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Paper Biostatic

Q2:-

"A"

SOLUTION:-

A fair coin is tossed 5 times. Find the probabilities of obtaining various numbers of head.

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 & tail.
2) The probability of head (success) is $p = 1/2$ & remain the for successive tosses.

3) The Successive tosses of the Coin are independent

4) The Coin is tossed 5 times

Therefore the r.v X which denotes the numbers of heads (successes) has a binomial Probability distribution with $P = \frac{1}{2}$ & $n = 5$, the Possible value of X are 0, 1, 2, 3, 4 & 5 hence.

$$P(\text{no head}) - P(X=0) = \left[\begin{matrix}5\\0\end{matrix}\right]\left(\frac{1}{2}\right)^0\left(\frac{1}{2}\right)^5 =$$

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

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

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

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

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

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

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

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

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

P.T.O

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

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

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

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

Q1:- (b)

SOLUTION:-

X	Y	XY	X^2	Y^2
20	5	100	400	25
11	15	165	121	225
15	17	210	225	196
10	14	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**	**2099**	**3309**	**1604**

As we know that for Y on X we have

$\hat{y} = a_{yx} + bx$ and

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

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

$$b_{yx} = \frac{9(2099) - (165)(114)}{9(3399) - (165)^2} = \boxed{0.03169}$$

$$\bar{y} = 114/9 = 12.66$$

$$\bar{x} = \sum x / n = 165/9 = 1833$$

$$a = 12.66 - (0.3169)(18.33)$$

$$a_{yx} = 12.089017$$

Now the least Square ~~~~ regression line equation of y and x is.

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

$$\hat{y} = 12088017 + 0.3169x$$

Now for find the equation of x and y for this we have.

$$\hat{y} = a + by, \quad b_{xy} = \frac{n\sum xy - \sum xy}{n\sum y^2 - (\sum y)^2}$$

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

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

$\Rightarrow b_{xy} = 81/1440 = 0.05625.$

$b_{xy} = 0.05625.$

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

$a_{xy} = 17.6175.$

Hence the equation ~~is~~ of least square regression is

$\hat{x} = a + by$

$x = 17.6175 + (0.05625)y.$

(ii) Now ~~to~~ find the predicted values of y con fr.

$x = 20, 11, 15, 25, 28.$

x	$\hat{y}$
20	12.723
11	12.8438.
15	12.565
25	12.88
28	12.976.

Q1 (a)

SOLUTION:-

$N = 10$, so $n/2 = 10/2 = 5$

$u = x - 7$, $v = y - 19$

& then find $r_{xy} = r_{uv}$.

X	Y	U	V	U^2	V^2	UV
3	25	-4	6	16	36	-24
4	24	-3	5	9	25	-15
5	20	-2	1	4	1	-2
6	20	-1	1	1	1	-1
7	19	0	0	0	0	0
8	17	1	-2	1	4	-2
9	16	2	-3	2	9	-6
10	13	3	-6	9	36	-18
11	10	4	-9	16	81	-36
13	8	6	-11	36	121	-66
76	172	6	-18	94	314	-170

$$r = \frac{-170 - 6 \times -18/10}{\sqrt{\left(94 - \frac{(6)^2}{10}\right)\left(314 - \frac{(-18)^2}{10}\right)}}$$

$$r = \frac{-170 + \frac{108}{10}}{\sqrt{\left(94 - 36/10\right) \cdot \left(314 - 324/10\right)}}$$

$$r = \frac{-1700 + \frac{108}{10}}{\sqrt{\left(940 - \frac{36}{10}\right)\left(3140 - \frac{324}{10}\right)}}$$

$$r = \frac{-159.2}{\sqrt{(90.4)(281.6)}}$$

$$r = \frac{-159.2}{\sqrt{25456.6}}$$

$$r = \frac{-159.2}{159.5}$$

$$= -0.998$$

$$\boxed{= -0.1}$$

Q3 (a)

SOLUTION.

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

uncompleted frequency distribution.

No	Tallymarks	frequency	Cumulative frequency.
0	1	1	1
1	1111	4	5
2	~~1111~~ 111	8	13
3	~~1111~~ ~~1111~~ 1	11	24
4	~~1111~~ 111	8	32
5	~~1111~~	5	37
6	1111	4	41
7	111	3	44
8	11	2	46
9	1	1	47
10	111	3	50

Q3 (b)

SOLUTION:-

Given data:-

2	6	1	5	4	3	7	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

group frequency distribution for given data:-

N= 50 data

$N = 50$, $x = 1$, $x_m = 10$

$Range = x_m - x_0$

$R = 10 - 1$ 9

$k = 1 + 3.3 \log N$

$= 1 + 3.3 \log(50)$

$= 1 + 3.3 (1.698)$

$= 1 + 5.6066$

$k = 6.606 = 6$

$h =$ Class Interval $=$ Range$/k$

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

we find out the Information from data

$N = 50 \quad R = 9, k = 6, h = 2$

Classes	Frequency	classbondary	Main 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

R. frequency	R. frequency	C.f	R.c.f.
$5/50$	$5/50 \times 100 = 10$	5	$5/50 = 0$
$19/50$	$19/50 \times 100 = 38$	24	$24/50 = 0$
$13/50$	$13/50 \times 100 = 26$	37	$37/50 = 0$
$7/50$	$7/50 \times 100 = 14$	44	$44/50 = 0$
$3/50$	$3/50 \times 100 = 6$	47	$47/50 = 0$
$3/50$	$3/50 \times 10 = 6$	50	$50/50 = 0$

Q2:- (b)

Solution:- There fore the binomial probability dist width $n = 10$

$p = 2/3$, $q = 1 - p$, $q = 1 - 2/3$, $q = 1/3$.

Let x ~~deter~~ donate the numbers of won by A then

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

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

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

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

$1 - 0.0197$

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

(ii):

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

$= 216\left(\frac{16}{81}\right)\left(\frac{1}{729}\right)$

$= 3360/59049$

$P(x=4) = 0056.$

(iii) $P(x=11) = 8(0) =$ b/c x can take only value

$0, 1, 2, 3 \ldots\ldots 10$

(iv) 6 or more games

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

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

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

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

$= 0.228 + 0.261 + 0.196 + 0.87 + 0018$

$\boxed{P(x \geq 6) = 0.79}$