Namee:- HANIF ULLAH

IDNo:- 14095

~~Subm~~

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Instuctor :- Sir Anwar Shamim

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Subject # Biostatistic

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Q1:-

①

(a) calculate the correlation coefficient b/w X & Y.

	X	Y	Dx (x-8)	Dy (y-17)	Dx^2	Dy^2	DxDy
	3	25	-5	8	25	64	-40
	4	24	-4	7	16	49	-28
	5	20	-3	3	9	9	-9
	6	20	-2	3	4	9	-6
	7	19	-1	2	1	4	-2
	8	17	0	0	0	0	0
	9	16	1	-1	1	1	-1
	10	13	2	-4	4	16	-8
	11	10	3	-7	9	49	-21
	13	8	5	-9	25	81	-45
Σ	76	172	-4	2	94	282	-160

$$r = \frac{\Sigma DxDy - (\Sigma Dx)(\Sigma Dy)/n}{\sqrt{\Sigma Dx^2 - (\Sigma Dx)^2/n}\,\sqrt{\Sigma Dy^2 - (\Sigma Dy)^2/n}}$$

$$= \frac{-160 - (-4)(2)/10}{\sqrt{94 - (-4)^2/10}\,\sqrt{282 - (2)^2/10}}$$

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(2)

$$= \frac{-152/10}{\sqrt{\frac{110}{10}}\sqrt{\frac{278}{10}}}$$

$$= \frac{-15.2}{\sqrt{(11)(27.8)}}$$

$$= \frac{-15.2}{92.2}$$

$$= \frac{-0.164}{2}$$ Ans:-

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(b) Given the following set of values

x	y	x^2	y^2	xy
20	5	400	25	100
11	15	121	225	165
15	14	225	196	210
10	17	100	289	170
17	8	289	64	136
18	9	324	81	162
21	12	441	144	252
25	16	625	256	400
28	18	784	324	504
165	114	3309	1604	2099

The estimated Linear regression Line of Y on x is.

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

where a and b are the Least square estimate of parameter α and β respectively and are given by

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

Substituting the sums, we get

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

$$b = \frac{18891 - 18810}{29781 - 27225}$$

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

$$b = 0.031$$

$$a = \frac{114}{9} - (0.031)\left(\frac{165}{9}\right)$$

$$a = 12.66 - (0.031)(18.33)$$

$$a = 12.66 - (0.56)$$

$$a = 12.66 - 0.56$$

$$a = 12.1$$

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Thus the estimated regression Line is

$$\hat{Y} = 12.1 - 0.031X$$

Least Square regression Line for X on Y.

$$X = a + bY$$

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

$$b = \frac{(9)(2099) - (165)(114)}{(9)(1604) - (114)^2}$$

$$b = \frac{18891 - 18810}{14436 - 12996}$$

$$b = \frac{81}{1440}$$

$$b = 0.056$$

Now:-

$$a = \frac{1}{n}(\Sigma x - b\Sigma Y)$$

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$a = \frac{1}{9}(165 - (0.056)(114))$

$a = \frac{1}{9}(165 - 6.384)$

$a = \frac{1}{9}(158.6) = \underline{17.62}$

Therefore

$x = a + by$

$$\boxed{x = 17.62 + 0.056y}$$

(b) Find the predict values of y for x = 20, 11, 15, 25, 28 and x for y = 5, 15, 9, 12, 16, 18

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x	y	$Y = 12.09 + 0.031x$	$X = 17.62 + 0.056y$
20	5	$= 12.09 + (0.031)(20) = 12.71$	$= 17.62 + (0.056)(5) = 17.9$
11	15	$= 12.09 + (0.031)(11) = 12.4$	$= 17.62 + (0.056)(15) = 18.4$
15	14	$= 12.09 + (0.031)(15) = 12.5$	$= 17.62 + (0.056)(9) = 18.1$
10	17	$= 12.09 + (0.031)(25) = 12.8$	$= 17.62 + (0.056)(12) = 18.2$
17	8	$= 12.09 + (0.031)(28) = 12.9$	$= 17.62 + (0.056)(16) = 18.5$
18	9		$= 17.62 + (0.056)(18) = 18.6$
21	12		
25	16		
28	18		

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Q3:- (a) Construct the ungrouped frequency distribution of these data.

(a)

ungrouped women	Tally	Frequency
0	I	1
1	IIII	4
2	IIIIIIII	8
3	IIIIIIIIIII	11
4	IIIIIIII	8
5	IIIII	5
6	IIII	4
7	III	3
8	II	2
9	I	1
10	III	3
	Total	50

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(b) Grouped frequency distribution.

Group	Tally	Frequency
0-1	~~||||~~	6
2-3	~~||||~~ ~~||||~~ ||||	19
4-5	~~||||~~ ~~||||~~ |||	13
6-7	~~||||~~ ||	07
8-9	|||	03
10-11	|||	03
	Total	50

Q2:- (a) A fair coin is tossed 5 times. Find the probabilities of obtaining various number of heads.

Answer:-

(a) → Let us regard the tossing of a coin as an experiment. Then we observe That.

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① Each Toss of coin has two possible outcomes, head and tail.

② The Probability of a head (success) is $P = \frac{1}{2}$ 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 number of heads (Successes) has a binomial probability distribution with $P = \frac{1}{2}$ and $n = 5$, the possible value of X are 0, 1, 2, 3, 4 and 5 hence

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

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

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

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

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

$$10 \times \left(\frac{1}{2}\right)^5 = \frac{10}{32}$$

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

$= 10/32$

$P(4\text{ heads}) = P(x=4) = \binom{5}{4}(\frac{1}{2})^4(\frac{1}{2})^{5-4} =$

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

$P(5\text{ heads}) = P(x=5) = \binom{5}{5}(\frac{1}{2})^5(\frac{1}{2})^0 =$

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

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

x	0	1	2	3	4	5
$f(x)$	$1/32$	$5/32$	$10/32$	$10/32$	$5/32$	$1/32$

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Q2(B)
Answer(b) :-

we observe That

(a) There are two possibles outcomes. i.e A will win or will not win the games.

(b) The Probability of A's winning in each game is $P = 2/3$

(c) The successive games are independently won or Lost; and

(d) There are 10 games.

Therefore The Binomial Probability distribution with $n=10$ & $P=\frac{2}{3}$ is appropriate.

Let x denote the number of games won by A Then.

$$n = 10$$

$$P = 2/3$$

$$q = 1-P$$

$$q = 1-\frac{2}{3}$$

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(13)

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

$$1 - \sum_{x=0}^{3} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^9 + 45 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^8$$

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

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

$$1 - 0.0197$$

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

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

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

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

$$\boxed{P(x=4) = 6.056}$$

(iii) $P(x=11) = f$ requency $(0) =$ because x can take only value.

(P.T.O

(14)

0, 1, 2, 3 10

(iv) 6 or more games.

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

$$= \binom{10}{6}\left(\frac{2}{3}\right)^6\left(\frac{1}{3}\right)^4 + \binom{10}{7}\left(\frac{2}{9}\right)^9$$

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

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

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

ThE End

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