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B.S Dental

QNo(1) (a)

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
12	8	144	64	96
75	172	645	3246	1140

$n = 10$, $\Sigma x = 75$, $\Sigma y = 172$, $\Sigma x^2 = 645$

$\Sigma y^2 = 3246$, $\Sigma xy = 1140$

Substituting in to the computing Formula for r gives

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

$$r = \frac{1140 - \left[(75)(172)\right]/10}{\sqrt{\left[645 - (75)^2/10\right]\left[3240 - (172)^2/10\right]}}$$

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$$r = \frac{1140 - 1290}{\sqrt{\left[645 - 5625/10\right]\left[3246 - 2958.4\right]}}$$

$$= \frac{-150}{(82.5)(287.6)}$$

$$= \frac{-150}{23727}$$

$$= -0.01 \text{ Ans.}$$

Q(1)(B)(a):

y on x — $y^{1} = a + bx$

x on y — $x^{1} = a + by$

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	16	400	625	256
28	18	504	785	324
165	114	2099	3309	1604

$y^{1} = a + bx$ — ①

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

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$$b_{yx} = \frac{9 \times 2099 - 165 \times 114}{9 \times 3.309 - (165)^5}$$

$$b_{yx} = \frac{81}{2556} = 0.01316$$

$$a = \bar{y} - b\bar{x} \longrightarrow (1)$$

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

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

$$a = 12.66 - 0.0316 \times 18.33$$

$$a = 12.081$$

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

$$y = 12.081 + 0.0316x$$

$$x = a + by$$

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

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

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

$a = 12.66 - 0.05625 \times 18.33$

$a = 11.62$

$x = a + by$

$x = 11.62 + 0.05625Y.$

$x = 20, 11, 15, 25, 28 = 99$

$y = 5, 15, 9, 12, 16, 18 = 75.$

X	20	11	15	10	10	17	18	21	25	28
Y	5	15	14	14	17	8	9	12	16	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	324
12	21	252	441
16	25	400	625
18	28	504	784
114	165	2,099	3,309

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

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

$$b = \frac{81}{2556} = 0.0316$$

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

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

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

$a = 12.66 - 0.0316 \times 18.33$

$a = 12.66 - 0.579$

$a = 12.081$

The estimathed regression model

$\hat{y} = a + bx$

$\hat{y} = 12.08 + 0.0316x$

Prediction of Y when Y = 20+11+15+25+28 = 99

$\hat{y} = 12.08 + 0.0316\ (99)$

$\hat{y} = 12.081 + 3.128$

$\hat{y} = 15.209$

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Q:-2(A)

Example:

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. The we observe that.

1. Each toss of coin has two possible outcomes, head and tail.
2. The probability of a head (success) is $p = 1/2$ 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 denote the numbers 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.

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

$$= 1 \times \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

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

$$= \frac{5}{32}$$

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

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

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

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 probabilites can also be obtained by expanding the binomial $(\frac{1}{2}+\frac{1}{2})^5$. The binomial P.d for the number of heads obtained in 5 tosses of fair coin is:

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

Q2 (B)

There fore the binomial probability dirt with $n=10$

$P = 2/3$

$q = 1-P$

$q = 1-2/3$

$q = 1/3$

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Let x denote the number of men by A then.

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

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

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

$$= 1 - \frac{1}{59049} (1 + 20 + 180 + 960)$$

$1 - 0.0197$

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

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

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

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

$P(x = 4) = 0.056$

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

$0, 1, 2 \ldots 10$

(iv) 6 or more games.

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

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

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

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

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

$$\boxed{P(x \geq 6) = 0.78}$$

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

Un-grouped frequency distribution

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

Q3: (B) Given data.

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

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Grouped frequency distribution for given data.

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

$\text{Range} = x_m - x_0$

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

$k = 1 + 3.3 \log N$

$= 1 + 3.3 \, (1.698)$

$= 1 + 5.6066$

$k = 6.606$

$k = \boxed{6}$

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

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

we find out the information from data

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

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