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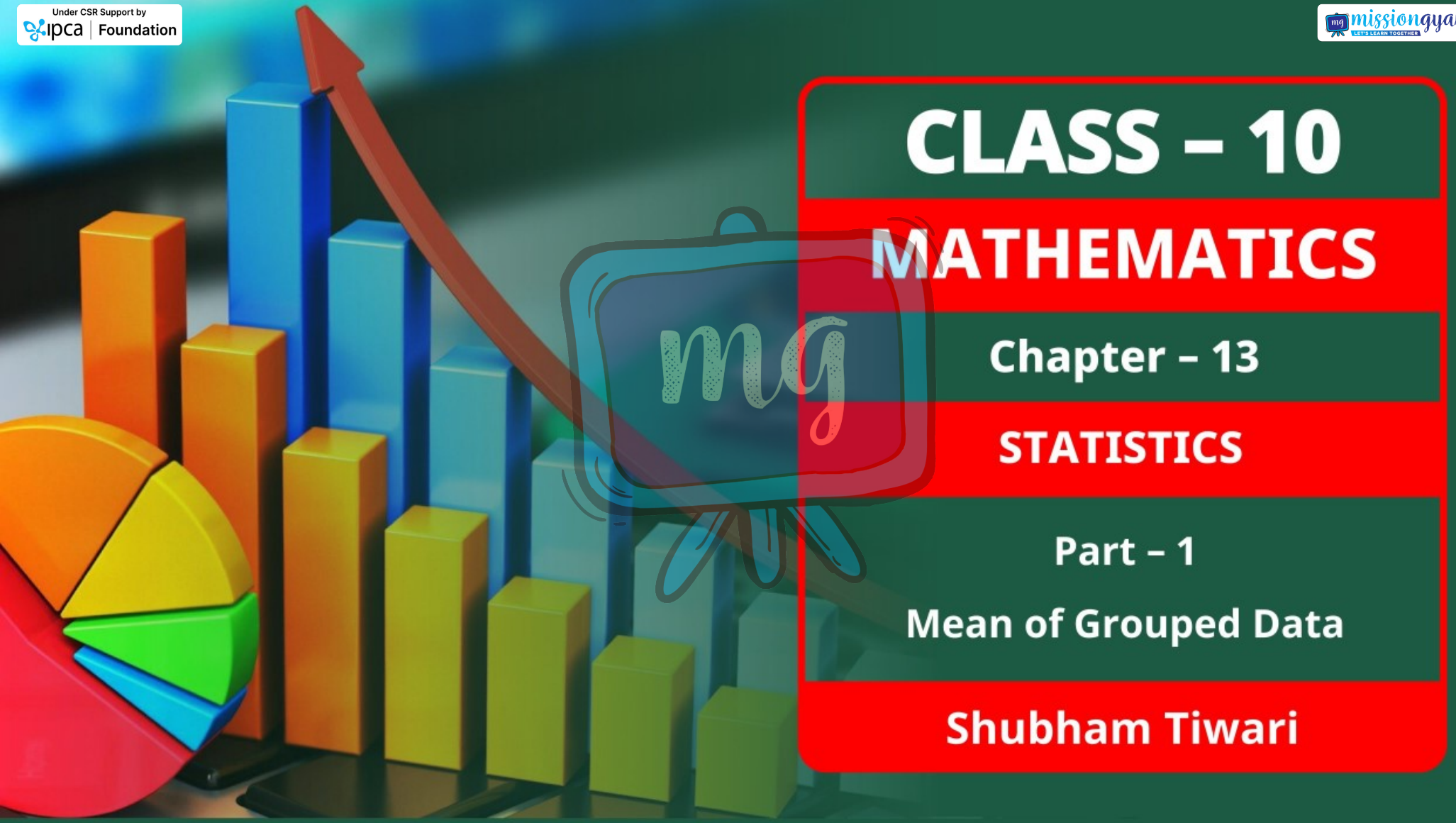


CLASS – 10

MATHEMATICS

Chapter – 13

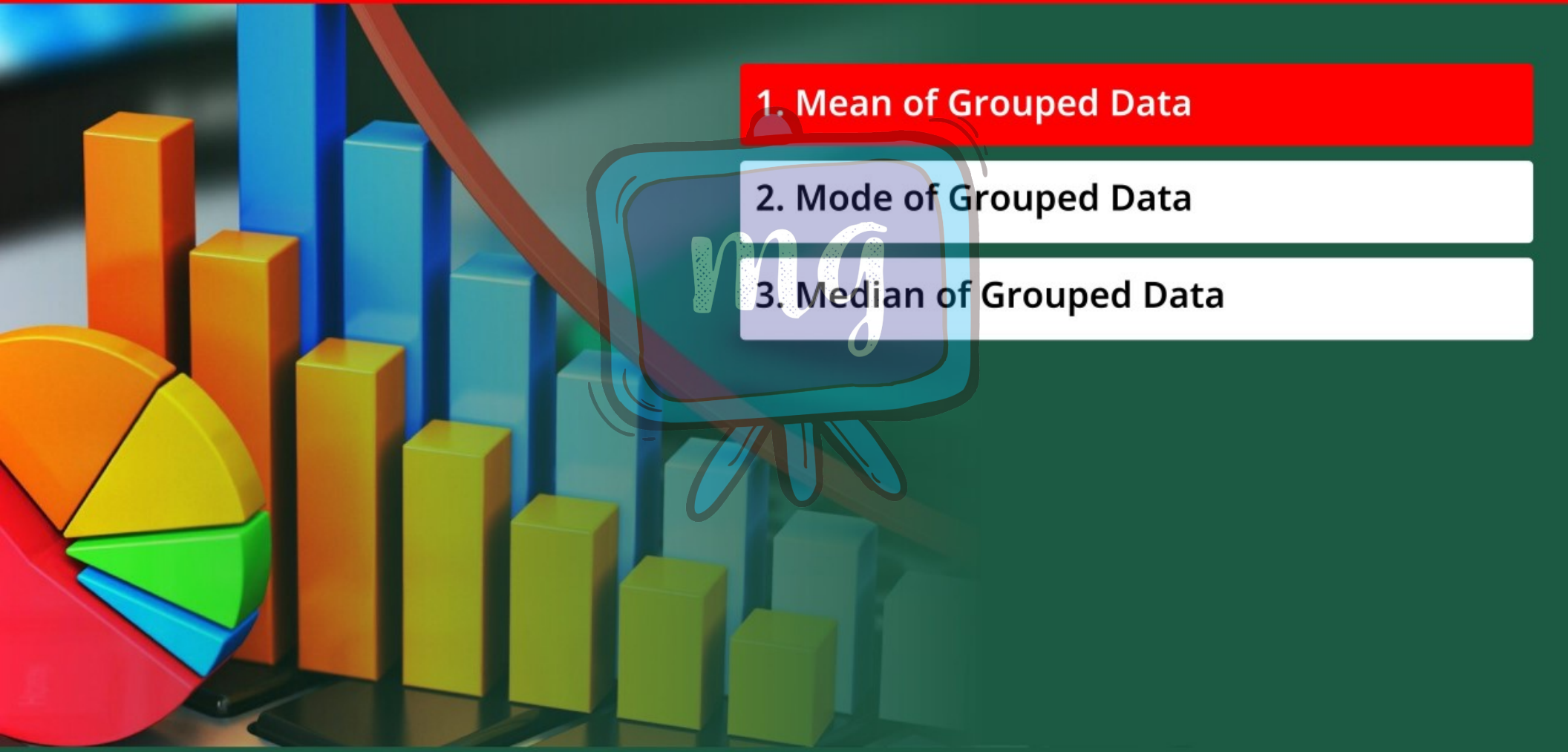
STATISTICS

Part – 1

Mean of Grouped Data

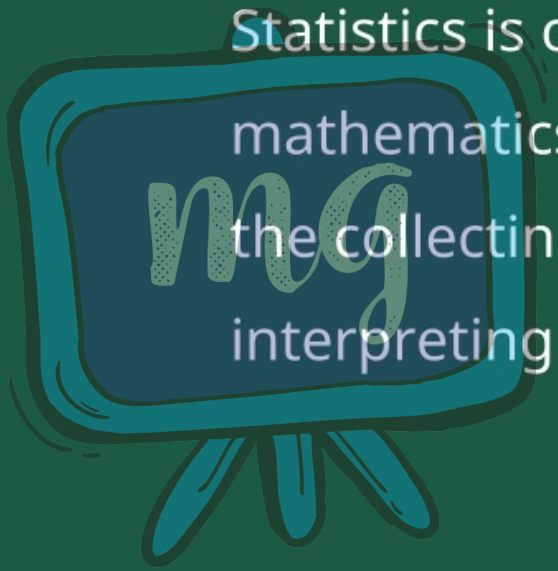
Shubham Tiwari

OVERVIEW



1. Mean of Grouped Data
2. Mode of Grouped Data
3. Median of Grouped Data

STATISTICS



Statistics is one of the parts of mathematics in which we study about the collecting, organizing, analyzing, interpreting and presenting data.

UNGROUPED DATA

Ungrouped data is data in its original or raw form. The observations are not classified into groups.

Example

The ages of everyone present in a classroom of kindergarten kids with the teacher are as follows :

3, 3, 4, 3, 5, 4, 3, 3, 4, 3, 3, 3, 3, 4, 3, 27.

GROUPED DATA

In grouped data, observations are organized in groups.

Example

a class of students got different marks in a school exam. The data is tabulated as follows :

Mark Interval	No. of Students
0 – 20	13
21 – 40	9
41 – 60	36
61 – 80	32
81 – 100	10

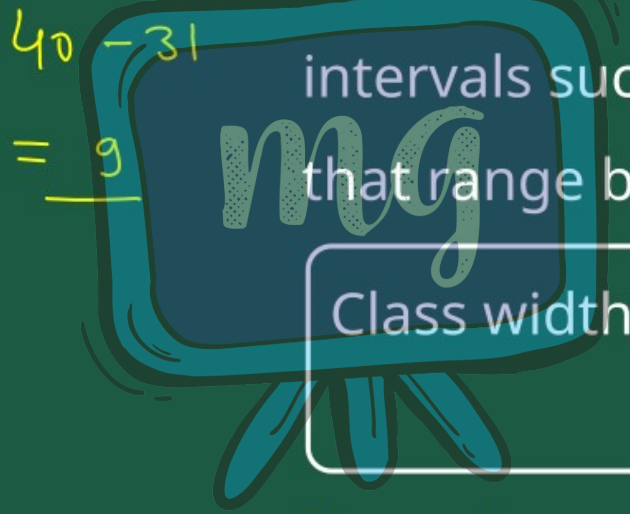
FREQUENCY

Frequency is the number of times a particular observation occurs in data.

Example

If four students have scored marks between 90 and 100, then the marks scored between 90 and 100 have a frequency of 4.

CLASS INTERVAL



Data can be grouped into class intervals such that all observations in that range belong to that class.

Class width = upper class limit – lower class limit

Example

Consider a class interval 31 – 40.

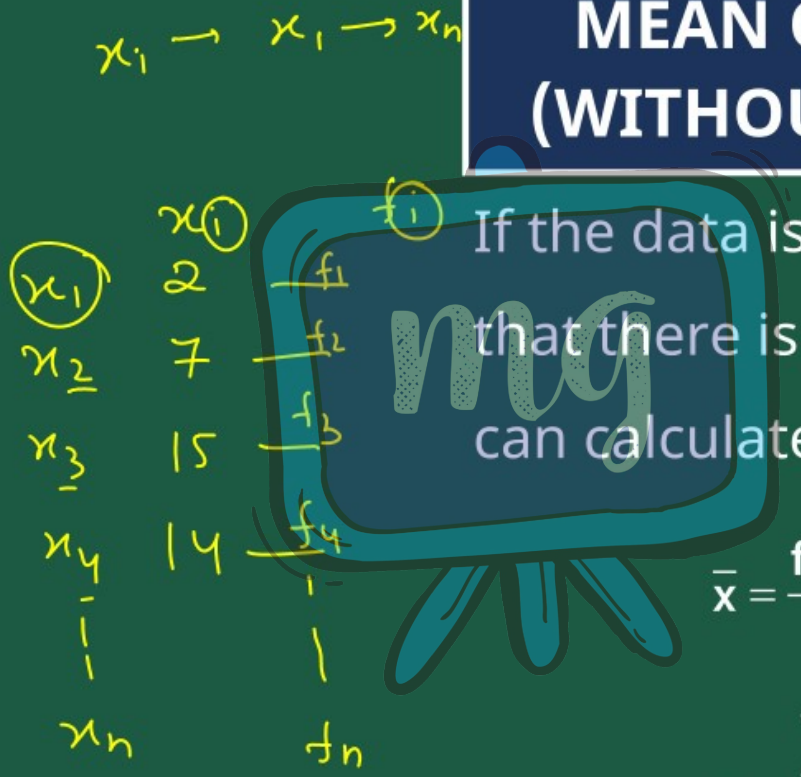
MEAN

The arithmetic mean is the sum of the values of all the observations divided by total number of observations.

$$\bar{x} = \frac{x_1 + x_2 + x_3 ..... + x_n}{n}$$

$$\text{Mean}(\bar{x}) = \frac{x_1 + x_2 + x_3 + x_4 + x_5}{5}$$

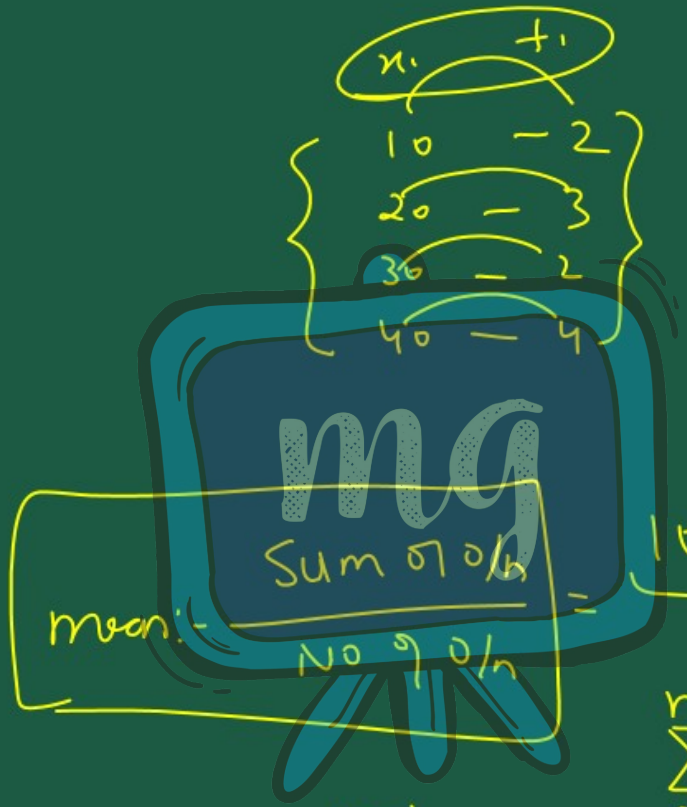
MEAN OF GROUPED DATA (WITHOUT CLASS INTERVAL)



If the data is organized in such a way that there is no class interval then we can calculate the mean by

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + f_3 x_3 ..... + f_n x_n}{f_1 + f_2 + ... + f_n}$$

$$\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$$



$10+10 = 10\times2$

$20+20+20 = 20\times3$

$30+30 = 30\times2$

$40+40+40+40 = 40\times4$

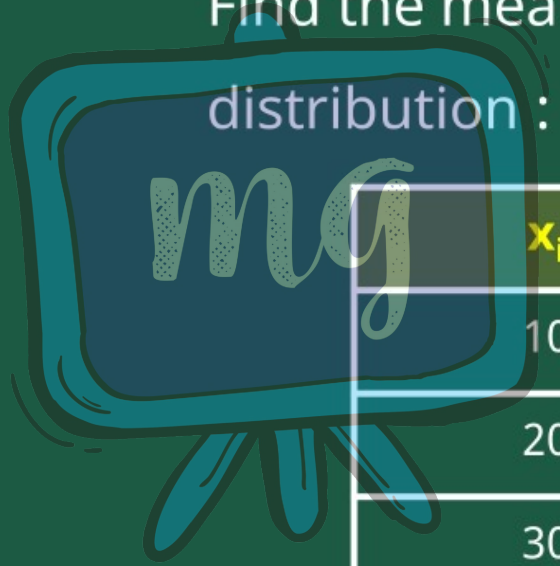
$$\text{Mean:-} = \frac{10\times2+20\times3+30\times2+40\times4}{11}$$

$$\text{Mean } (\bar{x}) = \frac{\sum_{i=1}^{n} f_i x_i = f_1x_1+f_2x_2+f_3x_3+\cdots}{\sum_{i=1}^{n} f_i}$$

where $x_1, x_2, x_3, \ldots\ldots x_n$ are the observations $f_1, f_2, f_3, \ldots\ldots f_n$ are the respective frequencies of the given observations.

Example :

Find the mean of the following distribution :



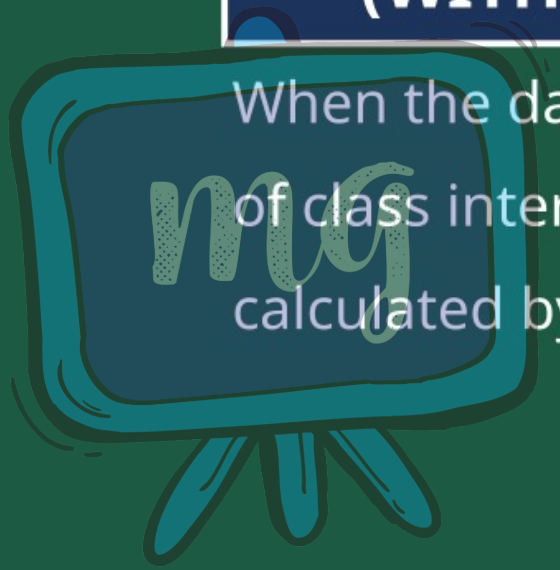
x_i	f_i
10	3
20	6
30	8
40	7

Solution :

x_i	f_i	$f_i x_i$
10	3	30
20	6	120
30	8	240
40	7	280
	24	670

$$\bar{x} = \frac{670}{24}$$

MEAN OF GROUPED DATA (WITH CLASS INTERVAL)



When the data is grouped in the form of class interval then the mean can be calculated by three methods.

MEAN OF GROUPED DATA (WITH CLASS INTERVAL)

1. Direct Method
2. Assumed Mean Method
3. Step Deviation Method

1. DIRECT METHOD

In this method, we use a midpoint which represents the whole class. It is called the class mark. It is the average of the upper limit and the lower limit.

$$\text{Class Mark} = \frac{\text{Upper Class Limit} + \text{Lower Class Limit}}{2}$$

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

Example :

A teacher marks the test result of the class of 55 students for mathematics. Find the mean for the given group.

Marks of Students	Frequency
0 – 10 5	2
10 – 20 15	3
20 – 30 25	7
30 – 40 35	5
40 – 50 45	4

Solution :

Marks of Students	Frequency (f_i)	Midpoint (x_i)	$f_i x_i$
0 – 10	2	5	210
10 – 20	3	15	45
20 – 30	7	25	175
30 – 40	5	35	175
40 – 50	4	45	180
			585

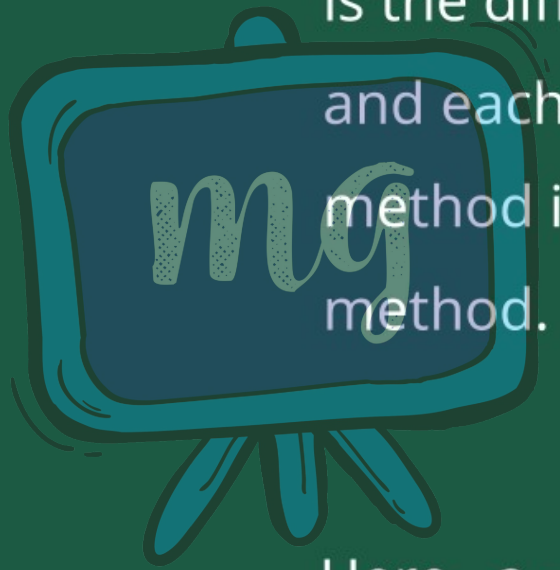
35 x 5
35 (4+1)
35 x 4 + 35
35 x 4 x 2
70
140 + 35

$\bar{x} = \frac{585}{21} = \frac{21}{1}$

2. ASSUMED MEAN METHOD

If we have to calculate the large numbers then we can use this method to make our calculations easy.

- In this method, we choose one of the x's as assumed mean and let it as "a".



- Then we find the deviation which is the difference of assumed mean and each of the x. The rest of the method is the same as the direct method.

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

Here, a = assumed mean

$d_i = x_i - a$

Example :

A teacher marks the test result of the class of 55 students for mathematics. Find the mean for the given group.

Marks of Students	Frequency
0 – 10	2
10 – 20	3
20 – 30	7
30 – 40	5
40 – 50	4

Solution :

Marks of Students	Frequency (f_i)	Mid value (x_i)	f_ix_i	$d_i = x_i - a$	f_id_i
0 – 10	2	5		5-25 = -20	-40
10 – 20	3	15		15-25 = -10	-30
20 – 30	7	25 =a		0	0
30 – 40	5	35		10	50 20
40 – 50	4	45		20	80 40
	21				60

$\bar{x} = 25 + \frac{60}{21}$

$a + \frac{\Sigma f_i d_i}{\Sigma f_i}$

LEARNING OUTCOMES

1. Mean of the Data
2. Methods of finding the Mean of Grouped Data with class interval

ASSESSMENT

1 The class limits of a given observation is 10 – 15, then the class mark for this interval will be :

A 11.5

B 12.5

C 12

D 14

$\frac{10+15}{2} = \frac{25}{2} = 12.5$

ASSESSMENT

2 If the mean of first n natural numbers is 3n/5, then the value of n is :

A 3

B 4

C 5

D 6

$\text{Sum} = \frac{n(n+1)}{2}$

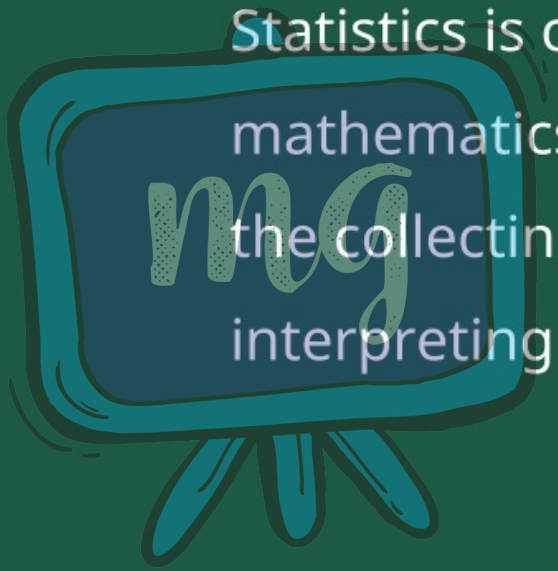
$\text{mean} = \frac{\text{Sum}}{\text{No}} = \frac{\frac{n(n+1)}{2}}{n}$

$\frac{3n}{5} = \frac{n+1}{2}$

$6n = 5n + 5$

$n = 5$

STATISTICS



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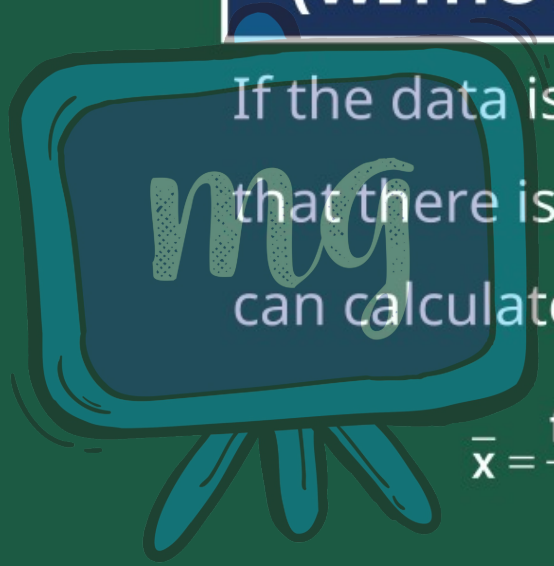

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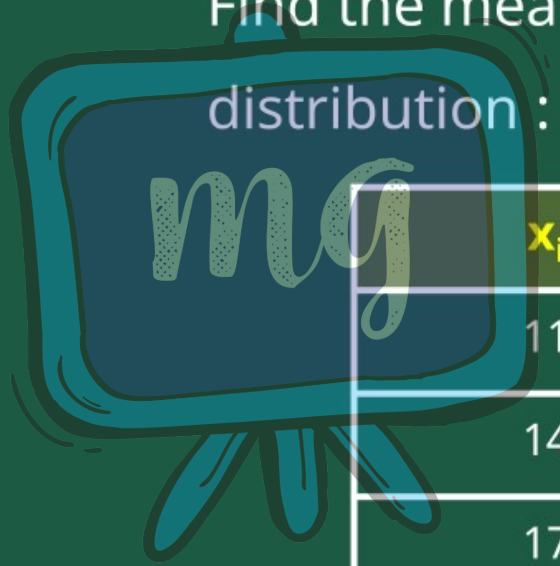

x_i	f_i
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14	6
17	8
20	7

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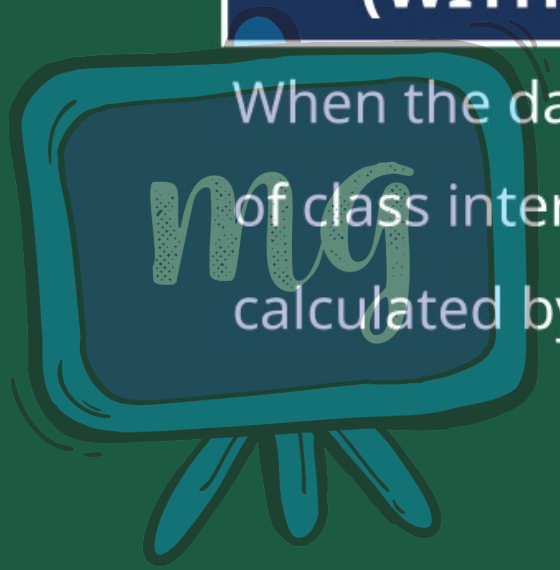

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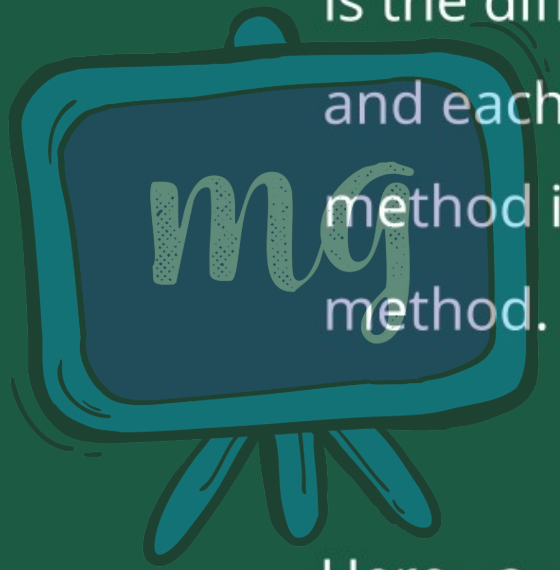

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