

INW (Peshawar)

Paper

Bio Statistics

RS Radiology

ID No

14075

Sir Shomam Anwar

Date

22.06.2020

Q1a

Sol

Page ①

$$N=10 \text{ so } \frac{n}{2} = \frac{10}{2} = 5$$

$$U = x - 7, \quad v = y - 19$$

and then find $\sum x^2 = \sum uv$

x	Y	U	V	U^2	V^2	UV
3	25	-4	6	16	26	-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	-11	36	121	-66

P.T.O

$$\delta = \frac{-170 - \frac{6x - 18}{10}}{10}$$

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

$$\delta = \frac{-170 + \frac{108}{10}}{10}$$

$$\sqrt{\left(94 - \frac{36}{10}\right) \left(314 - \frac{324}{10}\right)}$$

$$\delta = \frac{-1700 + 108}{10}$$

$$\sqrt{\left(\frac{940 - 36}{10}\right) \left(\frac{3140 - 324}{10}\right)}$$

$$\delta = \frac{-159.2}{\sqrt{(90.4)(281.6)}}$$

$$\delta = \frac{159.2}{\sqrt{25456.6}}$$

$$\delta = \frac{159.2}{159.5}$$

$$= 0.998 = \boxed{1}$$

END OF Q 1 (A)

Ans No (1) (B)

Page (3)

Now the Find the predicted values
of y vs x

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

x	\hat{y}
20	12.723
11	12.438
15	12.565
25	12.885
28	12.976

And the predicted values of x for y
are given

y	\hat{x}
5	17.898
15	18.461
9	18.123
12	18.292
16	18.517
18	18.63

END OF QUESTION

Q No 2 (A)

A Fair coin is tossed 5 times.

Find the probabilities of obtaining various numbers of Head?

Ans

\Rightarrow Each toss of coins has been two possible outcomes, head and tail.

\Rightarrow The probability of a head is $P = 1/2$ and remain the same for successive tosses.

\Rightarrow The coin is tossed 5 times.

$P = 1/2$ $n = 5$ possible value of x are 0, 1, 2, 3, ..., 5.

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

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

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

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

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

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

P.T.O

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

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

END OF QUESTION No 2 (A)

Ans 2 (B)

Page (6)

we observe that :-

- \Rightarrow two possible out come. A will win or not win.
- \Rightarrow Probability of A's winning each game $p = 2/3$.
- \Rightarrow Games are independently won or lost.
- \Rightarrow there are 10 games.

Solution

$$p = 2/3, q = 1-p, q = 1-2/3$$

Let x denote the number of won to A then.

$$\begin{aligned} \textcircled{1} P(x \geq 4) &= 1 - P(x < 4) \\ &= 1 - \sum_{x=0}^3 \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x} \\ &= 1 - \left[\left(\frac{1}{3}\right)^{10} + 10 \left(\frac{2}{3}\right) \left(\frac{1}{3}\right)^9 + 45 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^8 + 120 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7 \right] \\ &= 1 - \frac{1}{59049} [1 + 20 + 180 + 960] \\ &= 1 - 0.0197 \\ &= \boxed{P(x \geq 4) = 0.9803} \end{aligned}$$

$$\begin{aligned} \textcircled{ii} P(x=4) &= \binom{10}{4} \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^6 \\ &= 210 \left(\frac{16}{81}\right) \left(\frac{1}{729}\right) \\ &= \frac{3360}{59049} = \boxed{P(x=4) = (0.056)} \end{aligned}$$

P.T.O.

(iii) $P(X=11) = f(0)$ = because X can take only value. $0, 1, 2, 3, \dots, 10$

(iv) More game.

$$\begin{aligned}
 P(X=6) &= \sum_{x=6}^{10} \binom{10}{x} \left(\frac{2}{3}\right)^x \left(\frac{1}{3}\right)^{10-x} \\
 &= \binom{10}{6} \left(\frac{2}{3}\right)^6 \left(\frac{1}{3}\right)^4 + \binom{10}{7} \left(\frac{2}{3}\right)^7 \left(\frac{1}{3}\right)^3 + \binom{10}{8} \left(\frac{2}{3}\right)^8 \left(\frac{1}{3}\right)^2 + \binom{10}{9} \left(\frac{2}{3}\right)^9 \left(\frac{1}{3}\right)^1 + \binom{10}{10} \left(\frac{2}{3}\right)^{10} \left(\frac{1}{3}\right)^0
 \end{aligned}$$

$$P(X=6) = 0.228 + 0.261 + 0.196 + 0.087 + 0.018$$

$$P(X \geq 6) = 0.79$$

END OF QUESTION NO 2 (B)

1		4	5
2		8	13
3		11	24
4		8	32
5		5	27

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

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

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

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

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

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

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

$$= 1 + 3.3(1.698)$$

$$= 1 + 5.6066$$

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

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

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

we find out the information from data

P.T.O

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

Page (10)

Class	frequency	distributing	Main 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
8-10	3	7.5-9.5	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	$5/50 = 0_2$
19/50	$19/50 \times 100 = 38$	24	$24/50 = 0_2$
13/50	$13/50 \times 100 = 26$	37	$37/50 = 0_3$
7/50	$7/50 \times 100 = 14$	44	$44/50 = 0_2$
3/50	$3/50 \times 100 = 6$	47	$47/50 = 0_2$
3/50	$3/50 \times 100 = 6$	50	$50/50 = 0_3$

END OF Q No 3(B)