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Department (BS) MLT 6th Semester

Paper Bio-statistic

Submitted to Sir Anwar Shamism

(1)

Q No. 1

Part no. 1) 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 :-

$$N = 10 \quad \text{So} \quad \frac{N}{2} = \frac{10}{2} = 5$$

Let $u = X -$ and $v = y -$

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

(P.T.O)

Q No. 1 (1)

(2)

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	-10	36	121	-66	
Sum	76	172	6	-18	94	314	-70

Q No. 1 (1)

(3)

• Now to find the γ

The formula used

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

• Put Formula

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

$$r = \frac{\quad}{\quad}$$

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

$$r = \frac{-170 - \frac{108}{10}}{\quad}$$

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

$$r = \frac{-170 - 10.8}{\sqrt{(94 - 3.6)(314 - 32.4)}} = \frac{-159.2}{\sqrt{(90.4)(281.6)}}$$

$$r = \frac{-159.2}{\sqrt{25456.6}} = \frac{-159.2}{159.5}$$

$$r = -1$$

ANSWER

Q No 1 part (B)

102-8(9)

X	Y	XY	X ²	Y ²
20	5	100	400	25
11	15	165	121	325
15	14	210	225	196
10	17	170	100	289
17	8	306	289	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 $\hat{y} = a + bx$

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

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

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

$$\Rightarrow \boxed{b = 0.63} \rightarrow \textcircled{A}$$

Q No. 1 (part B) part (a) part

(2)

$$a = \frac{\sum y}{n} - b \left(\frac{\sum x}{n} \right)$$

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

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

$$a = 12.66 - 11.555$$

$$a = 1.11$$

∴ Thus regression Eq. x on y

$$\hat{X} = a + b \cdot y$$

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

$$b = \frac{9(2269) - (165)(114)}{9(1604) - (114)^2}$$

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

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

$$b = 1.12 \rightarrow (B)$$

Q No. 1 Part B (a) (3)

Thus the estimated regression
line of x on y

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

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

$$\boxed{x = 5.27} \rightarrow \text{Part (a)}$$

Q NO. 1 Part (B) (b)

Predicted value of x for y
 $y = 5, 15, 9, 12, 16, 18$

$$\bar{x} = 4.15 + 1.12 (5)$$

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

$$y = 5$$

$$\bar{x} = 4.15 + 1.12 (15)$$

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

$$y = 15$$

$$\bar{x} = 4.15 + 1.12 (9)$$

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

$$y = 9$$

$$\bar{x} = 4.15 + 1.12 (12)$$

$$\bar{x} = 17.59 \text{ --- (iv)}$$

$$y = 12$$

$$\bar{x} = 4.15 + 1.12 (16)$$

$$\bar{x} = 22.09 \text{ --- (v)}$$

$$y = 16$$

$$\bar{x} = 4.15 + 1.12 (18)$$

$$\bar{x} = 24.31$$

$$y = 18$$

1

Q No 1 part (B) (b)

Predicted values of y for
 $x = 20, 11, 15, 25, 28$.

$$\hat{y} = a + bx$$
$$= 1.11 + 0.63(20) \quad x = 20$$

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

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

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

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

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

$$\hat{y} = 10.56 \quad \text{--- (iii)} \quad x = 15$$

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

$$\hat{y} = 16.86 \quad \text{--- (iv)} \quad x = 25$$

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

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

Q3(a). 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	6	5	1	2	3	7	2	2

uncompd frequency distribution

NO	Tally marks	frequency	Cumulative frequency
0	I	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

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

Classes	Frequency	class boundary	Midpoint
0-1	5	0.5 - 1.5	1
2-3	14	1.5 - 2.5	2.5
4-5	13	3.5 - 4.5	4.5
6-7	7	5.5 - 6.5	6.5
8-9	3	7.5 - 8.5	8.5
10-11	3	10.5 - 11.5	11

Total 50

R-frequency	R-frequency	C-f	R-c-f
5/50	$5/50 \times 100 = 10$	5	$5/50 = 0.1$
19/50	$19/50 \times 100 = 38$	24	$24/50 = 0.48$
32/50	$32/50 \times 100 = 64$	37	$37/50 = 0.74$
39/50	$39/50 \times 100 = 78$	44	$44/50 = 0.88$
42/50	$42/50 \times 100 = 84$	47	$47/50 = 0.94$
45/50	$45/50 \times 100 = 90$	50	$50/50 = 1.0$

Q3 Give information of children born to 50 women.

Ans:

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

$N = 50$

$x_0 = 2$

$x_m = 10$

Range = $x_m - x_0$

$$R = 10 - 2 = \boxed{8}$$

$k = 1 + 3.3 \log N$

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

$$= 1 + 3.3 (1.699)$$

$$= 1 + 5.6066$$

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

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

$$h = \frac{8}{6} = 1.333 = \boxed{2}$$

we find out the information from data.

Q2. (A)

Two possible outcomes = win & not win

\Rightarrow Prob - A winning $p = 2/3$

= 10 games

= n_2 $1p = 213$

= Successive games won and lost independently

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

$$\textcircled{ii} P(x \geq 4) = 1 - P(x < 4) \quad 4 \text{ means 4 attempts}$$
$$= 1 - \sum_{x=0}^3 \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

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

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

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

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

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

$$= \frac{100}{6561} (30 + 16 + 2) = \frac{100 \times 48}{6561} = \frac{4800}{2187} \approx 2.194$$

Q: 2 (B)

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

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

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

$$\frac{(2)^3}{3^6} (50 + 160 + 240 + 244)$$

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

Ans (b)

\Rightarrow Two possible outcomes i.e. :
 A will win or will ~~not~~ ~~not~~ - win.

\Rightarrow Probability = A ~~will~~ win $p = 2/3$

= 10 games.

= $n = 10$

\Rightarrow Successive game won & lost independently

$$(i) P(X=4) = \frac{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^4 = \frac{1128}{6561} = 0.1719$$

$$(ii) P(X > 4) = 1 - P(X \leq 4) : \text{Mean less than or equal to 4}$$

$$= 1 - \sum_{x=0}^4 \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

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

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

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

$$e\text{iii)} \quad P(X \geq 6) = \sum_{x=6}^{\infty} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x}$$

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

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

$$\frac{100}{6561} (36 + 16 + 2) = \frac{100 \times 48}{6561}$$

$$\frac{4800}{2187} = 2.194$$

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

$$= \frac{10}{3} \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7 + \binom{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^6 + \binom{10}{5} \left(\frac{2}{3}\right)^5 \left(\frac{1}{3}\right)^5 + \binom{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4$$

$$= \left(\frac{2}{3}\right)^4 \left(60 + 160 + 240 + 240\right)$$

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