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Subject: Bio State:

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Q. 1. A firm: Calculate the correlation coefficient
 b/w x & y . (1)

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

Sol. Given:

$$N = 10 \quad \therefore \frac{N}{2} = \frac{10}{2} = 5$$

$$u = x - 7 \quad \& \quad v = y - 4$$

$$\text{Let } u = x - 7 \quad \& \quad v = y - 15$$

$$\& \text{ Then find } r_{xy} = r_{uv}$$

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	4	9	-6
10	13	3	-6	9	36	-36
11	10	4	-9	16	81	-36
13	8	6	-11	36	121	-66
76	172	6	-18	94	314	-120

So find the r
the formula is used.

$$r = \frac{\sum uv - (\sum u)(\sum v) / n}{\sqrt{\left[\sum u^2 - \frac{(\sum u)^2}{n}\right] \left[\sum v^2 - \frac{(\sum v)^2}{n}\right]}}$$

Put value

$$r = \frac{-170 - 6 \times (-18)}{10}$$

$$r = \frac{\sqrt{\left[94 - \frac{(6)^2}{10}\right] \left[314 - \frac{(-18)^2}{10}\right]}}{-170 - \frac{-108}{10}}$$

$$r = \frac{\sqrt{\left[94 - \frac{36}{10}\right] \left[314 - \frac{324}{10}\right]}}{-170 - 10.8}$$

$$r = \frac{\sqrt{(94 - 3.6)(314 - 32.4)}}{\sqrt{25456.6}} = \frac{-159.2}{159.5}$$

$$r = -1$$

Question 1
Part (B) (A) Part

X	Y	XY	X ²	Y ²
20	5	100	400	25
11	15	165	121	325
15	14	210	225	196
10	12	170	100	289
17	8	306	288	64
18	9	162	324	81
21	12	252	441	144
25	16	400	625	258
28	18	504	784	324
165	114	2269	3309	1604

∴ The regression equation of y on x is

$$y = a + bx$$

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

$$\Rightarrow b = \frac{9(2269) - (165)(114)}{9(3309) - (165)^2}$$

$$\Rightarrow b = \frac{20421 - 18810}{29781 - 27225} = \frac{1611}{2556}$$

$$\Rightarrow \boxed{b = 0.63} \quad \text{(A)}$$

Q 1 B part (A)

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$$a = \frac{\sum Y}{n} - b \left(\frac{\sum X}{n} \right)$$

$$a = \frac{114}{9} - 0.63 \left(\frac{165}{9} \right)$$

$$a = 12.66 - 0.63 (18.33)$$

$$a = 12.66 - 11.55$$

$$a = 1.11$$

∴ The regression Eqⁿ on y

$$X = a + by$$

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

$$b = \frac{9(2269) - (165)(114)}{9(1664) - (114)^2}$$

$$b = \frac{20421 - 18810}{14436 - 12396}$$

$$b = \frac{1611}{1440}$$

$$b = 1.12 \quad b$$

The automated regression

is of X on y

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

$$\hat{X} = 4.15 + 1.12y$$

$$\hat{X} = 5.27 \quad \text{part (A)}$$

Q no 2 Part B pag 5

(B part)

Predicted values of y for

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

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

$$= 1.11 + 0.63(20) \quad x = 20$$

$$\hat{y} = 1.11 + 12.6$$

$$\boxed{\hat{y} = 13.71} \text{ --- (i)}$$

$$\hat{y} = 1.11 + 0.63(11) \quad x = 11$$

$$\boxed{\hat{y} = 10.56} \text{ --- (ii)}$$

$$\hat{y} = 1.11 + 0.63(15)$$

$$\boxed{\hat{y} = 10.56} \text{ --- (iii)}$$

$$\hat{y} = 1.11 + 0.63(25)$$

$$\boxed{\hat{y} = 16.86} \text{ --- (iv)}$$

$$\hat{y} = 1.11 + 0.63(28)$$

$$\boxed{\hat{y} = 18.75} \text{ --- (v)} \quad x = 28$$

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Projected value of x for y

$$y = 5, 15, 9, 12, 16, 18$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (5)$$

$$\boxed{\bar{x} = 9.75} \quad \text{(i)}$$

$$y = 5$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (15)$$

$$\boxed{\bar{x} = 20.95} \quad \text{(ii)}$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (9)$$

$$\boxed{\bar{x} = 17.59} \quad \text{(iii)}$$

$$y = 9$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (12)$$

$$\boxed{\bar{x} = 17.59} \quad \text{iv}$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (16)$$

$$\boxed{\bar{x} = 22.09} \quad \text{v}$$

$$\bar{x} = 4 \cdot 15 + 1 \cdot 12 (18)$$

$$\boxed{\bar{x} = 24.31} \quad y = 18$$

Q no 3

pag (7)

Part A

Given data:

2	6	1	5	4	3	3	8	10	1
4	3	3	0	5	2	1	11	10	3
5	3	3	0	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

incomplete frequency distribution:

No	Tally marks	frequency	Cumulative frequency
0		1	1
1		4	5
2		8	13
3		11	24
4		8	32
5		5	37
6		4	41
7		3	44
8		2	46
9		1	47
10		3	50

Q No 3

Part B

Given information of children between
to 10 women.

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

Group frequency distribution for given
data.

$$N = 50 \text{ data}$$

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

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

$$R = 10 - 1 = 9$$

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

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

$$1 + 3.3 (1.698)$$

$$\Rightarrow 1 + 5.6066$$

$$k = 6.606 = 6$$

$h = \frac{9}{7} = 1.2857 = [2]$

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We find information from data

$n = 50, R = 9, k = 6, h = 2$

Classes	frequency	Class bounding	Mean 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	"

Total 50

R-frequency	R-frequency	C.F	R.e.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	$3/50 \times 100 = 6$	50	$50/50 = 1$

Q2. (A) (10)

Two possible outcomes = win & Notwin

⇒ Prob - A winning $p = 2/3$

= 10 games

= n_2 $1p = 2/3$

= Successive games won and lost Independently

$$\textcircled{i} P(x=4) = \frac{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^4 = \frac{1128}{5651}$$

$$\textcircled{ii} P(x \geq 4) = 1 - P(x < 4) \quad 4 \text{ means 4 anspre}$$

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

$$= 1 - \left(\frac{1}{3}\right)^{10} + 10 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^9 + 28 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^8 + 56 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7$$

$$= 1 - \frac{1}{6561} (20 + 16 + 28 + 448)$$

$$1 - \frac{577}{6561} = \frac{5984}{6561} = 0.9121$$

$$P(x > 6) = \sum_{x=7}^{10} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

$$= \frac{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4 + \frac{10}{7} \left(\frac{2}{3}\right)^7 \left(\frac{1}{3}\right)^3 + \frac{10}{10} \left(\frac{2}{3}\right)^8 \left(\frac{1}{3}\right)^2$$

$$= \frac{100}{6561} (30 + 16 + 2) = \frac{100 \times 48}{6561} = \frac{4800}{6561} = 2194$$

Q: 2 (B)

(11)

$$P(3 \leq x < 6) = \left(\sum_{x=3}^5 \binom{6}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{6-x} \right)$$

$$= \frac{10}{3} \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^3 + \left(\frac{8}{4}\right) \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^2 + \left(\frac{10}{3}\right) \left(\frac{2}{3}\right)^5 \left(\frac{1}{3}\right)^1$$

$$\left(\frac{10}{6}\right) \left(\frac{2}{5}\right)^6 \left(\frac{1}{3}\right)^2$$

$$\frac{(2)^3}{3^{16}} (50 + 160 + 240 + 244)$$

$$\frac{10 \times 644}{6561} = \frac{6440}{6561} = \boxed{0.98155}$$