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Paper BiosTat

Q1 (a)

Sol:

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

$U = X - 7$, $V = Y - 19$

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

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	69	-6
10	13	3	-6	9	36	-18
11	10	4	-9	16	81	-36
13	8	6	-11	36	121	-66
76	172	6	-18	94	314	-170

Sum:

$r = -170 - 6 \times -18$

$$\gamma = \frac{-170 - \frac{6 \times -18}{10}}{\sqrt{\left(94 - \frac{(6)^2}{10}\right)\left(314 - \frac{(-18)^2}{10}\right)}}$$

$$\gamma = \frac{-170 + \frac{108}{10}}{\sqrt{\left(94 - \frac{36}{10}\right)\left(314 - \frac{324}{10}\right)}}$$

$$\gamma = \frac{\frac{-1700 + 108}{10}}{\sqrt{\left(\frac{940 - 36}{10}\right)\left(\frac{3140 - 324}{10}\right)}}$$

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

$$\gamma = \frac{-159.2}{\sqrt{25456.6}}$$

$$\gamma = \frac{-159.2}{159.5} = -0.998 = \boxed{0.1}$$

Q1 (b)

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	288	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

Regression equation = y on x

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

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

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

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

$$\boxed{b = 0.63}$$

i- x on y

$\hat{x} = a + by$

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

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

$b = \boxed{1.22}$

Thus

$\hat{x} = a + by$

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

$\boxed{\hat{x} = 5.27}$

Q2: A

Let us regard the tossing of a coin as an experiment,

We observe that

1) each Toss of coin has Two possible outcomes, heads and Tails

(2) Probability of head is $p = 1/2$, & Vice Versa

(3) Successive Tosses of coins are independent

(4) Coin is tossed 5 times

Therefore the r.v X which donates the number of head has a binomial probability distribution with $p = \frac{1}{2}$,

Therefore X are 1, 2, 3, 4, 5.

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

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

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

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

7:00

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

8:00

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

9:00

These probabilities can also be obtained by bionomial $\left(\frac{1}{2}+\frac{1}{2}\right)^5$

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) Therefore the Bionomical Probability distribution with $n=10$

$P = \frac{2}{3}$

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

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

$\Rightarrow 1 - \left[\left(\frac{1}{3}\right)^{10} + 10 \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^9 + 45 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^8 + 120 \left(\frac{2}{3}\right)^3 \left(\frac{1}{3}\right)^7\right]$.

$\Rightarrow 1 - \frac{1}{59049} + 10 \left(\frac{2}{3}\right) \frac{1}{19683}$

$\Rightarrow 1 - \frac{1}{59049} [1 + 20 + 180 + 960)$

$\boxed{= 1 - 0.0197}$ $P(x \geq 4)$

$= \boxed{0.9803}$

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

$= 210 \left(\frac{16}{81}\right)\left(\frac{1}{729}\right) = \frac{3360}{59043} = \boxed{0.0\ldots5}$

=

(iii) $P(x=1)$, $f(0)$. because X can only take numbers or value upto 10 (12...10)

(4) 6 or more games

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

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

$$\binom{10}{9}\left(\frac{2}{3}\right)^{9}\left(\frac{1}{3}\right)^{1} + \binom{10}{10}\left(\frac{2}{3}\right)^{10}\left(\frac{1}{3}\right)^{0}$$

$$\Rightarrow 0.228 + 0.261 + 0.196 + 0.087 + 0.48$$

$$P\, x \geq 6 = 0.79$$

Q3. (a)

Ungrp data:

NO	Tally marks	f	C.f
0	|	1	1
1	||||	4	5
2	~~||||~~ |||	8	13
3	~~||||~~ ~~||||~~ |	11	24
4	~~||||~~ |||	8	32
5	~~||||~~	5	37
6	||||	4	41
7	|||	3	44
8	||	2	46
9	|	1	47
10	|||	3	50

(B) Grp Data:

$N = 50$
$x_0 = 1$
$x_m = 10$

Range $= x_m - x_0 \Rightarrow 10 - 1 = \boxed{9}$

$K \sim 1 + 3.3 \log N$

$1 + 3.3 \log(50)$

$1 + 3.3 (1.698)$

$= 1 + 5.6066$

$K = 6.606 = \boxed{7}$

h = class interval = $\frac{\text{range}}{K}$

$h = \frac{9}{7} = 1.28 = \boxed{2}$

$N = 50$, $R = 9$, $K = 7$, $h = 2$.

classes	Frequencing	class Bonding	M.P
0-1	5	0.5-1.5	1
2-3	19	10.5 - 3.5	2.5
4-5	13	3.5 - 5.5	4.5
6-7	7	5.5 - 7.5	6.5
8-9	3	7.5 - 9.5	8.9
10-11	3	9.5 - 11.5	11

Total = $\boxed{50}$

R.frequency	R.f	C.f	R.C.f
5/50	10	5	0.1
19/50	38	24	0.5
13/50	26	37	0.6
7/50	14	44	0.8
3/50	6	47	0.9
3/50	6	50	0.1