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Q1 (a)

Sol:

$N = 10$, So $\frac{n}{2} = \frac{10}{2} = 5$

$U = X - 7$, $V = y - 19$

and 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	19	-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
Sum:						

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

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

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

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

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

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

$$\gamma = \frac{-159.2}{159.5} = -0.998 = \boxed{0.1}\,!$$

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Q1
(b):-
Ans:-
The necessary calculation for determining the equation of least square regression.

	X	Y	X^2	Y^2	ΣXY
1	20	5	400	25	100
2	11	15	121	225	165
3	15	14	225	196	210
4	10	17	100	289	170
5	17	8	289	64	136
6	18	9	324	81	162
7	21	12	441	144	252
8	25	16	625	256	400
9	28	18	784	324	504
Total	165	114	3309	1604	2099

As we know that for y on x we have

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

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

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

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

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

$$= \frac{81}{2556}$$

$= 0.03169$

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

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

$= 12.66 - (0.3169)(18.33)$

$l_{yx} = 12.089017$

Now the least square regression line equation of y and x is

$\hat{y} = a + bx$

$\hat{y} = 12.089017 + 0.3169x$

Now to find the equation of x on y for this we have

$\hat{x} = a + bxy$ and

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

$axy = \bar{x} - bxy\,\bar{y}$

by putting values

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

$$bxy = \frac{8}{1440} = 0.05625$$

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

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

$$a_{xy} = 17.6175$$

Hence the equation of least square regression line is

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

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

(ii) Now to find the predicted values of y for X = 20, 11, 15, 25, 28

X	$\hat{y}$
20	12.723
11	12.8438
15	12.565
25	12.8813
28	12.976

and the predicted values of

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(7)

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

Y	$\hat{X}$
5	17.89875
15	18.46125
9	18.12375
12	18.2925
16	18.8175
18	18.63

Q2:-

(a):-

Ans:

Let us regard the tossing of a coin an experiment. Then we observe that:-

(i) each toss of a coin (i.e each trial) has two possible outcomes, heads (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 idependent; and

(iv) the coin is tossed 5 times.

Therefore the r.v. X which denotes the number of heads (successes) has a binomial probability distribution with $p = 1/2$ and $n = 5$. The possibl 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 expanding the binomial $\left(\frac{1}{2} + \frac{1}{2}\right)^5$.

The binomial probability distribution for the number of heads obtained in 5 tosses of a fair coin is.

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

Q2 part (b)
Ans:-

Solution:-

Therefore the binomial probability with $n = 10$

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

Let x denote the number won by A then

(i) $p(x \geq 4) = 1 - p(x \leq 4)$

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

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

$$\left. + 120 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^9\right]$$

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(11)

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

$1-00197$

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

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

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

$$= \frac{3360}{59049}$$

$$\boxed{P(x=4) = 0.056}$$

(iii) $P(x=11) = b(6) =$ because x can take only value

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

(iv) 6 or more games

(12)

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

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

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

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

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

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

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Q3 (a):-
Ans

Given data

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

un completed frequency distribution

No	Tallymarb	frequency	comolative frequency
0	I	1	1
1	IIII	4	5
2	𝍸 III	8	13
3	𝍸 𝍸 1	11	24
4	𝍸 III	8	32
5	𝍸	5	37
6	IIII	4	41
7	III	3	44
8	II	2	46
9	I	1	47
10	III	3	50

Q3(b):-

Ans:-

Give information 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

group frequency distribution for given data.

$N = 50$ data

$N = 50 \qquad x_0 = 1 \qquad x_m = 10$

Range $= X_m = x_0$

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

$K = 1 + 3.3 \log N$

$= 1 + 3.3 \log (50)$

$1 + 3.3 (1.698)$

$= 1 + 5.6066$

$K = 6.606 = \boxed{6}$

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

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

we find out the information from data

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

Classes	Frequency	class boundary	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 50

R. frequency	R. frequency	C.F	R.CF
5/50	5/50×100=10	5	5/50 =0.
19/50	19/50×100=38	24	24/50 =0.
13/50	13/50×100=26	37	37/50=0.
7/50	7/50×100=14	44	44/50=0.
3/50	3/50 ×100=6	47	47/50 =0.
3/50	3/50 ×100 =6	50	50/50=0.