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paper = Biostatistic

Bs MLT 6th

Q1

a) Calculate the Correlation coefficient between X and Y.

Price(x)	3	4	5	6	7	8	9	10	11	13
Demand(y)	25	24	20	20	19	17	16	13	10	8

Solution.

$N = 10$, so $\frac{N}{2} = \frac{10}{2} = 5$

So $u = X - 7$ & $v = Y - 11$

Let $u = X - 7$ and $v = Y - 19$

and then find $r_{xy} = r_{uv}$

	X	Y	u	v	u^2	v^2	uv
	~~7~~ 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	-10	36	121	-66
Sum =	76	172	6	-18	94	314	-170

$$r = \frac{-170 - \frac{6 \times -18}{10}}{\sqrt{\left[96 - \frac{96}{10}\right]\left[314 - \frac{314}{10}\right]}}$$

$$r = \frac{\frac{-1700 + 108}{10}}{\sqrt{\left\{\frac{960 - 96}{10}\right\}\left[\frac{3140 - 314}{10}\right]}}$$

$$r = \frac{\frac{-1,592}{10}}{\sqrt{\left[\frac{864}{10}\right]\left[\frac{2826}{10}\right]}}$$

$$r = \frac{\frac{-1592}{10}}{\sqrt{\left[\frac{2441664}{100}\right]}}$$

$$r = \frac{\frac{-1592}{10}}{\frac{1562.58}{10}} = \frac{-1592 \times 10}{1562.58 \times 10}$$

$$r = \frac{-15920}{15625.8} = \boxed{-1.01} \rightarrow \text{Ans}$$

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 and tail.
2. The probability of a head (success) is p =1/2 and remain the same 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 = ½ and n = 5. the possible value of X are 0,1,2,3,4, and 5 hence.

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

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

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

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

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

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

These probabilities can also be obtained by expanding the binomial (½ + ½)^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
$f(x)$	$\frac{1}{32}$	$\frac{5}{32}$	$\frac{10}{32}$	$\frac{10}{32}$	$\frac{5}{32}$	$\frac{1}{32}$

Q 2 part (b)

Solution Here-

There fore 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 won by A then

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

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

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

$$\left. + 120 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7 \right]$$

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

$1 - 0.0197$

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

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

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

$= \frac{3360}{59049}$

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

(iii) $P(X=11) = 0$ because X can take only value

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

(iv) 6 or more games

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

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

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

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

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

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

Q3. Give information of children born to 50 women.

Birth.

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

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

$\text{Range} = x_m - x_0$

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

$K = 1 + 3.3 \log N$

$= 1 + 3.3 \log(50)$

$1 + 3.3\ (1.698)$

$= 1 + 5.6060$

$K = 6.606 = \boxed{6}$

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

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

we find out the information from data.

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

Classes	Frequency	classbonding	Mainpoint
0-1	5	0.5 - 1.5	1
2 - 3	19	1.5 - 3.5	2.5
4 - 5	13	35 - 5.5	4.5
6 - 7	7	55 - 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.c.f
5/50	5/50 x 100 = 10	5	5/50 = 0.
19/50	19/50 x 100 = 38	24	24/50 = 0.
13/50	13/50 x 100 = 26	37	37/50 = 0.
7/50	7/50 x 100 = 14	44	44/50 = 0.
3/50	3/50 x 100 = 6	47	47/50 = 0.
3/50	3/50 x 100 = 6	50	50/50 = 0.

Q3(a): Given data:

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

uncompled frequency distribution

NO	Tolly marks	frequency	Cumulative frequency
0	I	1	1
1	IIII	4	5
2	~~IIII~~ III	8	13
3	~~IIII~~ ~~IIII~~ 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

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Q1: Calculate:

(A) part

x	3	4	5	6	7	8	9	10	11	13
y	25	24	20	20	19	17	16	13	10	8

Sol: let us change the origin of x and y

$u = x - 7$, $v = y - 19$ $n/2 = 10/2$

$= 5$

x	y	u	uc	vc	uv	
3	25	3-7 = -4	25-19 = 6	14^2 = 16	10^2 = 36	-4×6 = -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	4	9	-6
10	13	3	-6	9	36	-18
11	10	4	-9	16	81	-136
13	8	6	-11	36	121	-66
		= 6	Σ = 18	Σ 96	Σ 314	Σ 170

$$r = \frac{\Sigma uv - \frac{1}{N}\, \Sigma u \Sigma v}{\sqrt{\Sigma \Sigma uc - \frac{1}{N} (\Sigma u)^2 \{\Sigma v^2 - \frac{1}{N}(\Sigma v^2\}}}$$

$$= \frac{-170 - \frac{1}{10}\{6 \times -18)}{\sqrt{\{96 - \frac{1}{10}(96)^2\{(-18)^2 - \frac{1}{10}(-18)\}}}$$

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Q1

part B:

x	20	11	15	25	28	10	$= 99$
y	5	15	9	12	10	18	$- 75$

x	20	11	15	$\cancel{10}$	10	17	18	21	25	28
y	5	15	14	$\cancel{14}$	17	8	9	12	10	18

y	x	xy	x^2
5	20	100	400
15	11	165	121
14	15	210	225
17	10	170	100
8	17	136	289
9	18	162	289
12	21	252	324
16	25	400	441
18	28	504	625
114	105	2099	785
			3309

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

$$B = \frac{9 \times 2099 - 105 \times 114}{9 \times 3309 - (105)^2}$$

$$B = \frac{81}{2556} \Rightarrow \boxed{0.0316}$$

Q1.

(a) Determine the equation of least Squares of line of Y on x and x on y.

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	10	250	625	256
28	18	400	784	324
165	114	504 / 2,099	3309	1604

$\hat{y} = a + bx$

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

$$b = \frac{9 \times 2099 - 165 \times 114}{9 \times 3,309 - (165)^2}$$

$$b_{yx} = \frac{81}{2550} = 0.0316$$

$a = \bar{y} - b\bar{x}$ — (1)

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

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

$a = 12.66 - 0.0316 \times 18.33$

$a = 12.081$

$\bar{y} = a + bx$

$\bar{y} = 12.081 + 0.0316x$

$x = a + by$

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

$$b_{xy} = \frac{9 \times 2097 - (165)(114)}{9 \times 1604 - (114)^2}$$

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

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

$a = 12.66 - 0.05625 \times 18.33$

$a = 11.62$

$x = a + by$

$x = 11.62 + 0.05625y$

R:
part.

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

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

$a = 12.66 - 0.0316 \times 18.33$

$a = 12.66 - 0.579$

$a = 12.081$

The estimated regression model.

$$y = a + bx$$

$$y^{\wedge} = 12.088 + 0.0316x$$

prediction of y when $x =$ [illegible]

$$y^{\wedge} = 12.081 + 0.0316\,(99)$$

$$y^{\wedge} = 12.081 + 3.128$$

$$\boxed{y^{\wedge} = 15.209}$$