



Grade 10



MATHEMATICS



Competency :-Facilitates daily work by investigating the various methods of representing data.

Competency Level:-Extends frequency tables to easily communicate data.

Frequency Distributions

Uses representative values to interpret data.

Range

The difference between the greatest value and the least value of a set of data is called range.

$$\text{range} = \text{greatest value} - \text{least value}$$

Example :- Find the range of the set of data, 12, 25, 16, 18, 37, 20

$$\begin{aligned}\text{range} &= \text{greatest value} - \text{least value} \\ &= 37 - 12 = 25\end{aligned}$$

Mode

The value which has the greatest frequency in a set of data is known as the mode.

Example :- 5,11,19,11,16,20

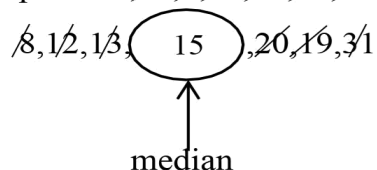
$$\text{Mode} = 11$$



Median

If a set of data is arranged either in ascending order or in descending order, the value which sits right in the center of the distribution is known as the median.

Example:- 12, 15, 8, 20, 13, 19, 31



median = 15

Position of the median can be obtained as follows.

Median = The value at the position at $\frac{\text{Number of data} + 1}{2}$
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In the above example, position of the median = $\frac{7 + 1}{2} = 4$
 value at the 4th position = 15

Example:- 16, 23, 15, 18, 9, 19, 24, 30

~~8, 12, 13~~, 15, 16, 18, 19, 23, 24, 30

$$\text{Median} = \frac{18 + 19}{2} = \frac{37}{2} = 18.5$$

Mean

Sum of the values of the set of data divided by the number of data gives the mean or average of the distribution.

Example :- 12, 16, 8, 19, 5

$\text{Mean} = \frac{\text{sum of the data}}{\text{number of data}}$
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$$\text{Mean} = \frac{12 + 16 + 8 + 19 + 5}{5} = \frac{60}{5} = 12$$



Revision 01

Find the range, mode, median and the mean of the following sets of data.

- 16, 18, 30, 40, 10, 12, 18
- 25, 32, 51, 14, 18, 24, 32
- 12, 5, 7, 8, 5, 9, 7, 7, 16, 9, 9

Frequency distribution of non-grouped data.

Discrete data in non-grouped data distribution is presented in tabulated form.

Example :- Masses of pumpkins harvested in a chena are given in the table below.

Mass (kg)	No of pumpkins (frequency)
1	3
2	4
3	7
4	3
5	2
6	2

(i). Find the mode.

Mode is the value appears with the greatest frequency.

∴ the mode here = 3.

(ii). Find the median.

median = data of the position at, $\frac{\text{number of data}}{2}$

Hence position of median = $\frac{21+1}{2} = \frac{22}{2} = 11$

Data at the 11th position = 3

Median mass of pumpkins = 3kg

(iii). Find the mean

Mass (kg)	Frequency (f)	f
1	3	3
2	4	8
3	7	21
4	3	12
5	2	10
6	2	12
	$\Sigma = 21$	$\Sigma = 66$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{66}{21} = 3.14$$



Revision 02

The table below shows ages of the patients who visited a certain medical clinic.

Age	25	26	27	28	29	30	31	32
Number. of patients	2	3	4	6	7	3	3	2

In this frequency distribution,

- Find the range.
- Find the mode.
- What is the median value?
- Work out the mean of the distribution.

Grouped Frequency Distribution.

If the range of data is large, then the data is divided into class intervals. Such a frequency distribution is called a grouped frequency distribution.

Grouped frequency distributions are divided into two groups, grouped frequency distribution in continuous form and in discrete form.

Continuous data distribution

Except for parameters which takes only whole numbers, any other data which can be available in any range of values are considered here.



Example :- The following grouped frequency distribution shows the heights of some students.

height (cm)	No of students
140 – 145	4
145 – 150	5
150 – 155	8
155 – 160	7
160 – 165	4
165 - 169	2

Modal class = 150 - 155

In the class interval, 150 – 155,

Size of the class interval = $155 - 150 = 5$

Data distribution with discrete data

If the range of data is in the form of number of books, number of children etc. which take only whole numbers are considered here.

Example:- The table shows a distribution of marks obtained by some students in a test.

Marks	No of students
10 – 19	2
20 – 29	3
30 – 39	4
40 – 49	7
50 – 59	6
60 – 69	5
70 – 79	2
80 - 89	1

Modal class = 40 – 49

Size of the class interval, $(29 - 20 + 1 = 10)$



Mid value of a class interval

The value which sits at the middle in the class interval is the mid value of the interval.

Example:- mid value of, 10 - 14 class interval

$$= \frac{10 + 14}{2} = \underline{\underline{\quad\quad}}$$

Example:- mid value of the class interval, 21 – 30 ,

$$= \frac{21 + 30}{2} = \underline{\underline{\quad\quad}}$$

Activity - I

01. The masses of parcels in a distribution are shown below. Complete its “Mid value” column

Mass (kg)	Mid value	Frequency
30 – 34	3
34 – 38	4
38 - 42	5
42 – 46	3
46 – 50	2

02. The table shows a frequency distribution of marks obtained by a group of students in a test. Complete its ‘Mid Value’ column.

Marks	Mid Value	Frequency
0 – 9	1
10 – 19	2
20 – 29	3
30 – 39	5
40 - 49	7
50 – 59	4
60 – 69	3

Exercise

Work on the exercise, 26.1 of Grade 10 textbook.



Finding the mean of a grouped frequency distribution.

Example 01

The following frequency distribution shows marks of 40 students obtained in a test which gives maximum 50 marks.

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	6	8	12	10	4

Calculate the mean marks obtained by a student.

Class Interval	Mid Value ()	Frequency (f)	
0 - 10	5	6	30
10 - 20	15	8	120
20 - 30	25	12	300
30 - 40	35	10	350
40 - 50	45	4	180
		$\Sigma = 40$	$\Sigma = 980$

$$\text{Mean} = \frac{\Sigma}{\Sigma}$$

$$= \frac{980}{40}$$

$$= 24.5$$

Activity - 2

Marks obtained by some students in a mathematics paper is shown below

Class Interval	6-10	10-14	14-18	18-22	22-26
Frequency	8	9	15	12	6

Find the mean marks obtained by a student

Class Interval	Mid value	Frequency (f)	
6 - 10	8	8	64
10 - 14			
14 - 18			
18 - 22			
22 - 26			
		$\Sigma = \dots\dots\dots$	$\Sigma = \dots\dots\dots$

$$\text{Mean} = \frac{\Sigma}{\Sigma} = \dots\dots\dots = \dots\dots\dots$$



Exercise

(01). The table shows the masses of some sportsmen in a club.

Mass (kg)	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79
No of sportsmen(f)	3	6	10	6	4	1

- What can be the maximum mass of a sportsman?
- How many sportsmen are accountable in above survey?
- Calculate the mean mass of a sportsman to the nearest kilograms.
- What is the percentage of sportsmen who weigh less than 70 out of total number above?

(02). The daily sales income in a grocery within a 30-day month is given below.

Income (Rs)	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200
No of days	3	4	7	8	5	3

- Which class interval contains the income which is recoded in most number of days?
- Which class interval contains the median daily income?
- Using the mid value of each class interval, calculate the mean daily income of the grocery.

For further knowledge, work on Exercise 26.2 of Grade 10 textbook.



Finding the mean of a frequency distribution using an assumed mean

To avoid dealing with large mid values in class intervals, calculate the mean using an assumed mean. Here the assumed mean is subtracted from each mid value of class intervals to obtain the deviation of each mid-value from the assumed mean.

$$\text{Deviation (d)} = \text{Mid value} - \text{Assumed mean}$$

If assumed mean is A, mean of the deviations = $\frac{\sum}{\Sigma}$

$$\text{Mean} = A + \frac{\sum}{\Sigma}$$

Example 01

Class Interval	10-14	15-19	20-24	25-29	30-34
Frequency	3	4	17	9	7

Taking the mid value of the class interval, 20 – 24 as the assumed mean, calculate the mean of the distribution.

Class Interval	Mid value	Frequency (f)	Deviation (d)	
10 - 14	12	3	-10	-30
15 - 19	17	4	-5	-20
20 - 24	22	17	0	0
25 - 29	27	9	5	45
30 - 34	32	7	10	70
		$\Sigma = 40$		$\Sigma = 50 + 115 = 65$

$$\text{Mean} = A + \frac{\sum}{\Sigma}$$

$$= 22 +$$

$$= 22 + 1.625$$

$$= 23.625$$



Activity - 3

Ages of 80 patients who visited a medical clinic are tabulated below.

Class Interval (yrs)	9-17	18-26	27-35	36- 44	45-53	54-62
Frequency (f)	7	11	13	21	18	10

Taking the mid value of the class interval, 36 – 44 as the assumed mean, complete the following table to work out the mean age of a patient in the clinic.

Class Interval (yrs)	Mid value	Frequency (f)	Deviation (d)	
9 - 17	13	7	-27	-189
18 - 26		11		
27 - 35		13		
36 - 44		21		
45 - 53		18		
54 - 62		10		
		$\Sigma = 80$		$\Sigma =$

$$\text{Mean} = A + \frac{\Sigma}{\Sigma} = \dots\dots\dots$$

$$= \dots\dots\dots + \dots\dots$$

$$= \dots\dots\dots$$

$$= \dots\dots\dots$$



Exercise

(01). The table shows the information about detected Covid – 19 infected patients within 28 days in a certain locked down area

Class Interval (days)	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24	24 - 28
No of patients (f)	5	9	20	7	5	3	1

- Find the modal class of the distribution.
- State whether measures taken to control the pandemic in the area was successful with reasons
- Taking the mid value of the modal class as the assumed mean, workout the mean of the frequency distribution.

For further knowledge, work on Exercise 26.3 of Grade 10 textbook.



Answers

Revision 01

- (01). (i). range 30 (ii). mode 18 (iii). median 18 (iv). mean 20.57
(02). (i). range 37 (ii). mode 32 (iii). median 23.5 (iv). mean 26.75
(03). (i). range 11 (ii). mode 7 (iii). median 8 (iv). mean 8.54

Revision 02

- (01). (i). range 7 (ii). mode 29 (iii). median 28.5 (iv). mean 28.46

Activity 01

- (01) 32,36,40,44,48
(02) 4.5, 14.5, 24.5, 34.5, 44.5, 54.5, 64.5

Exercise 26.1

- | | | |
|---|---------|-----------------------|
| (01) (i) 25.5, 35.5, 45.5, 55.5, 65.5, 75.5, 85.5, 95.5 | (ii) 10 | (iii) 51-60 |
| (02) (i) 142.5, 147.5, 152.5, 157.5, 162.5, 167.5 | (ii) 13 | (iii) 150-155 |
| (03) (i) 540.5, 560.5, 580.5, 600.5, 620.5 | (ii) 35 | (iii) 43 (iv) 57 |
| (04) (i) 150, 250, 350, 450, 550, 650 | (ii) 42 | (iii) 100 |

Activity 02

- (01) 15.92

Exercise

- (01). (i). 79 (ii). 30 (iii). 63kg (iv). 63.33
(02). (i). 1600 – 1800 (ii). 1600-1800 (iii). 1613.33



Exercise 26.2

- (01) (i) 24.6 (ii) 246kg
 (02) (i) 34.53 (ii) 3108
 (03) (i) 10 (ii) 21-30 (iii) 23.83
 (04) (i) 185 (ii) 31-36 (iii) 36.64
 (05) (i) 75 – 100 (ii) 73.5

Activity 03

- (01) 37.975

Exercise

- (i). 8-12 (ii). Since detected patients were decreasing towards the end, the program was successful.
 (iii). 11

Exercise 26.3

- (01) (i) 35-45 (ii) 23 (iii) 35
 (02) (i) 12-18 (ii) 7.14% (iii) 18.43 (iv) 1240.1
 (03) (i) 36-44 (ii) 37.53 (iii) below 27 (iv) above 53
 (04) (i) 251 – 275 (ii) 268 kg (iii) 16080kg (iv) 4/15
 (05) (i) 90 (ii) group A 40.9, group B 38.4 (iii) group A
 (06) (i) 61-70 (ii) 62 (iii) σ_L . 86800
 (07) (i) 700-850 (ii) σ_L 738.57 (iii) σ_L .738570 (iv) $\times 100\% = 30\%$
 (08) (i) 56-60 (ii) 8.3% (iii) 52.67 kmh⁻¹ (iv) 105.34km