CDS 1 2025

LIVE

MATHS

STATISTICS

CLASS 1

NAVJYOTI SIR

Crack
EXAMS

12 Dec 2024 Live Classes Schedule

8:00AM	12 DEC 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	12 DEC 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:30AM	OVERVIEW OF SRT & SDT	ANURADHA MA'AM

NDA 1 2025 LIVE CLASSES

1:00PM	PHYSICS - MOTION - CLASS 2	NAVJYOTI SIR
4:30PM	ENGLISH - ACTIVE PASSIVE VOICE - CLASS 1	ANURADHA MA'AM
5:30PM	MATHS - APPLICATIONS OF DERIVATIVES - CLASS 3	NAVJYOTI SIR

CDS 1 2025 LIVE CLASSES

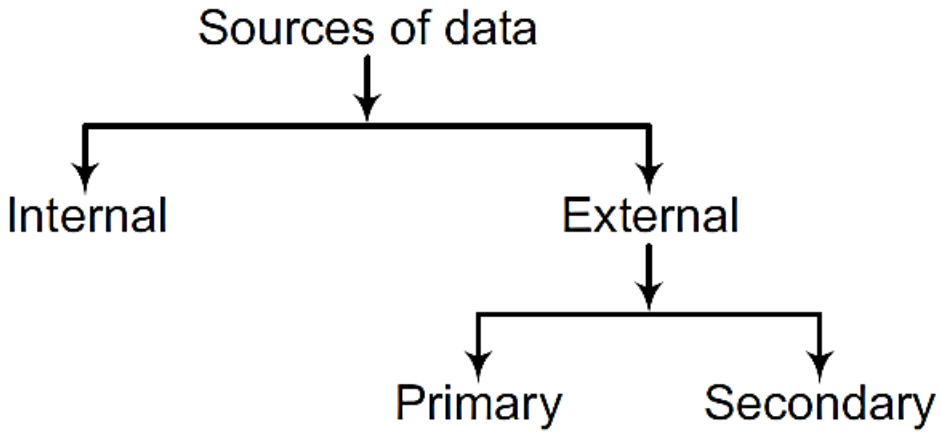
1:00PM	PHYSICS - MOTION - CLASS 2	NAVJYOTI SIR
4:30PM	ENGLISH - ACTIVE PASSIVE VOICE - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - STATISTICS - CLASS 1	NAVJYOTI SIR

STATISTICS

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

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

Raw ou Ungrouped data When the data are presented in random and is not prepared according to some order. It does not give us a clear picture of the class.

Grouped data When the data is arranged in any manner like ascending or descending etc. It can also be presented in the form of a table called frequency distribution table.

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.

No. of hours | No. of households (frequency)

discrete
4
5
6
7

(ii) Continuous Frequency Distribution

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

Groups

4 – 6 → $\frac{4+6}{2} = 5$

6 – 8 → $\frac{6+8}{2} = 7$

8 – 10 → $\frac{8+10}{2} = 9$

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.

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

To represent a group into a single number.

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).

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

} discrete data

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**

continous

DISCRETE CUMULATIVE FREQUENCY

No. of children	No. of families (frequency)	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**	

used when finding median

CLASS INTERVAL

Class interval of the form $10-20, 20-30, 30-40, \ldots\ldots$; in which upper limit of any class interval coincides with the lower limit of the just next class interval, is called **Exclusive class Interval**.

Class interval of the form $10-19, 20-29, 30-39, \ldots\ldots$; in which upper limit of any class interval does not coincides with the lower limit of the just next class interval, is called **Inclusive class Interval.**

we work on this,

convert into exclusive class interval for solving.

$10-0.5 \text{ — } 19+0.5$ $\quad$ $10.5 \text{ — } 19.5$

$20-0.5 \text{ — } 29+0.5$ $\quad$ $19.5 \text{ — } 29.5$

$30-0.5 \text{ — } 39+0.5$ $\quad$ $29.5 \text{ — } 39.5$

RANGE

The range is the difference of maximum and minimum observation of observations of a distribution. If L and S are maximum and minimum observation of distribution then,

$$\text{Range} = L - S$$

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
2. Geometric Mean
3. Harmonic Mean
4. Median
5. Mode

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

$$\bar{x}_{12} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$$

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

PROPERTIES OF MEAN

(i) If each observation is increased by 'a', then the mean is also increased by 'a'. If is the mean of n observations $x_1, x_2, ..., x_n$, then the mean of observations $(x_1 + a), (x_2 + a), (x_3 + a), ..., (x_n + a)$ is $(\bar{x} + a)$.

(ii) If each observation is decreased by 'a', then mean is also decreased by 'a'. If $\bar{x}$ is the mean of n observations $x_1, x_2, ..., x_n$; then mean of observations $(x_1 - a), (x_2 - a), ..., (x_n - a)$ is $(\bar{x} - a)$.

PROPERTIES OF MEAN

(iii) If each observation is multiplied by a non-zero number 'a'. Then, mean is also multiplied by 'a'. If $\bar{x}$ is mean of n observations $x_1, x_2, ..., x_n$; then mean of $ax_1, ax_2, ..., ax_n$ is a. $\bar{x}$.

(iv) If each observation is divided by a non-zero number 'a', then mean is also divided by the non-zero number 'a'. If $\bar{x}$ is the mean of n observations $x_1, x_2, ..., x_n$, then mean of $\frac{x_1}{a}, \frac{x_2}{a}, ... \frac{x_n}{a}$, is $\frac{\bar{x}}{a}$.

EXAMPLE

The mean for following distribution is

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

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

Class size = 10

$\text{Mean, } \bar{x} = \frac{\Sigma xf}{\Sigma f}$

$\bar{x} = A + h\frac{\Sigma u_i f_i}{\Sigma f_i}$

$\Sigma f_i = 161$

class mark (x_i)	(f_i)	xf	$d_i = x_i - A$	$u_i = \frac{x_i - A}{h}$	$u_i f_i$
5	22		−20	−2	−44
15	38		−10	−1	−38
A → 25	46		0	0	0
35	35		10	1	35
45	20		20	2	40

$\Sigma u_i f_i = -6$

$u_i f_i = 25 + (10)\frac{(-7)}{161}$

$\approx 25 - \frac{7}{16}$

$= 25 - 0.43$

$\simeq 24.57$

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)

MEDIAN

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

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

EXAMPLE

3, 4, 5, 5, 8, 9, 9, 9, 13, 15, 16

no. of observations = 11 ⟶ Odd

(n)

for n = odd, median $= \left(\frac{n+1}{2}\right)^{th}$ observation $= \left(\frac{11+1}{2}\right)^{th}$

$= 6^{th} = \boxed{9}$

3, 4, 5, 5, 8, 9, 9, 9, 13, 15

n = 10 = even

$$\text{median} = \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2} = \frac{5^{th} + 6^{th}}{2} = \frac{8+9}{2} = \frac{17}{2} = \boxed{8.5}$$

MEDIAN

Median of a continuous series First find the cumulative frequency table of given observations, then find the group (median group) of $\frac{n}{2}$ th observation. Then,

$$\therefore \quad \text{Median} = l + \frac{\left(\frac{n}{2} - c\right)}{f} \times h$$

where, l = lower limit of median group
f = frequency of median group
h = size of median group
c = cumulative frequency of a group before to median group

$n = \Sigma f$

$\frac{n}{2}$] just greater value of cf

check corresponding class interval ⟶ median class

EXAMPLE

The median for the following distribution is

Class Interval	Frequency	cf
0–10	22	22
10–20	38	60
20–30	46	106
30–40	35	141
40–50	20	161

(a) 20 (b) 22.46 (c) 24.46 (d) 25

$\Sigma f = n = 161$

(1) $\frac{n}{2} = \frac{\Sigma f}{2} = \frac{161}{2} = 80.5$

(2) Mark cf just bigger than 80.5.

(3) corresponding to this cf, class interval = median class

$20 - 30$

l

$$\text{Median} = l + \frac{\left(\frac{n}{2} - cf\right)}{f} \times h$$

$$= 20 + \left(\frac{80.5 - 60}{46}\right) \times 10 = 20 + \left(\frac{20.5}{46}\right) \times 10 = 20 + \frac{205}{46} = 20 + 4.\overline{4}$$

$$= 24.46$$

EXAMPLE

The median for the following distribution is

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

(a) 20 (b) 22.46 (c) 24.46 (d) 25

Ans: (c)

MODE

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

Mode of a continuous series First find the modal group, which has maximum frequency, then

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

where, l = lower limit of modal group

h = size of modal group

f_1 = frequency of modal group

f_0 = frequency of a group before to modal group

f_2 = frequency of a group next to modal group

EXAMPLE

The mode of the following distribution is

Class Interval	Frequency
0–20	17
20–40	28
40–60	32
60–80	24
80–100	19

(a) 40 (b) 42.67 (c) 46.67 (d) 7

f_0, f_1, f_2

Modal class = 40 – 60

l

$h = 20$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 40 + \left(\frac{32 - 28}{2 \times 32 - 28 - 24}\right) \times 20$$

$$= 40 + \left(\frac{4}{64 - 52}\right) \times 20$$

$$= 40 + \frac{4}{12} \times 20 = 40 + \frac{20}{3}$$

$$= 40 + 6.67 = 46.67$$

EXAMPLE

The mode of the following distribution is

Class Interval	Frequency
0–20	17
20–40	28
40–60	32
60–80	24
80–100	19

(a) 40 (b) 42.67 (c) 46.67 (d) 7

Ans: (c)

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