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Bs. Dental 6th Semester

Subject Bio statistics

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Submitted to Sir Anwar Shamim

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Gul Hina

Date: _____

Question No-1

find the following.

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 tail
2. The probability of a head (success) is $p = 1/2$ and remain the same for succeive tosses.
3. The successive tosses of the coin are independent
4. The coin is tossed 5 time.

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

Date:

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

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

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

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

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

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

These probabilities can also be obtained by expanding the binomial $(1/2 + 1/2)^5$. The binomial p.d for the number of heads obtained in 5 tosses of fair coin is

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

P.T.O

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Therefore the binomial probability dist with $n = 10$.

$p = 2/3$

$q = 1 - p$

$q = 1 - 2/3$

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

Let x denote the number of women by

Then

① $p(x \geq 4) = 1 - p(x < 4)$

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

$= 1 - [(\frac{1}{3})^{10} + 10(2/3)^1(\frac{1}{3})^9 + 45(\frac{1}{3})^2(\frac{2}{3})^8$

$+ 120(2/3)^3(\frac{1}{3})^7]$

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

$1 - 0.0197$

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

ii $p(x = 4) = \binom{10}{4}(2/3)^4(\frac{1}{3})^6$

$= 210(16/81)(\frac{1}{729})$

$= 3360/59049$

$P(x=4) = 0.056$

$\therefore P(x=11) = 0$ because x can take only value.

0, 1, 2, 3 ... 10.

6 or more games

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

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

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

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

$0.227 + 0.262 + 0.196 + 0.087 + 0.018$

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

Date:

Question No-2

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:

Given that.

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 class = 06

4- The Class magnitude = 10/7 = 1.5 = 2.00

→ Now (a) The ungrouped (Discrete) Data.

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	

→ Now (B) The group frequency data.

Children Born in group	f
0-1	5
2-3	19
4-5	13
6-7	7
8-9	3
10-11	3
	50

Question NO. 3

a. Calculate the correlation coefficient b/w X & Y

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

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 of the square regression line of Y on X & X & X on Y.

b. Find the predicted values of X = 20, 11, 15, 25, 28 and X for Y = 5, 15, 9, 12, 16, 18.

Solution:

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

Let us chang the origin of X &

Hence:

$U = X - 7, \quad V = 19$

Then r_{xy} = ran the calculation

needed to find r of given.

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
$\Sigma = 76$	$\Sigma = 172$	$\Sigma = 670$	$\Sigma = 3240$	$\Sigma = 1148$.

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 $n = 10$

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

$r =$

For $n = 10$

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

$$r = \frac{11480 - 13072}{\sqrt{(6770 - 5776)(32400 - 29584)}}$$

$$r = \frac{-1592}{\sqrt{(994)(2816)}}$$

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

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

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

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 $y = a + bx$.

$y = 12.09 + 0.03_1 x$

least Square regression line for x on y.

$x = a + by$

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

Date: _____

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

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

$b = 0.056$

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

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

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

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

$a = 1762$

Hence $X = a + by$

$X = 17.62 + 0.056Y$

b- find the predicted values of Y for X = 20, 11, 15, 25, 28, & X for Y = 5, 15, 9, 12, 16, 18.

P.T.O

Date: _____

Page no.

x	y	$Y = 12.09 + 0.031x$	$x = 17.62 + 0.56y$
10	5	$= 12.09 + (0.03)(10) = 12.71$	" + " (5) 17.9
11	15	$= 12.09 + (0.031)(11) = 12.4$	" + " (15) 18.4
15	14	" + " (15) 12.5	" + " (9) = 18.1
10	17	" + " (25) 12.9	" + " (12) = 13.2
17	8	" + " (28) 12.7	" + " (16) = 18.5
18	9	" + "	" + " (18) = 18.6
21	12	" + "	
25	16	" + "	
28	18	" + "	

Q. No-3 completed.