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Subject Biostatistic

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Q2:- Find the following?

part a

a) A fair Coin is tossed 5 times. Find the probabilities of obtaining various numbers of head.

Let us regard the tossing of a Coin has ~~two possible~~ an experiment. Then we observe that.

1) Each toss of Coin has two possible outcomes i-e head and Tail.

2) The probability of a head (success) is $p = \frac{1}{2}$ q the remain the Same for Successive tosses.

3) The Successive tosses of the Coin are ~~Indep~~ independent

4) The Coin is tossed 5 times

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

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

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

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

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

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

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

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

The binomial pd for the number of heads obtained in 5 tosses of your coin is.

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

answer 2

b

Part "b"

Therefore The binomial probibility dist with $n = 10$.

$p = 2/3$

$q = 1-p$

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

$q = \frac{1}{3}$

Let X denote The number of won by A

Then

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

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

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

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

$$1 - 0.0197$$

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

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 $P(x=11) = \phi(0)$ = because x can take only value :-

0, 1, 2, 3, ---- 10

iv

6 or more games:-

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

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

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

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

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

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

Q3:- The following figures give the number of children born to 50 women.

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 these data.

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

Solution:-

Give that:-

(1) X_0 (minimum [redacted] 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

→ Now 9 The Ungrouped (Discrete) Data:—

Children Born x_i	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	

→ Now (b) The grouped frequency data:-

Children Borne Grouped	f
0 – 1	5
2 - 3	19
4 - 5	13
6 - 7	7
8 – 9	3
10 – 11	3
	50

Q1:-

Part (A)

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	172	1148	670	3240

Now we need to find

$n\sum xy = ?$

$\sum x \sum y = ?$

$n\sum x^2 = ?$

$(\sum x)^2 = ?$

$n\sum y^2 = ?$

$(\sum y)^2 = ?$

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

$\sum y^2 = 3240$

$(\sum x) = 76$

$n = 10$

$\sum y = 172$

Putting value in formula:-

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

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

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

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

$$r_{xy} = -0.986$$

Interpretation:-

Hence we have the $r_{xy} = -0.986$ which tell us that there is strong negative correlation b/w x & y.

Q1- Part (B)

Part (b)

Y on X

$\hat{y} = a + bx$

X on Y

$\hat{x} = a + by$

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	2,099	3309	1604

(i) Determine the equation of Least Square 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

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

$\rightarrow a_{yx} = \dfrac{\sum y}{n} - b_{yx}\left(\dfrac{\sum x}{n}\right)$

or

$\rightarrow a_{yx} = \bar{y} - b_{yx}\bar{x}$

$b_{yx} = \dfrac{9(2099) - (165)(114)}{9(3309) - (165)^2}$

$b_{yx} = \dfrac{81}{2556}$

$\boxed{b_{yx} = 0.03169}$

Now

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

$$= 12.67 - (0.580983)$$

$$\boxed{a_{yx} = 12.089017}$$

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

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

&

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

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

By putting the value:-

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

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

$$\boxed{b_{xy} = 0.05625}$$

and

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

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

$$\boxed{a_{xy} = 17.6175}$$

Hence the equation of least square regression line is

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

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

x	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

The End