Commercial Mathematics and Statistics
Suggested Answer

Roll No..... **Maximum Marks - 25**

Total No. of Questions - 2 **Total No. of Printed Pages -1**

Time Allowed - 1 Hour **Marks**

Attempt all questions.

1. **(4×4=16)**

a) Jacob purchased a motorcycle valued Rs. 3,00,000. He paid 40% cash at the time of purchase and agreed to pay the balance with interest at 12% p.a compounded monthly in 2 years. If the first installment is paid after1 month from the date of purchase, find the amount of each installment.

b) Find the median of the following frequency distribution:

X	5	7	9	12	14	17	19	21
f	6	5	3	6	5	3	2	4

c) The prices of shares X and Y are given below, state which share is more stable in value.

X: 55 54 52 53 56 58 52 50 51 49
Y: 108 107 105 105 106 107 104 103 104 101

d) The budget inquiry of the middle class families in Kathmandu city is given below.

Expenditure	Price in 2010 (Rs.)	Price in 2014 (Rs.)	Weight
Food	7500	10500	45
Clothing	2550	3500	15
Reconstruction	4000	5000	20
Fuel	1000	1250	5
Miscellaneous	1800	2000	15

What change of the cost of living figure in 2014 have taken place as compared to 2010?

Answer:

a)

Remaining money to pay = Cost price – Down payment
or, Remaining money to pay= 3,00,000 – 40% of 3,00,000

= 3,00,000–1,20,000

= 1,80,000

We can say that,

Remaining money to pay = Present value of annuity

So, $\frac{P}{i/m}\left[1-\left(1+i/m\right)^{-mn}\right]=180000$

Or, $\frac{P}{0.12/12}\left[1-\left(1+0.12/12\right)^{-12\times 2}\right]=180000$

Or, $\frac{P}{0.01}\left[1-\left(1+0.01\right)^{-24}\right]=180000$

or, $\frac{P}{0.01}[1-0.78757]=1{,}80{,}000$

or, $\frac{P}{0.01}[0.21243]=1{,}80{,}000$

or, P= 8,473

Hence, each monthly instalment is of Rs. 8,473

b)

X	5	7	9	12	14	17	19	21
f	6	5	3	6	5	3	2	4
c.f.	6	11	14	20	25	28	30	34

Here N = 34 and $\frac{N+1}{2}th$ item $=\frac{34+1}{2}th=17.5th$ item.

Since, c.f. is just greater than 17.5 is 20 and the corresponding value is 12.

Therefore, Median = 12.

c) The share which has less coefficient of variation (C.V.) is more stable.

Here, $\bar{X}=\frac{\sum X}{n}=\frac{530}{10}=53, \bar{Y}=\frac{\sum Y}{n}=\frac{1050}{10}=105$

Share X			Share Y		
X	$X-\bar{X}=X-53$	$\left(X-\bar{X}\right)^2$	Y	$Y-\bar{Y}=Y-105$	$\left(Y-\bar{Y}\right)^2$
55	2	4	108	3	9
54	1	1	107	2	4
52	-1	1	105	0	0
53	0	0	105	0	0
56	3	9	106	1	1
58	5	25	107	2	4
52	-1	1	104	-1	1
50	-3	9	103	-2	4
51	-2	4	104	-1	1
49	-4	16	101	-4	16
$\sum X$ =530	$\sum\left(X-\bar{X}\right)=0$	$\sum\left(X-\bar{X}\right)^2=70$	$\sum Y$ =1050	$\sum\left(Y-\bar{Y}\right)=0$	$\sum\left(Y-\bar{Y}\right)^2=40$

$\therefore \sigma_X=\sqrt{\frac{1}{n}\sum(X-\bar{X})^2}=\sqrt{\frac{70}{10}}=2.646$

$$\therefore \sigma_Y = \sqrt{\frac{1}{n}\sum (Y-\bar{Y})^2} = \sqrt{\frac{40}{10}} = 2$$

$$\text{C.V. of X series} = \frac{\sigma_X}{\bar{X}} \times 100 = \frac{2.646}{53} \times 100 = 4.99$$

$$\text{C.V. of Y series} = \frac{\sigma_Y}{\bar{Y}} \times 100 = \frac{2}{105} \times 100 = 1.90$$

Hence C.V. of Y series is less than C.V. of X series so the shares of Y are more stable.

d) Consumer price index for 2014 with 2010 as base

Group	2010	2014	Price relatives	Weight (W)	PW
	Price (P_0)	Price (P_1)	$P=\frac{P_1}{P_0} x100$		
Food	7500	10500	140	45	6300
Clothing	2550	3500	137.25	15	2058.75
Reconstruction	4000	5000	125	20	2500
Fuel	1000	1250	125	5	625
Miscellaneous	1800	2000	111.11	15	1666.66
				$\sum W = 100$	$\sum PW = 13150.41$

$$\therefore Consumer\,\text{Price}\,index(P_{01}) = \frac{\sum PW}{\sum W}$$

$$= \frac{13150.41}{100}$$

$$= 131.5$$

Change of cost of living index in 2014 increased as compared with 2010=31.5%

2. **(3×3=9)**

a) A question paper has two parts P and Q, each containing 10 questions. If a student needs to choose 8 from part P and 4 from part Q, in how many ways can he do that?

b) If the second and fifth terms of an arithmetic progression are 7 and 19 respectively find the tenth term.

c) Draw "less than and more than" Ogives from the following data and compute the value of the median:

Daily wages	200-300	300-400	400-500	500-600	600-700	700-800	Total
No. of workers	5	8	15	24	20	6	78

Answer:

a)

Number of ways to choose 8 questions from part P = $^{10}C_8$
Number of ways to choose 4 questions from part Q = $^{10}C_4$

Total number of ways
= $^{10}C_8$ x $^{10}C_4$
= $^{10}C_2$ x $^{10}C_4$

=45 x 210

= 9450

b) Let a and d be the first term and common difference of the A.P.

According to question, $a + d = 7$ ... ... (1)

$a + 4d = 19$ ... ... (2)

Equation (2) − Equation(1) gives

$-3d = -12$

$\therefore d = 4$

Putting the value of d in equation (1)we get

$a + 4 = 7$

$\therefore a = 3$

Hence, $t_{10} = a + 9d$

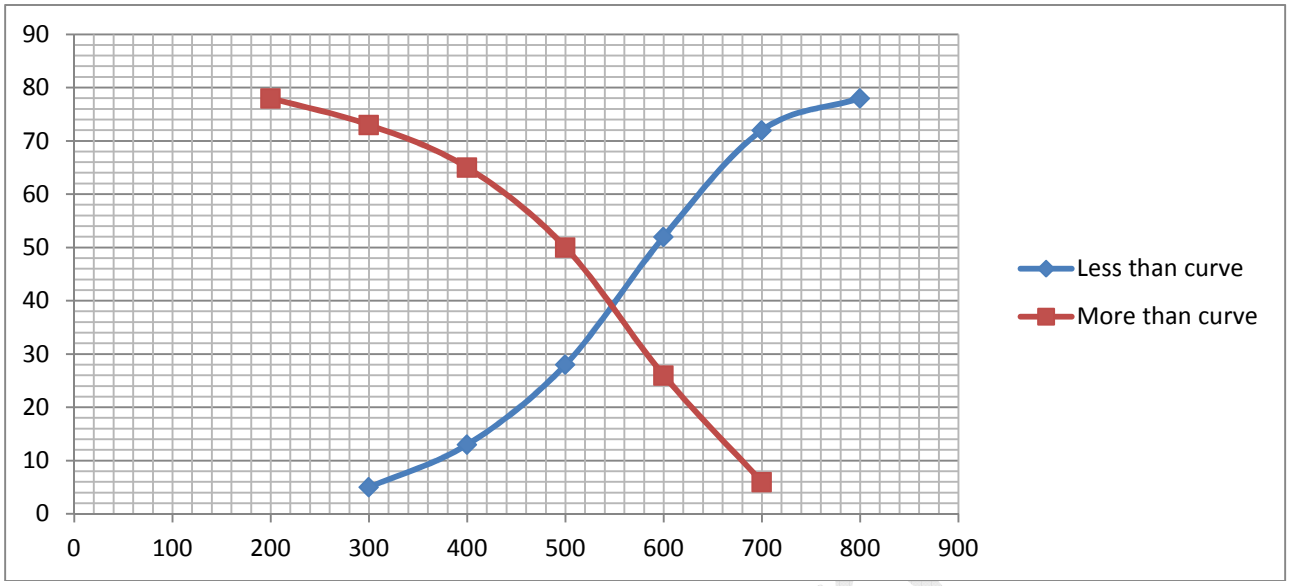
$= 3 + 9(4)$

$= 39$

c)

i) Less than and more than table of frequencies

Daily wages	No. of workers	Daily wages	No. of workers
Less than 300	5	More than 200	78
Less than 400	13	More than 300	73
Less than 500	28	More than 400	65
Less than 600	52	More than 500	50
Less than 700	72	More than 600	26
Less than 800	78	More than 700	6



Daily wages

Median=545 (approximate)