CDS-AFCAT 2 2024

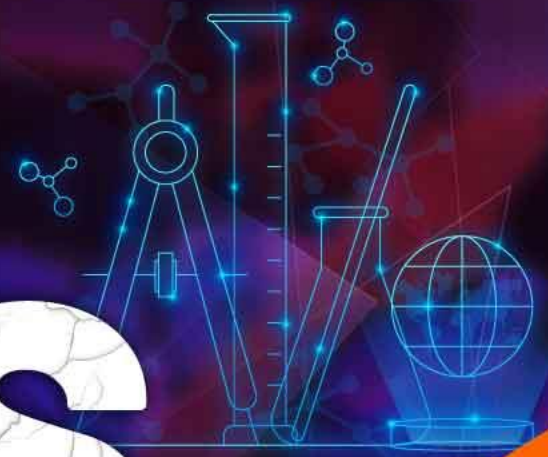
SSBCrack EXAMS

LIVE

MATHS

STATISTICS

CLASS 1



NAVJYOTI SIR

20 June 2024 Live Classes Schedule

8:00AM	20 JUNE 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	20 JUNE 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	COMPLETE SCREENING TEST	ANURADHA MA'AM

AFCAT 2 2024 LIVE CLASSES

2:30PM	STATIC GK - HISTORY - CLASS 2	DIVYANSHU SIR
4:00PM	MATHS - STATISTICS - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - COMPREHENSION - CLASS 2	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 1	RUBY MA'AM
5:30PM	ENGLISH - COMPREHENSION - CLASS 2	ANURADHA MA'AM
6:30PM	MATHS - CONTINUITY & DIFFERENTIABILITY	NAVJYOTI SIR

CDS 2 2024 LIVE CLASSES

11:30AM	GK - ANCIENT HISTORY - CLASS 1	RUBY MA'AM
4:00PM	MATHS - STATISTICS - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - COMPREHENSION - CLASS 2	ANURADHA MA'AM

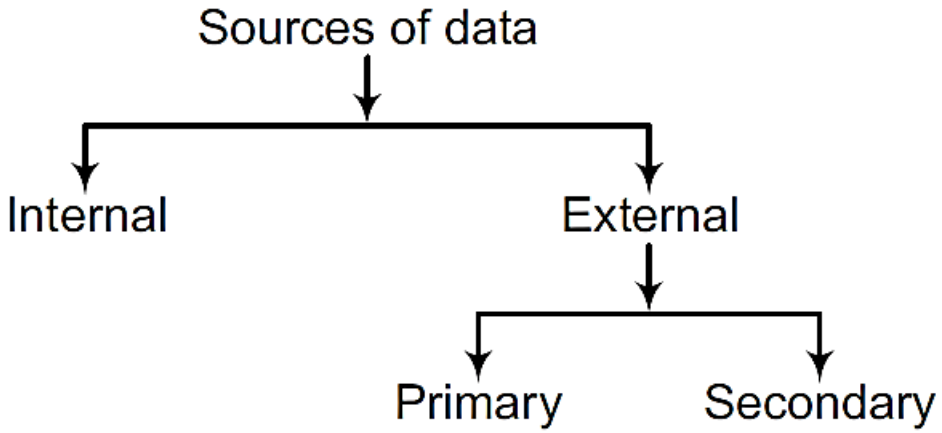
STATISTICS

Statistics is the branch of science, which deals with the collection, analysis and interpretation of numerical data.

collecting → analysing → finding insights / conclusions.

CLASSIFICATION OF DATA

Classification of data is the first step in statistics towards achieving the goal on conclusion. There are different sources of collection of data.

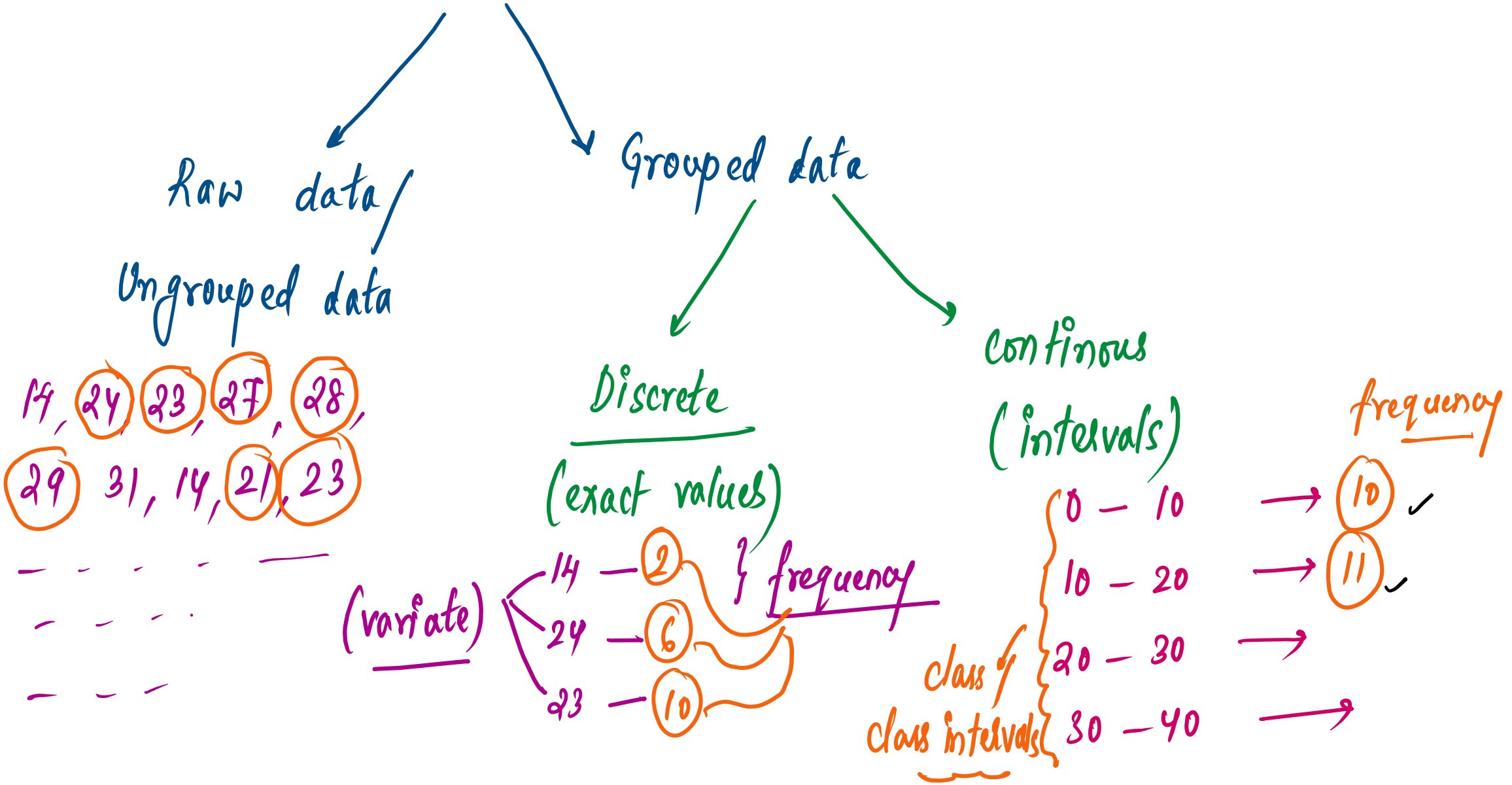


The two main type of data on the basis of collection are

(i) Primary data It is the data collected actually in the process of investigation by the investigator. It is original and is first hand information.

(ii) Secondary data Data which is already collected by other persons is called as secondary data.

PRESENTATION OF DATA



IMPORTANT TERMS

Frequency Number of observations falling in a particular class is called frequency of that class.

Class marks It is the mid-point of the class interval.

$$\text{Class mark} = \frac{\text{Lower limit of class} + \text{Upper limit of class}}{2}$$

continous data

0 – 10 ⟶ 5

10 – 20 ⟶ 15

20 – 30 ⟶ 25

class marks (single value to represent a class)

Cumulative frequency The cumulative frequency of a class interval is the sum of frequencies of all classes upto that class. (including the frequency of that particular class).

0 – 10 — (10)

10 – 20 — (30)

20 – 30 — (25)

} freq.

cum. freq.

10

10 + 30 = 40

40 + 25 = 65

FREQUENCY DISTRIBUTION TABLE

60, 70, 59, 60, 50, 58, 62, 56, 59, 59, 58, 70, 58, 62, 50, 58, 58, 50, 62, 56

To make the data easily understandable we write it as in the following table.

Marks obtained	50	56	58	59	60	62	70
No. of students (Frequency)	3	2	5	3	2	3	2

FREQUENCY DISTRIBUTION OF DATA

Frequency distribution are of two types

(i) Discrete Frequency Distribution

A frequency distribution is called discrete frequency distribution if data are presented in a way that exact measurements of the units are clearly shown.

(ii) Continuous Frequency Distribution

A frequency distribution in which data are arranged in classes or groups which are not exactly measurable.

GROUPED FREQUENCY DISTRIBUTION TABLE

Marks obtained

(Groups or class Intervals)	No. of Students (frequency)
50 – 55	8
55 – 60	4
60 – 65	12
65 – 70	5
70 – 75	2
75 – 80	6
80 – 85	8
85 – 90	5
90 – 95	10
Total	**60**

DISCRETE CUMULATIVE FREQUENCY

No. of children	No. of families (frequency) (f_i)	Cumulative frequency
1	5	5
2	6	11 (=5+6)
3	4	15 (=11+4)
4	3	18 (=15+3)
5	2	20 (=18+2)
Total	20	

20, 21, 23, 20, 25, 26

20 — 2 ; 21 — 1 ; 23 — 1 ; 25 — 1 ; 26 — 1

2+1+1+1+1 = 6

no. of observations in the data = $\sum f_i$

RANGE

Set of observations / Data

Range = max. value − min. value

10, 12, 17, 18, 16, 24, 21

Range = 24 − 10 = 14

MEASURES OF CENTRAL TENDENCY

Generally average value of a distribution in the middle part of the distribution such type of values are known as measures of central tendency.

An average of a distribution is the value of the variable which is representative of the entire distribution.

The following are the five measures of central tendency.

1. Arithmetic Mean / Mean / Average
2. Geometric Mean
3. Harmonic Mean
4. Median
5. Mode

ARITHMETIC MEAN / MEAN

$$\frac{\text{Sum of observations}}{\text{no. of "}} = \bar{x} \text{ (Mean)}$$

1 2 3 4 5

4, 3, 7, 8, 6

$$\frac{4+3+7+8+6}{5}$$

$$= \frac{28}{5} = 5.6$$

x_i (variates)	f_i (frequencies)	$x_i f_i$
	Σf_i	$\Sigma x_i f_i$ =

$$\bar{x} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

EXAMPLE

The mean for following distribution is

(a) 22.33 (b) 23.24 (c) 24.56 (d) 25.56

Class Interval	Frequency
0–10	22
10–20	38
20–30	46
30–40	35
40–50	20

$\bar{x} = \frac{\Sigma x_i f_i}{\Sigma f_i} = \_\_\_ = \_\_\_$

x_i	f_i	$x_i f_i$
5	22	$22 \times 5 = 110$
15	38	$15 \times 38 = \_$
25	46	$25 \times 46 = \_$
35	35	$35 \times 35 = \_$
45	20	$45 \times 20 = \_$
	$\Sigma f_i = 161$	$\Sigma x_i f_i = 110 + \_ + \_ + \ldots$

EXAMPLE

The mean for following distribution is

(a) 22.33 (b) 23.24 (c) 24.56 (d) 25.56

Class Interval	Frequency
0–10	22
10–20	38
20–30	46
30–40	35
40–50	20

Ans: (c)

COMBINED MEAN

If two sets of observations are given, then combined mean for the two sets can be calculated with the help of following formula

$$\bar{x}_{12} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2} = \frac{\text{Total sum of both}}{\text{Total in number of both}}$$

where, $\bar{x}_{12}$ = combined mean of two sets of observations

$\bar{x}_1$ = mean of first set of observations

n_1 = number of observations in first set

$\bar{x}_2$ = mean of second set of observations

n_2 = number of observations in second set

MEDIAN (value at the middle)

Median of a discrete series First, arrange the value of given observations (or variables) in ascending order, then find the cumulative frequency.

(a) If n is an odd number, then Median = value of $\left(\frac{n+1}{2}\right)$th term

(b) If n is an even number, then

$$\text{Median} = \frac{\text{value of } \left(\frac{n}{2}\right)\text{th term} + \text{value of } \left(\frac{n}{2}+1\right)\text{th term}}{2}$$

odd

4, 3, 7, 8, 9, 6, 5

3, 4, 5, 6, 7, 8, 9 | (n = 7)

n is no. of observations,

Median = $\left(\frac{n+1}{2}\right)^{th}$ observation

= $\left(\frac{7+1}{2}\right)^{th}$ = 4th obs.

even

4, 6, 5, 7, 4, 3, 5, 8, 9, 10

3, 4, 4, 5, 5, 6, 7, 8, 9, 10 | (n = 10)

(5+6)/2 = 5.5

$$\left\{\left(\frac{n}{2}\right)^{th} + \left[\left(\frac{n}{2}\right)+1\right]^{th}\right\} / 2$$

MODE

Mode of a discrete series The mode of a discrete series is that value of variable for which the frequency is maximum.

4, 6, 8, 15, 16, 18, 24, 36, 18, 16, 18

Mode = observation that is repeated maximum times,

Mode = 18

RELATION B/W MEAN, MEDIAN, MODE

$$3\ \text{Median} = \text{Mode} + 2\ \text{Mean}$$

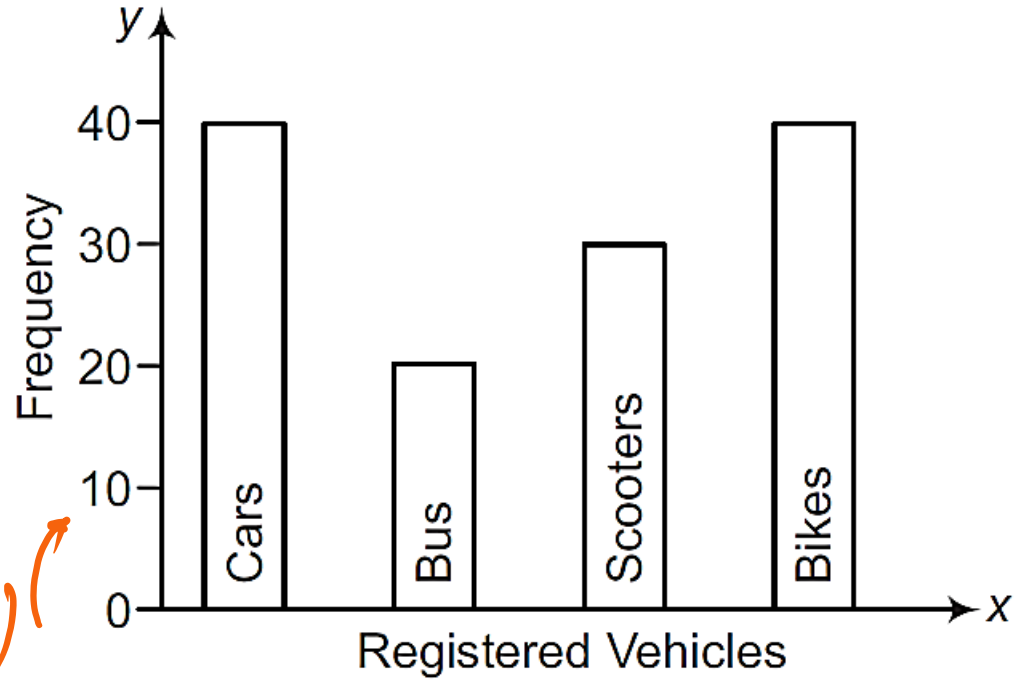
3 Median − 2 Mean = Mode

BAR DIAGRAM

In bar diagrams, only the length of the bars are taken into consideration. The width of each bar can be any, but widths of all the bars is same and space between these bars should be same. The width of the bar has no special meaning.

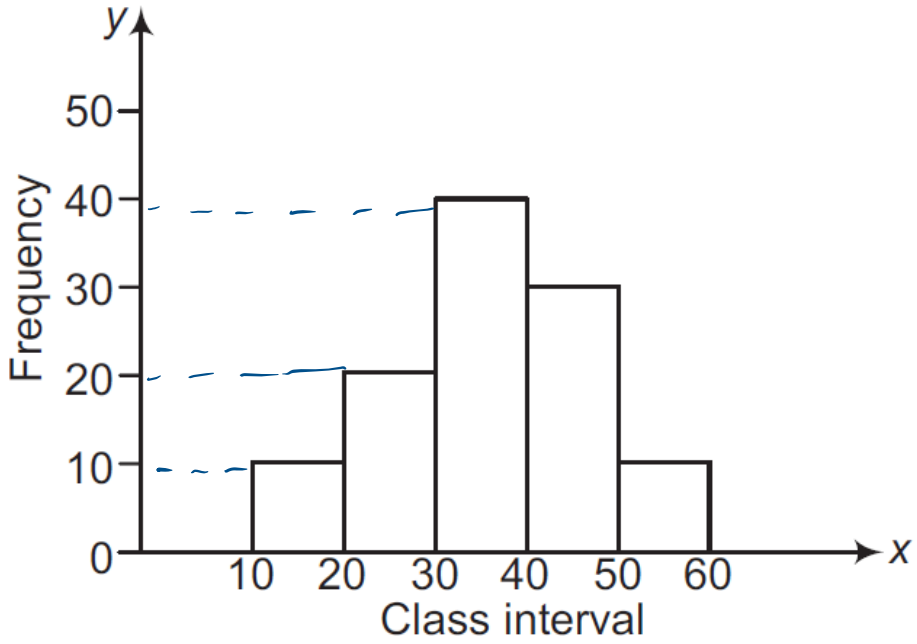
e.g., The bar diagram of the following data is

Registration of vehicles in 2011	Car	Bus	Scooters	Bikes
No. of vehicles	40	20	25	35



(discrete – exact values)

HISTOGRAM

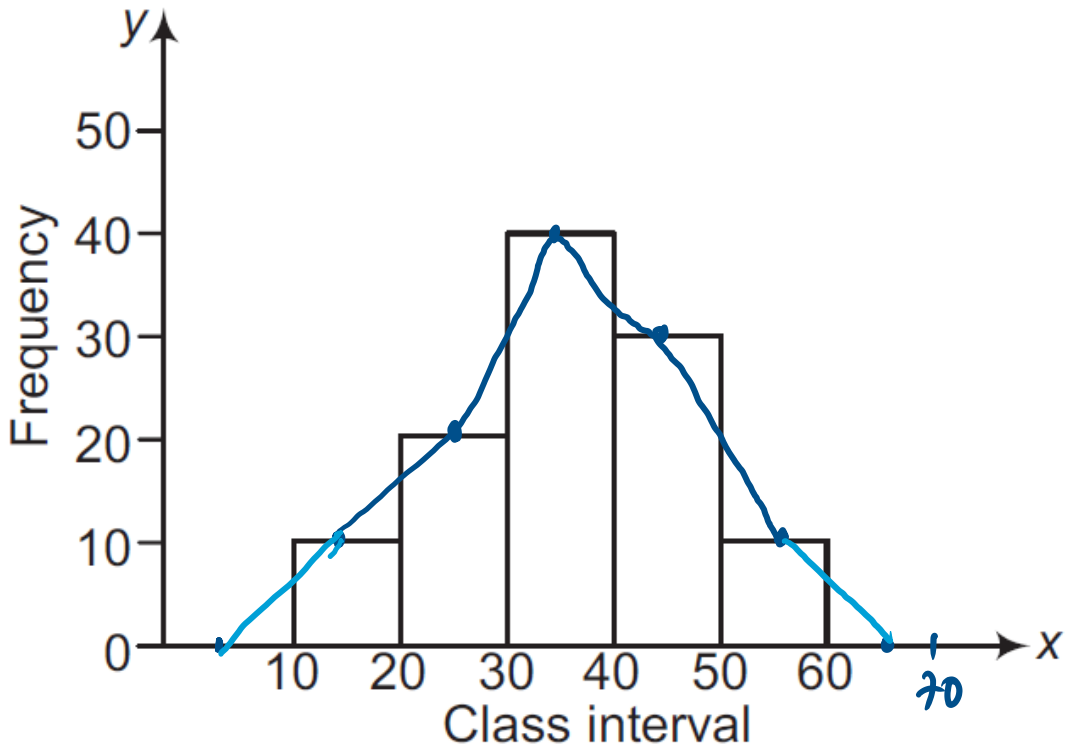


class	f
10 – 20	10
20 – 30	20
30 – 40	40
40 – 50	30
50 – 60	10

no gap between rectangles,

continous, intervals data representation.

FREQUENCY POLYGON

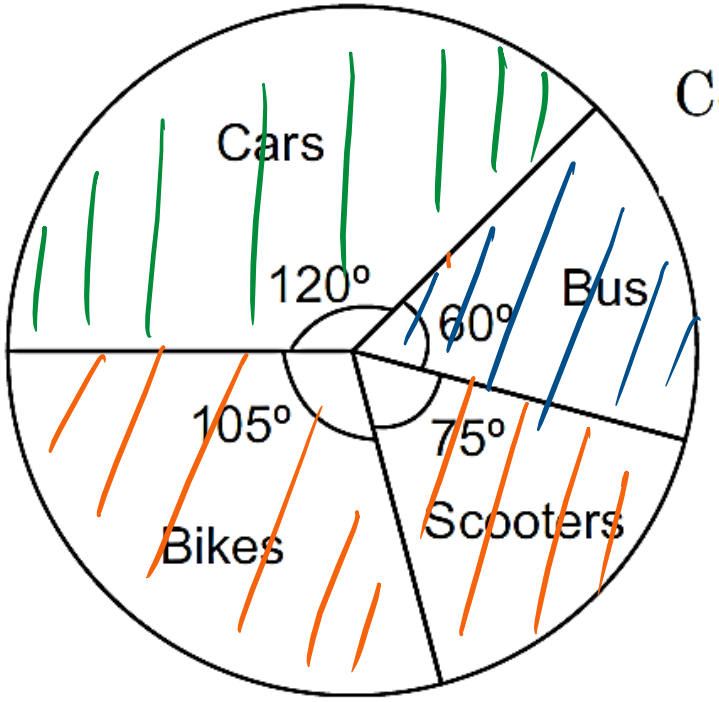


1) class mark = mid value of interval,

$$\frac{\text{upper limit} + \text{lower limit}}{2}$$

PIE DIAGRAM

Pie diagram is used to represent a relative frequency distribution. A pie diagram consists of a circle divided into as many sectors or there are classes in a frequency distribution. Sum of all the angles of sectors is 360°



$$\text{Central angle} = \left[\frac{\text{frequency} \times 360^\circ}{\text{total frequency}}\right]$$

(parts of whole)

each variate has 1 angle.

$$\frac{\text{part } (f_i)}{\text{whole}} = \frac{\text{angle}}{360^\circ}$$

(Σf_i)

$$\text{angle } (f_i) = \frac{f_i}{\Sigma f_i} \times 360^\circ$$

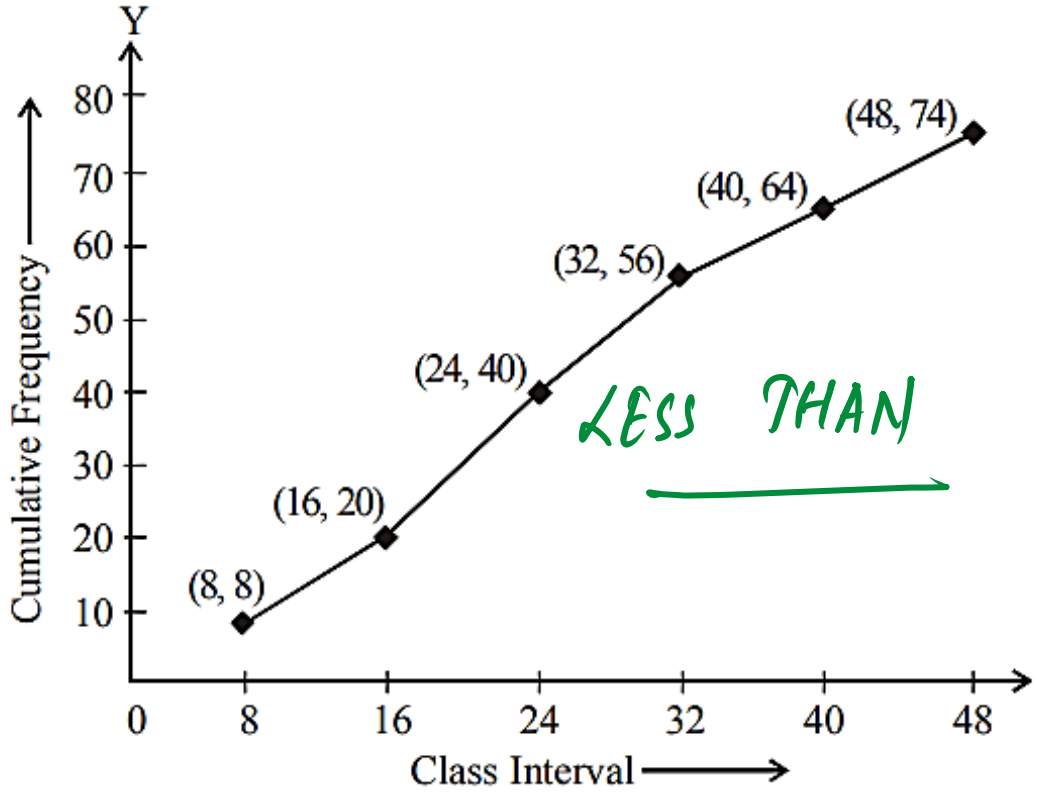
CUMULATIVE FRQUENCY CURVE (OGIVE)

Less than More than.

Class Interval	0-8	8-16	16-24	24-32	32-40	40-48
Frequency	8	12	20	16	8	10

Class Interval	Cumulative Frequency
Less than 8 or = 8	8
Less than 16	8 + 12 = 20
Less than 24	20 + 20 = 40
Less than 32	40 + 16 = 56
Less than 40	56 + 8 = 64
Less than 48	64 + 10 = 74

(8,8), (16,20), (24, 40) . . . .

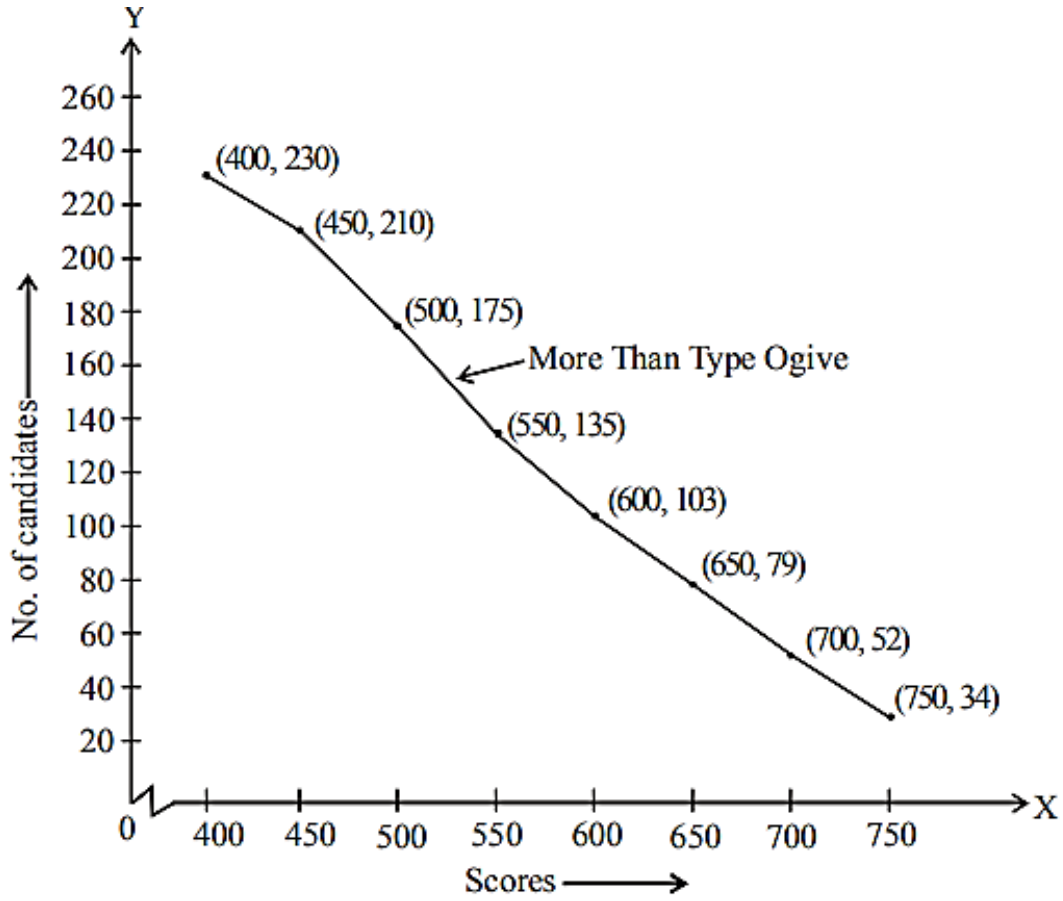


CUMULATIVE FRQUENCY CURVE (OGIVE)

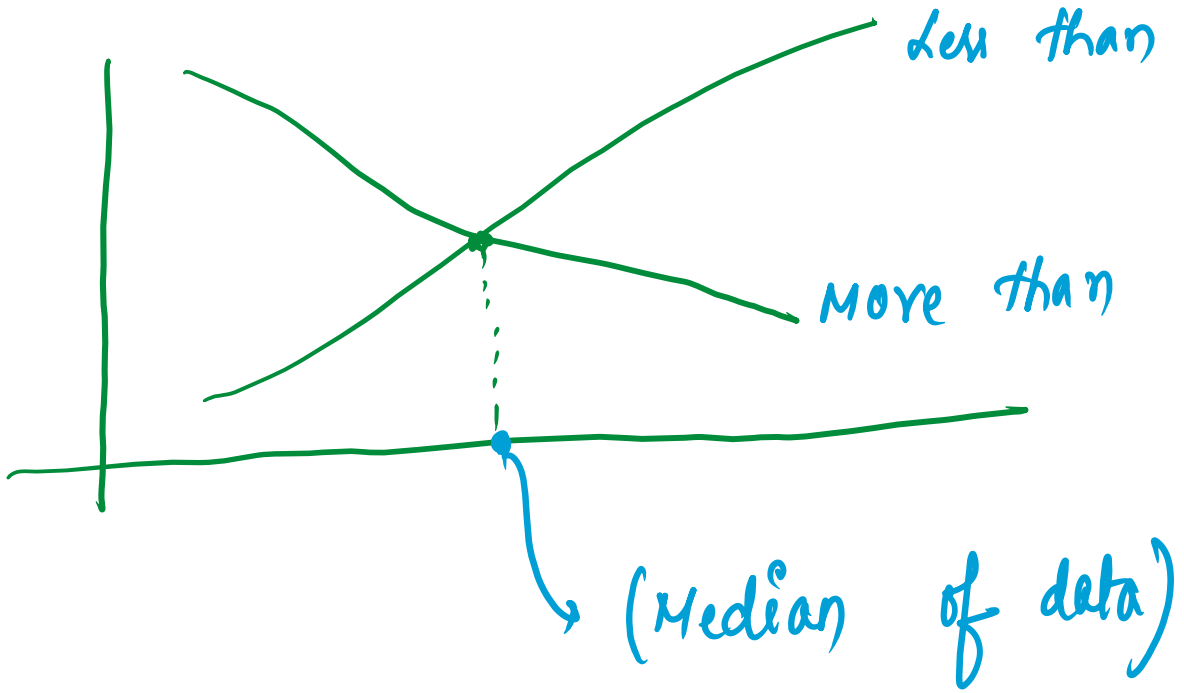
Scores	400-450	450-500	500-550	550-600	600-650	650-700	700-750	750-800
No. of Candidate	20	35	40	32	24	27	18	34

Secors	No. of Candidates
More than or equal to 400	230
More than or equal to 450	230 – 20 = 210
More than or equal to 500	210 – 35 = 175
More than or equal to 550	175 – 40 = 135
More than or equal to 600	135 – 32 = 103
More than or equal to 650	103 – 24 = 79
More than or equal to 700	79 – 27 = 52
More than or equal to 750	52 – 18 = 34

(400, 230), (450, 210), (500, 175) ...



Less - than ogive & More than ogive of same data,



GEOMETRIC & HARMONIC MEAN (GM & HM)

For 2 numbers, a & b,

$$GM = \sqrt{ab}$$

$$HM = \frac{2}{\frac{1}{a} + \frac{1}{b}} = \frac{2ab}{a+b}$$

For n numbers, $a_1, a_2, a_3 \cdots a_n$

$$GM = \sqrt[n]{a_1 a_2 a_3 \cdots a_n}$$

$$HM = \frac{n}{\frac{1}{a_1} + \frac{1}{a_2} + \frac{1}{a_3} + \cdots \frac{1}{a_n}}$$

EXAMPLE

If the harmonic mean of 60 and x is 48, then what is the value of x?

(a) 32 (b) 36

(c) 40 (d) 44

$$HM = \frac{2ab}{a+b} = \frac{2 \times 60 \times x}{60+x} = 48$$

$$120x = 60 \times 48 + 48x$$

$$72x = 60 \times 48$$

$$x = \frac{60 \times 48}{72} = 40$$

EXAMPLE

If the harmonic mean of 60 and x is 48, then what is the value of x?

(a) 32 (b) 36

(c) 40 (d) 44

Ans: (c)

RELATION OF AM, GM, HM

If a and b are two real numbers and A, G and H are arithmetic mean, geometric mean and harmonic mean, respectively.

$$\therefore \quad A = \frac{a+b}{2}, G = \sqrt{ab} \text{ and } H = \frac{2ab}{a+b}$$

$$\Rightarrow \quad A > G > H \text{ and } G^2 = AH.$$

Q) The harmonic mean H of two numbers is 4 and the arithmetic mean A and geometric mean G satisfy the equation $2A + G^2 = 27$. The two numbers are

(a) 6, 3 (b) 9, 5

(c) 12, 7 (d) 3, 1

$G^2 = A \times H$

$2A + AH = 27$

$2A + 4A = 27$ (Given $H = 4$)

$6A = 27$

$A = \frac{9}{2} \Rightarrow \frac{a+b}{2} = \frac{9}{2} \Rightarrow a+b = 9$

$H = \frac{2}{\frac{1}{6}+\frac{1}{3}} = \frac{2 \times 6}{1+2}$

$= \frac{12}{3} = 4$

Q) The harmonic mean H of two numbers is 4 and the arithmetic mean A and geometric mean G satisfy the equation $2A + G^2 = 27$. The two numbers are

(a) 6, 3 (b) 9, 5

(c) 12, 7 (d) 3, 1

Ans: (a)

Q)

X	1	2	3	4
Frequency	2	3	f	5

The frequency distribution of a discrete variable X with one missing frequency f is given above. If the arithmetic mean of X is $\frac{23}{8}$, what is the value of the missing frequency?

(a) 5 (b) 6
(c) 8 (d) 10

$\bar{x} = \frac{\sum x_i f_i}{\sum f_i} = \left\{ \frac{1\times2 + 2\times3 + 3f + 4\times5}{2+3+f+5} = \frac{23}{8} \right\}$

$\frac{28+3f}{10+f} = \frac{23}{8}$

$224 + 24f = 230 + 23f$

$f = 6$

Q)

X	1	2	3	4
Frequency	2	3	f	5

The frequency distribution of a discrete variable X with one missing frequency f is given above. If the arithmetic mean of X is $\frac{23}{8}$, what is the value of the missing frequency?

(a) 5 (b) 6
(c) 8 (d) 10

Ans: (b)

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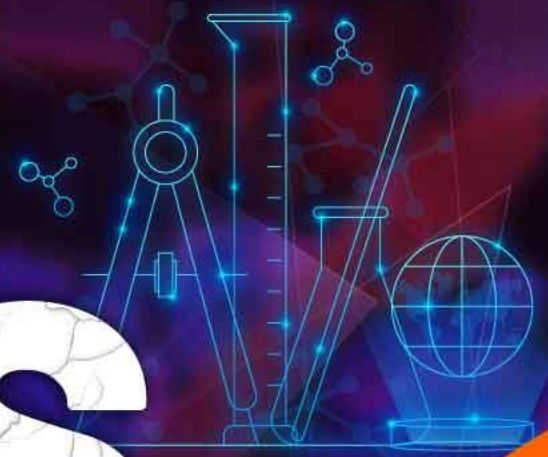

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