



Green University of Bangladesh

Department of Computer Science and Engineering

Mid Assignment

Course Title: Statistics and Complex Variables

Course code: MAT-201

Date of Submission: 16.03.2021

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Ans to the Q.no: 1(a)

Class interval	Tally	Frequency (f _i)	Mid value (x _i)	f _i x _i	d _i = $\frac{x_i - A}{c}$
50-60	 	30	55 (A)	0	0
60-70	 	27	65	27	1
70-80	 	17	75	34	2
80-90		3	85	9	3
total		n = 77		$\sum f_i x_i = 70$	

Arithmetic mean by short-cut method:

we know that,

$$\bar{x} = A + \frac{\sum_{i=1}^n f_i d_i}{n} \cdot c$$

$$= 55 + \frac{70}{77} \times 10$$

$$= 64.09$$

Ans.

Here,

class interval, c = 10

Approximate mean, A = 55

(2)

Ans to the Q.no: 1(b)

Profit (lacs)	no. of companies (f_i)	cumulative frequency(F_i)	Continuous class interval
0-9	25	25	0-9.5
10-19	100	125	9.5-19.5
20-29	175	300	19.5-29.5
30-39	74	374	29.5-39.5
40-49	66	440	39.5-49.5
50-59	35	475	49.5-59.5
60-69	5	480	59.5-69.5
	$N = 480$		

1st quartile:

$$Q_1 = \frac{N \cdot 1}{4} = \frac{480 \times 1}{4} = 120$$

Here, (9.5 - 19.5) is the 1st quartile class
 $\therefore Q_1 = 120$
 because 120th observation lies (9.5 - 19.5)
 in this class.

now,

$$Q_1 = L_1 + \frac{\frac{N}{4} - f_c}{f_g} \cdot c$$
$$= 9.5 + \frac{120 - 25}{100} \times 10$$
$$= 19$$

And,

3rd quartile:

$$Q_3; \frac{N \cdot i}{4} = \frac{480 \times 3}{4} = 360$$

Here, (29.5 - 39.5) is the 3rd quartile class because 360th observation lies (29.5 - 39.5) in this class.

now,

$$Q_3 = L_3 + \frac{\frac{N \cdot i}{4} - f_c}{f_g} \cdot c$$
$$= 29.5 + \frac{360 - 300}{74} \times 10$$
$$= 37.6081$$

④

$$\begin{aligned}\therefore \text{Quartile deviation} &= \frac{Q_3 - Q_1}{2} \\ &= \frac{37.6081 - 19}{2} \\ &= 9.30405\end{aligned}$$

\therefore Quartile deviation is 9.30

Ans.

Ans to the Q. no: 2(a)

wages	continuous class interval	no. of companies (f_i)	Mid value (x_i)	Cumulative frequency (F_i)	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i (x_i - \bar{x})^2$
300-399	299.5-399.5	9	349.5	9	3145.5	19916	1790244
400-499	399.5-499.5	12	449.5	21	5394	19916	1436592
500-599	499.5-599.5	17	549.5	38	9341.5	60516	1028772
600-699	599.5-699.5	22	649.5	60	14289	21316	468952
700-799	699.5-799.5	30	749.5	90	22485	2116	63480
800-899	799.5-899.5	45	849.5	135	38227.5	2916	13220
900-999	899.5-999.5	30	949.5	165	28485	23716	711480
1000-1099	999.5-1099.5	25	1049.5	190	26237.5	64516	1622900
1100-1199	1099.5-1199.5	10	1149.5	200	11495	125316	1253160
total		$N = 200$			$\sum f_i x_i = 159100$		$\sum f_i (x_i - \bar{x})^2 = 8496800$

We know,

$$\begin{aligned}
 \text{Arithmetic mean, } \bar{x} &= \frac{\sum f_i x_i}{N} \\
 &= \frac{159100}{200} \\
 &= 795.5
 \end{aligned}$$

3rd Quartile :

$$i=3; \frac{ni}{4} = \frac{200 \times 3}{4} = 150$$

Here, (899.5 - 999.5) is the 3rd Quartile class because the 150th observation lies in this class.

we know,

$$\begin{aligned} Q_3 &= L_3 + \frac{\frac{ni}{4} - f_c}{f_{qi}} \cdot c \\ &= 899.5 + \frac{150 - 135}{30} \times 100 \\ &= 949.5 \quad \underline{\text{Ans.}} \end{aligned}$$

Standard deviation:

we know that,

$$\begin{aligned} \text{Standard deviation, } \sigma &= \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n}} \\ &= \sqrt{\frac{8496500}{200}} \\ &= 206.11 \quad \underline{\text{Ans.}} \end{aligned}$$

Mean deviation using empirical relation:

$$\begin{aligned} \text{Mean deviation} &= \frac{4}{5} \times \text{standard deviation} \\ &= \frac{4}{5} \times 206.11 \\ &= 164.89 \quad \underline{\text{Ans.}} \end{aligned}$$

②

Ans to the Q. no: 2(b)

Class interval	Tally	Frequency	Mid value	cumulative frequency
8-9		0	8.5	0
9-10		4	9.5	4
10-11	 	14	10.5	18
11-12	 	20	11.5	38
12-13	 	11	12.5	49
13-14		0	13.5	49
14-15		1	14.5	50
total		$N = 50$		

Histogram:

- i) Variables can be expressed as continuous class interval
- ii) X-axis continuous class interval
- iii) Y-axis frequency.

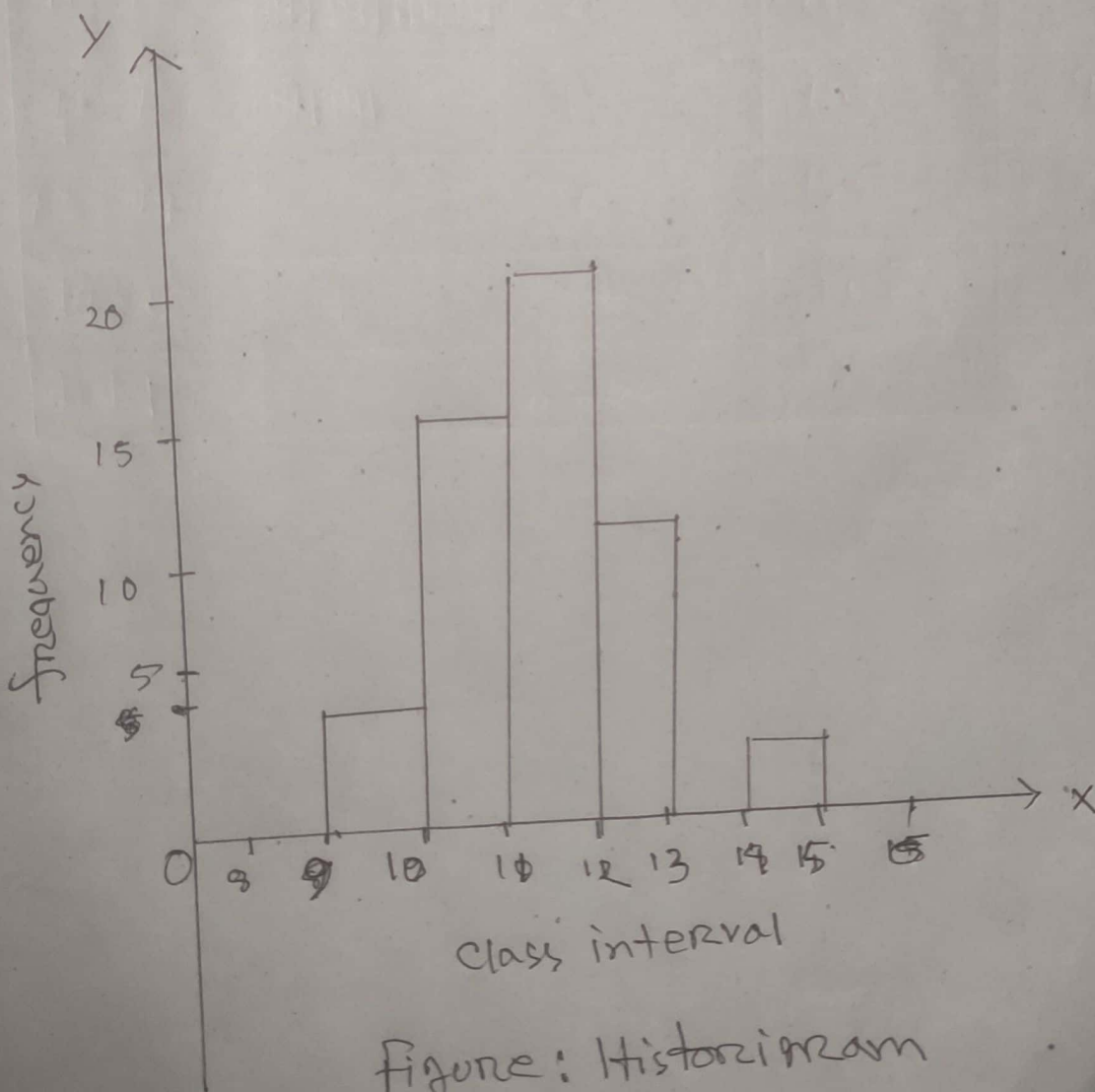


Figure: Histogram

Con Cumulative frequency curve:

i) X-axis upper limit of the continuous class interval

ii) Y-axis cumulative frequency

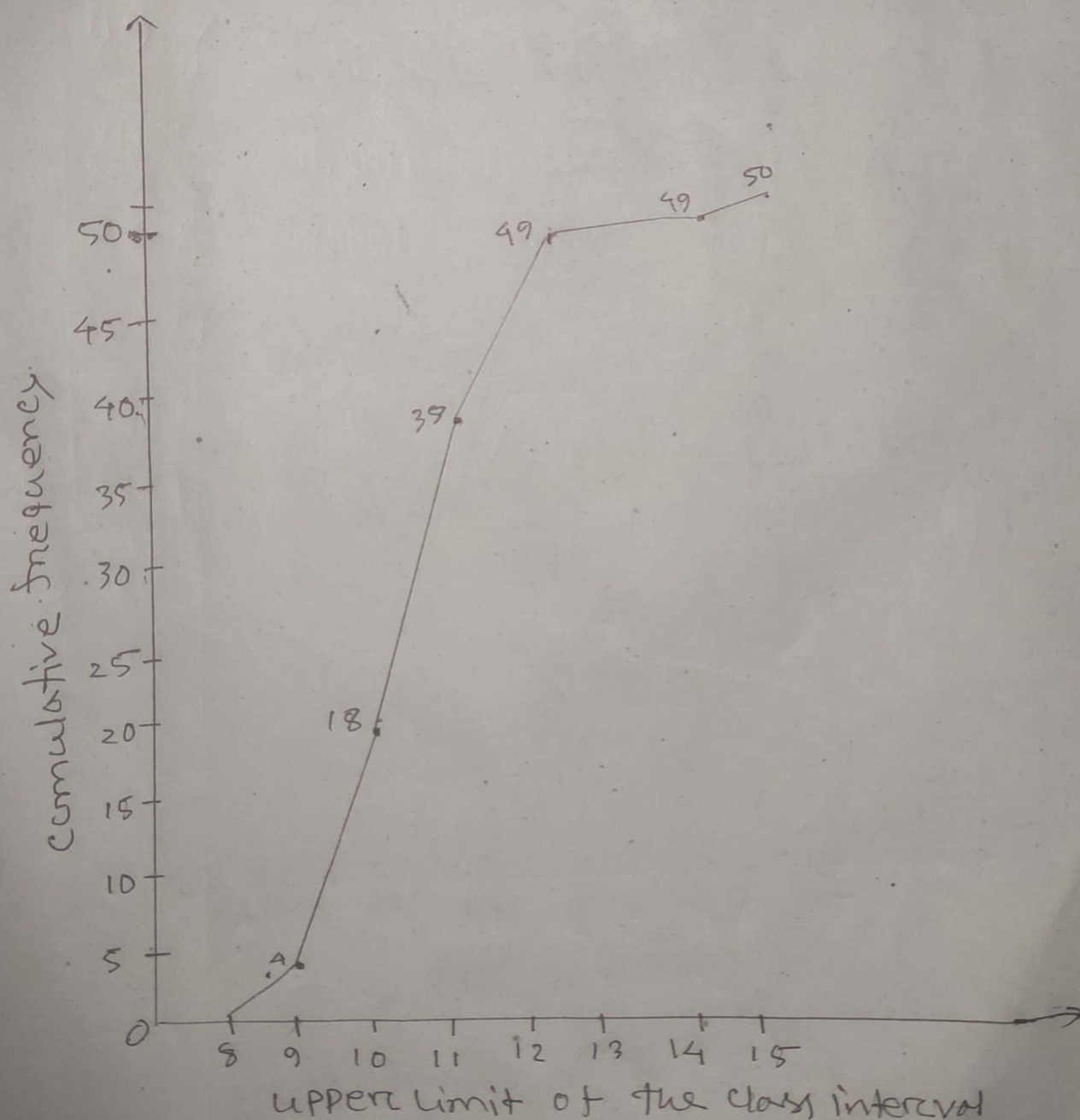


Figure: Cumulative frequency curve.

Frequency Polygon:

- i) X-axis's Mid value of the continuous class interval.
- ii) Y-axis's frequency.

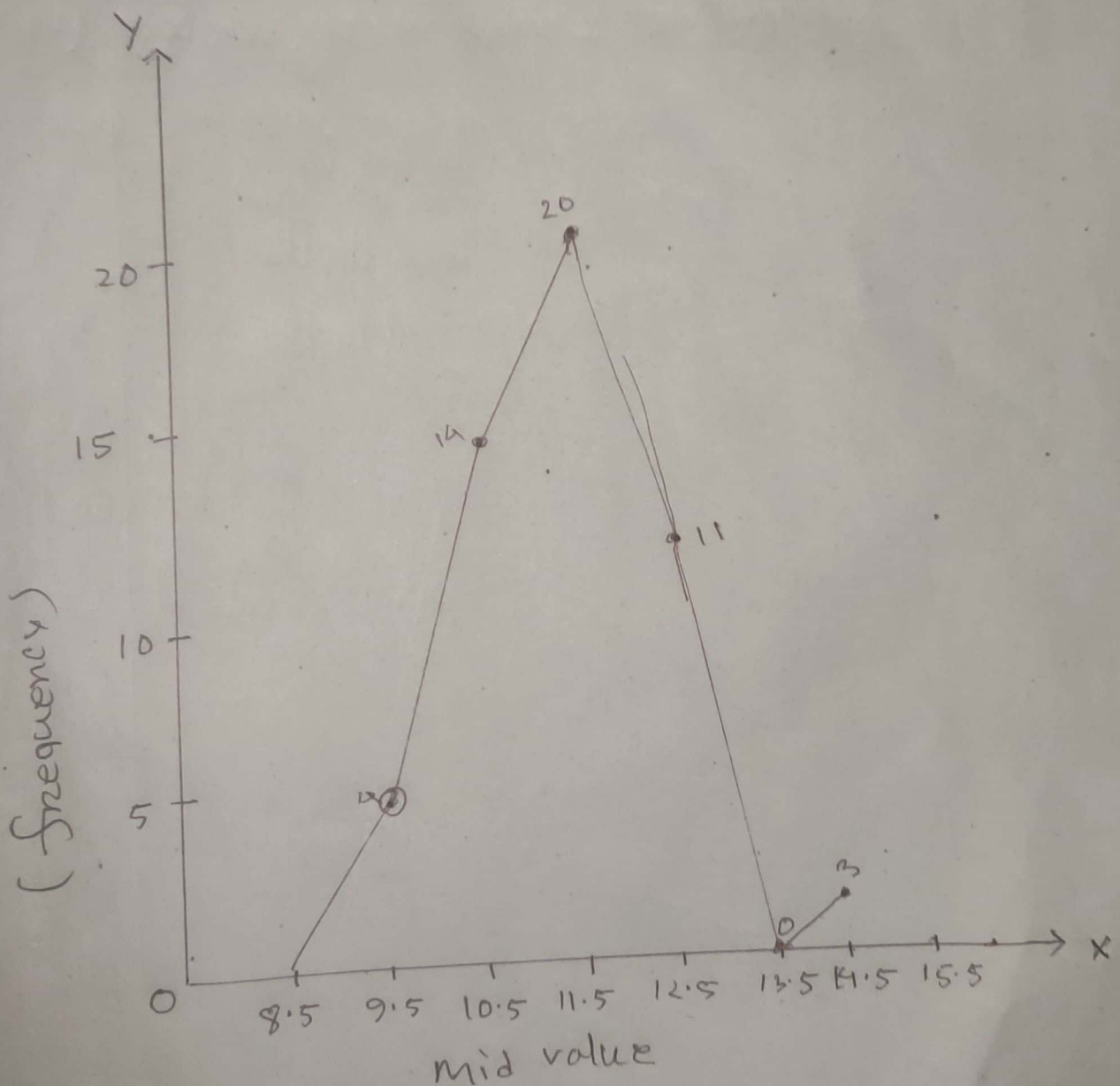


Figure: Frequency polygon

Ans. to the Q. no: 3(a)

before satisfaction level			After satisfaction level		
x	$d = x - A$	d^2	y	$d = y - A$	d^2
69	-13	169	65	-3	9
73	-9	81	75	7	49
58	-24	576	63	-5	25
76	-6	36	75	10 7	49
82	0	0	82	14	196
65	-17	289	68	0	0
75	-7	49	87 71	-3	9
64	-18	324	65	10 -3	9
64 97	5	25	85	17 10	289
87 70	-12	144	68	10 0	0
70 719	$\Sigma d = -106$	$\Sigma d^2 = 1693$	$\Sigma y = 717$	$\Sigma d = 37$	$\Sigma d^2 = 635$

The Co-efficient of variances:

Before Takeover:

we know,

$$C.V = \frac{\sigma}{\bar{x}} \times 100$$

$$\begin{aligned}\sigma &= \sqrt{\frac{\sum d^2}{N} - \left(\frac{\sum d}{N}\right)^2} \\ &= \sqrt{\frac{1693}{10} - \left(\frac{-106}{10}\right)^2} \\ &= \sqrt{56.94} \\ &= 7.54\end{aligned}$$

$$\begin{aligned}\therefore \bar{x} &= A + \frac{\sum d}{N} \\ &= 82 + \frac{-106}{10} \\ &= 71.4\end{aligned}$$

$$\begin{aligned}\therefore C.V &= \frac{\sigma}{\bar{x}} \times 100 \\ &= \frac{7.54}{71.4} \times 100 \\ &= 10.560\%\end{aligned}$$

After Takeover:

we know,

$$C.V = \frac{\sigma}{\bar{y}} \times 100$$

$$\sigma = \sqrt{\frac{\sum d^2}{N} - \left(\frac{\sum d}{N}\right)^2}$$

$$= \sqrt{\frac{635}{10} - \left(\frac{37}{10}\right)^2}$$

$$= \sqrt{49.81}$$

$$= 7.057$$

$$\bar{y} = A + \frac{\sum d}{N}$$

$$= 68 + \frac{37}{10}$$

$$= 71.7$$

$$\therefore C.V_y = \frac{\sigma}{\bar{y}} \times 100$$

$$= \frac{7.057}{71.7} \times 100$$

$$= 9.842\%$$

Comments:

The satisfaction level is greater before the takeover of the company.

$$CV_X = 10.560\% > CV_Y = 9.842\%$$

$$\therefore CV_X > CV_Y$$

Ans