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program:bs (MLT)

semester:6th

[dreamstime.](http://dreamstime.com)

(1)

Q1

Ans:

Calculate Correlation b/w x and y

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
$\Sigma x = 76$	$\Sigma y = 179$	$\Sigma x^2 = 670$	$\Sigma y^2 = 3240$	$\Sigma xy = 1148$

$n = 14$

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

$$r = \frac{14(1148) - 76(179)}{\sqrt{[14(670) - (76)^2] [14(3240) - (179)^2]}}$$

$$= \frac{16072 - 13072}{\sqrt{(9380 - 5776)(45360 - 32041)}}$$

$$\sqrt{(9380 - 5776)(45360 - 32041)}$$

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$$r = \frac{3000}{\sqrt{(3604)(15776)}}$$

$$r = \frac{3000}{7540}$$

$$r = 0.39$$

Q 1

Ans (B) :-

X	Y	X ²	XY
20	5	400	100
11	15	121	165
15	14	225	210
10	17	100	170
17	8	289	136
18	9	324	162
21	12	441	252
25	16	625	400
28	18	784	504
$\Sigma X = 165$	$\Sigma Y = 114$	$\Sigma X^2 = 8309$	$\Sigma XY = 2099$

$$\hat{Y} = a + bX$$

where

$$b = \frac{n \Sigma XY - \Sigma X \Sigma Y}{\sqrt{n \Sigma X^2 - (\Sigma X)^2}}$$

$$\sqrt{n \Sigma X^2 - (\Sigma X)^2}$$

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$$b_2 = \frac{9(2099) - (165)(114)}{\sqrt{9(3309) - (165)^2}}$$

$$b_2 = \frac{18891 - 18810}{\sqrt{27881 - 27225}}$$

$$b_2 = \frac{81}{556}$$

$$b_2 = \frac{81}{23} = \boxed{3.52}$$

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

$$= \frac{114}{9} - 3.52 \left(\frac{165}{9} \right)$$

$$a = 12.66 - (3.52)(18.33)$$

$$a = \boxed{-51.86}$$

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

$$\hat{y} = -51.86 + bx$$

$$\{x = 201\}$$

$$\hat{y} = -51.86 + 3.52 \times 20$$

$$\hat{y} = \boxed{18.53}$$

Q2 :-

→ (A)

Ans :-

→ Let us regard 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, heads - (Success) and tail (Failure)
- (ii) The probability of a head (Success) is $p = \frac{1}{2}$ and remain the same for successive tosses:
- (iii) ~~The probability of a head~~
- (iii) The successive tosses of the coin are independent, and
- (iv) The coin is tossed 5 times.

There The r.v, x which denotes the number of heads (Successes) has a binomial probability distribution with $p = 1/2$ and $n = 5$.

The possible value of x are - 0, 1, 2, 3, 4 and 5 Hence

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

$1 \times \left[\frac{1}{2}\right]^5 = \frac{1}{32}$

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

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

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

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

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

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

The binomial p.d for the number of heads obtained in 5 tosses of fair coin is

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

(6)

Qa

(B)

Ans:

Solution:-

Therefore the binomial probability
dist with $n=10$

$$p = 2/3$$

$$q = 1-p$$

$$q = 1-2/3$$

$$q = 1/3$$

Let x denote the number of wins
by A then

$$\textcircled{i} \quad P(x \geq 4) = 1 - P(x \leq 3)$$

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

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

$$= 1 - \frac{1}{59049} [1 + 20 + 130 + 960]$$

$$1 - 0.0197$$

$$P(x \geq 4) = 0.9803$$

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$$\begin{aligned}
 \text{(ii)} \quad P(X=4) &= \binom{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^6 \\
 &= 210 \left(\frac{16}{81}\right) \left(\frac{1}{729}\right) \\
 &= \frac{3360}{59049}
 \end{aligned}$$

$$P(X=4) = 0.056$$

(iii) $P(X=11) = f(0) =$ because X can take only value 0, 1, 2, 3, ..., 10.

(iv) 6 or more games \Rightarrow

$$\begin{aligned}
 P(X \geq 6) &= \sum_{x=6}^{10} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x} \\
 &= \binom{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4 + \binom{10}{7} \left(\frac{2}{3}\right)^7 \left(\frac{1}{3}\right)^3 \\
 &\quad + \binom{10}{8} \left(\frac{2}{3}\right)^8 \left(\frac{1}{3}\right)^2 + \binom{10}{9} \left(\frac{2}{3}\right)^9 \left(\frac{1}{3}\right)^1 \\
 &\quad + \binom{10}{10} \left(\frac{2}{3}\right)^{10} \left(\frac{1}{3}\right)^0 \\
 &= 0.228 + 0.261 + 6.186 + 0.087 + 0.018
 \end{aligned}$$

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

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Q3 :- Given information of children born to 50 women.

(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	2	4	4	4	6	8	10	7
7	5	6	5	3	2	3	9	2	2

cm grouped frequency distribution

No	Tally mark	Frequency	Cumulative Frequency
0	✓ 1	1	1
1	IIII	4	5
2	IIII III	8	13
3	IIII III I	11	24
4	IIII III	8	32
5	IIII	5	37
6	IIII	4	41
7	III	3	44
8	II	2	46
9	I	1	47
10	III	3	50

(9)

Q3

(B)

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

Grouped Frequency distribution for given data:

$$N = 50 \quad x_0 = 1, \quad x_m = 10$$

$$\text{Range} = x_m - x_0 =$$

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

$$K = 1 + 3.3 \log N$$

$$= 1 + 3.3 \log (50)$$

$$= 1 + 5.6066$$

$$K = 6.606 = \boxed{6}$$

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

$$h = \frac{9}{6} = 1.5 = \boxed{2}$$

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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	9.5 - 11.5	11

R. Frequency	R. Frequency %	C.F	R.C.F
5/50	$5/50 \times 100 = 10$	5	$5/50 = 0.1$
19/50	$19/50 \times 100 = 38$	24	$24/50 = 0.5$
13/50	$13/50 \times 100 = 26$	32	$32/50 = 0.6$
7/50	$7/50 \times 100 = 14$	44	$44/50 = 0.8$
3/50	$3/50 \times 100 = 6$	47	$47/50 = 0.9$
3/50	$3/50 \times 100 = 6$	50	$50/50 = 1$