(X=8) + P(X=9) + P(X=10)$$

OR

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

$$= 1 - \{P(X=0) + P(X=1) + P(X=2) + P(X=3) + P(X=4)\}.$$

$$P(X \geq 4) = 1 - \{(1/3)^{10} + (10)(2/3)(1/3)^9 + 45(2/3)^2(1/3)^8 + 120(2/3)^3(1/3)^7\}$$

$$= 1 - \left\{ \frac{1}{59049} + \frac{20}{59049} + \frac{180}{59049} + \frac{96}{59049} \right\}$$

$$P(x \geq 4) = 1 - \frac{(1+20+180+96)}{59049}$$

$$= 1 - \frac{1161}{59049}$$

$$= 1 - 0.019$$

$$P(x \geq 4) = 0.98$$

(ii) $P(x = 4/10) = 0$

that is possible prob.

Hence impossible prob $= 0$

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

Hence $x = 11$ is not include in this range b/c that is impossible

impossible prob $= 0$

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

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

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

$$P(x \geq 6) = 210\left(\frac{2}{3}\right)^{10}\left(\frac{1}{3}\right)^{4} + 120\left(\frac{2}{3}\right)^{7}\left(\frac{1}{3}\right)^{3} + 45\left(\frac{2}{3}\right)^{8}\left(\frac{1}{3}\right)^{2}$$

$$+ 10\left(\frac{2}{3}\right)^{9}\left(\frac{1}{3}\right) + 1\left(\frac{2}{3}\right)^{10}\left(\frac{1}{3}\right)^{0}$$

$$P(x \geq 6) = \frac{13440}{59049} + \frac{15360}{59049} + \frac{11520}{59049} + \frac{5120}{59049}$$

$$+ \frac{1024}{59049}.$$

$$P(x \geq 6) = \frac{46464}{59049}$$

$$P(x \geq 6) = 0.78$$

Hence proof.

Q3

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

2	6	7	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	20	2

(A) construct the un grouped frequency distribution of these data.

No	Tally mark	frequency	C.F
0	1	1	1
1	1111	4	5
2	LHI 111	8	13
3	LHI LHI 1	11	24
4	LHI 111	8	32
5	LHI	5	37
6	1111	4	41
7	111	3	44
8	11	2	46
9	1	1	47
10	111	3	50

Q3 Part B

construct the grouped frequency distribution of the data

$N = 50 \quad X_0 = 1, \; X_m = 10$

Range $= X_m - X_0$

$R = 10 - 1 = \boxed{9}$

$k = 1 + 3.3 \log N$

$= 1 + 3.3 \log(50)$

$= 1 + 3.3(1.698)$

$= 1 + 5.6066$

$k \; 6.606 = \boxed{7}$

$h =$ class interval $= \frac{Range}{k}$

$h = 9/7 = 1.285 = \boxed{2}$

(15)

we Find out the informations from data

$N = 50, R = 9, K = 6, h = 2$

class	f	c.b	mid point
0 - 1	5	-0.5 - 1.5	1
2 - 3	19	1.5 - 3.5	2.5
4 - 5	13	3.5 - 5.5	4.5
6 - 7	7	5.5 - 7.5	6.5
8 - 9	3	7.5 - 9.5	8.5
10 - 11	3	10.5 - 11.5	11

Total

R.F	R.F %	C.F	R.C.F
5/50	5/50 x 100 = 10	5	5/50 = 0.1
19/50	19/50 x 100 = 38	24	24/50 = 0.48
13/50	13/50 x 100 = 26	37	37/50 = 0.74
7/50	3/50 x 100 = 14	44	44/50 = 0.88
3/50	3/50 x 100 = 6	47	47/50 = 0.94
3/50	3/50 x 100 = 6	50	50/50 = 1