"Allied Health Sciences"
"Final Term Examination"

Name - Gul shad
I.D - 13766
Department - B.s Dental Technology
Subject - Bio statistics
Instructor - Sir Anwar shamim.

Q. No. 2
Find the following

(a) A fair Coin is tossed 5 times. Find the probabilities of obtaining various numbers of heads.
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 number of heads (successes) has a binominal probability distribution with $p = 1/2$ and $n = 5$ the possible value of X are 0, 1, 2, 3, 4 and 5 hence.

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

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

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

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

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

$$P(5\ \text{heads}) = P(x=4) = \binom{5}{5}\left(\frac{1}{2}\right)^5\left(\frac{1}{2}\right)^0 = 1 \times \left(\frac{1}{2}\right)^5 = \frac{1}{32}$$

These probabilities can also be obtained by expanding the binominal $(1/2 + 1/2)^5$. The binominal 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. No - 2
Part
(B) A and B play a game in which A,s probability of winning is 2/3. In a series of 10 games, what is the probability that A will win (i) at least 4 games, (ii) Exactly equal to 4/10 games (iii) Exactly equals to 11 games (iv) 6 or more games.

Sol:→
Therefore 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) $P(x \geq 4) = 1 - P(x < 4)$

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

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

$$\left. + 120\left(\frac{2}{3}\right)^3\left(\frac{1}{3}\right)^9\right]$$

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

$$= 1 - 0.0197$$

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

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

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

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

$P(x=4) = 0.056$

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

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

(iv) 6 or more games

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

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

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

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

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

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

Q No. 1

Part (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

Sol :->

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
13	8	169	64	104
$\Sigma = 76$	$\Sigma = 172$	$\Sigma = 670$	$\Sigma = 3240$	$\Sigma = 1148$

Formula for Correlation Coefficient

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

For $n = 10$

$$r = \frac{(10)(1148) - (76)(172)}{\sqrt{\{(10)(670) - (76)^2\}\{(10)(3240) - (172)^2\}}}$$

$$r = \frac{11480 - 13072}{\sqrt{(6700 - 5776)(32400 - 29584)}}$$

$$r = \frac{-1592}{\sqrt{(924)(2816)}}$$

$$r = \frac{-1592}{\sqrt{2601984}}$$

$$r = \frac{-1592}{1613.06}$$

$$r = -0.98$$

Ans

End Q1 Part (a)

Q 1

Part B

Give the following set of values.

X	20	11	15	10	17	18	21	25	28
Y	5	15	14	17	8	9	12	16	18

Sol:-

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	~~400~~ 252
25	16	625	256	400
28	18	784	324	504
$\Sigma = 165$	$\Sigma = 114$	$\Sigma = 3309$	$\Sigma = 1604$	$\Sigma = 2099$

(a) Formula for Least Square regression line for Y on X

$$Y = a + bx$$

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

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

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

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

$$b = 0.031$$

Now

$$a = \frac{1}{n}\left\{\sum y - b\sum x\right\}$$

$$a = \frac{1}{9}\left\{114 - (0.031)(165)\right\}$$

$$a = \frac{1}{9}\left\{114 - 5.115\right\}$$

$$a = \frac{1}{9}\left\{108.8\right\}$$

$$a = 12.09$$

Hence

$$Y = a + bx$$

$$\boxed{Y = \cancel{12}\ 12.09 + 0.031x}$$

Least square regression line for X on Y

$$X = a + by$$

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

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

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

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

$$b = 0.056$$

Now

$$a = \frac{1}{n}\{\Sigma x - b\Sigma y\}$$

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

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

$$a = \frac{1}{9}\{158.6\}$$

$$a = 17.62$$

Hence

$$x = a + by$$

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

(b)

X	Y	$Y = 12.09 + 0.031x$	$x = 17.62 + 0.056y$
20	5	$= 12.09 + (0.031)(20) = 12.71$	$= 17.62 + 0.056(5) = 179$
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		

{Q 1 End}

Q No. 3

The following figure give the number of children born to 50 women.

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

(a) Construct ungrouped frequency distn of these data.

x	f
0	1
1	4
2	8
3	11
4	7
5	5
6	4
7	3
8	2
9	1
10	3

End Part-a Q-3

Q 3
Part (b) Grouped frequency distribution

classes	f
0 - 2	5
2 - 4	19
4 - 6	12
6 - 8	7
8 - 10	3
10 - 11	3

End