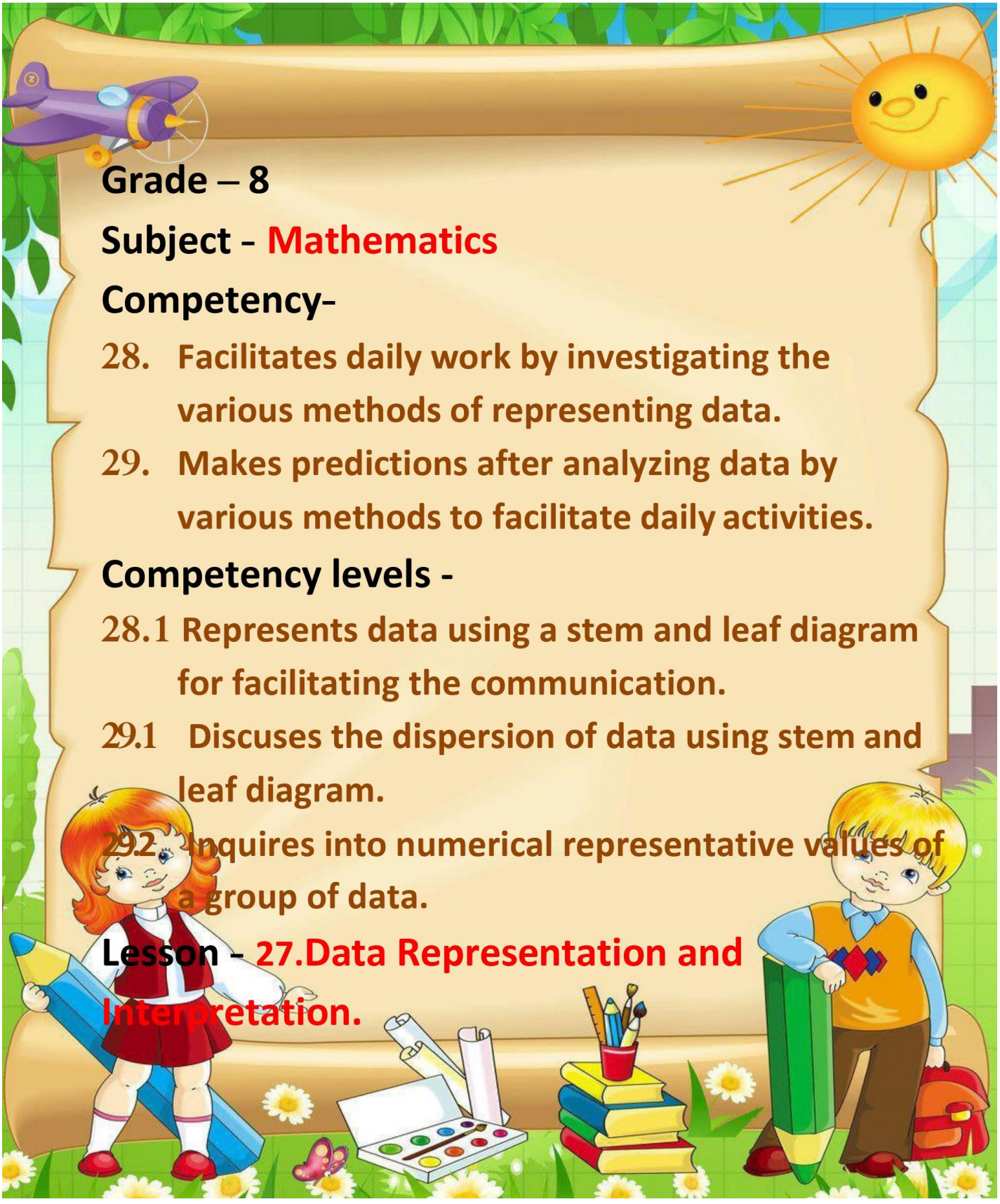
Grade 8

MATHEMATICS



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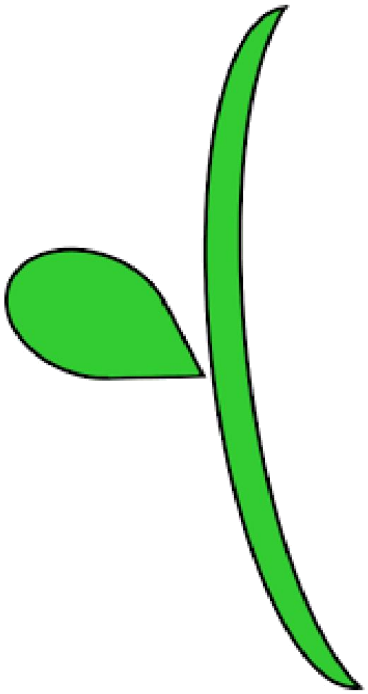
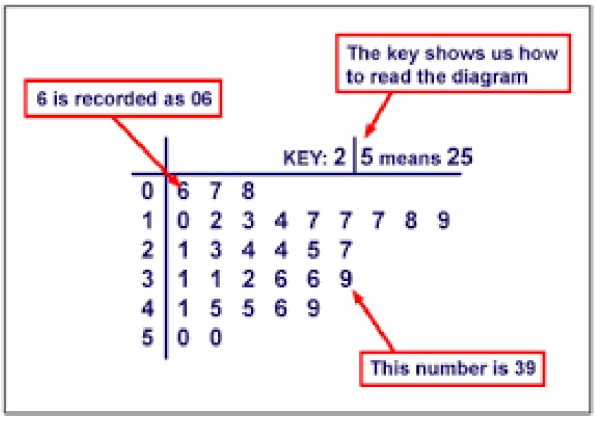
27. Data Representation and Interpretation

By studying this lesson you will be able to,

- Represent data in a stem and leaf diagram,
- Find the maximum value, minimum value and the range of a collection of data using a stem and leaf diagram.
- Find the mode, median, and range of a collection of raw data.





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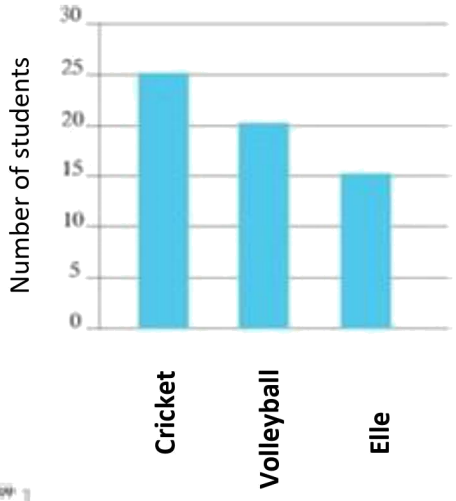
27.1 Introduction

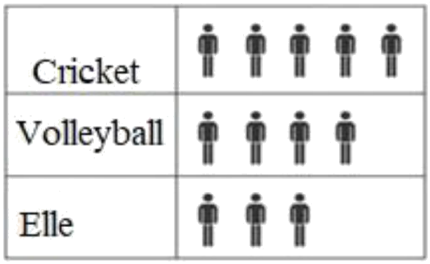
In grade 6 and 7 you learnt to represent and interpret data using picture graphs, bar graphs and multi bar graphs. Now we will consider what a stem and leaf diagram is and how data represented in a stem and leaf diagram.

Do you remember the ways of representing data?

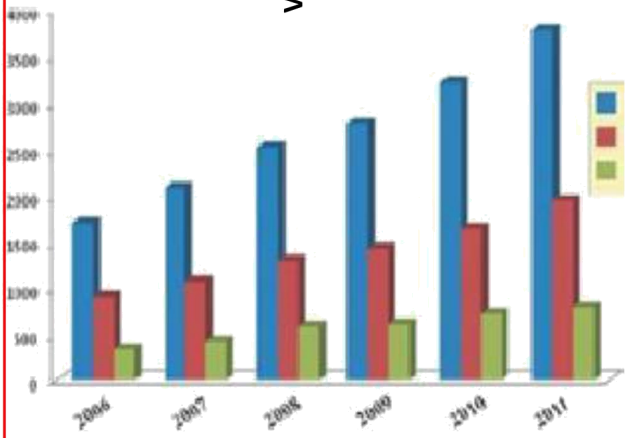
Yellow	////	4
Red	////	5
Blue	//// //	6
Green	/	1
Pink	////	4

Games	Number of players
Cricket	25
Volleyball	20
Elle	15





Scale: represents 5 players
Picture graph



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Let us review what you learnt about data representation and interpretation in previous grades. Do the following exercise and check your memory power.

Exercise 1

Mark (in front of the correct statements and mark (X) in front of the false statements.

(I) Use tally marks as a method of collecting data. ☐

(II) 𝍸 /// indicate number 8. ☐

(III) Data can be represented by using tables. ☐

(IV) Representing data in picture graphs can be done attractively. ☐

(V) It is easy to interpret data using bar graphs and multi bar graphs. ☐

(VI) Information cannot be compared easily by representing in graphs. ☐

(VII) Representing and interpreting data by various methods are useful for day today activities. ☐

(VIII) Data can be represented **only** by using the above methods. ☐

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27.2 Stem and leaf diagram.

A **stem and leaf diagram** is a standard method of organizing numerical data that is enable us to interpret the data easily.

When data is organized according to this method,

- If the values of data are from 0 to 99, the digit in the ones place indicates the leaf and the digit in the tens place indicates the stem and we draw the stem and leaf diagram as follows (Refer example 1).
- If the values of data are from 100 to 999 the digit in the ones place indicates as the leaf, the digits in the tens place, and hundreds together indicates as the stem (Refer example 2).
- When the collection of data consisting of decimal numbers, the whole number part indicates as the stem and the decimal part indicates as the leaf (Refer example 3).

Now you study the following examples.

Example 1

Following represents the marks obtained for a Maths assignment.

2 3 6 10 12 13 15 21 23 24 27

The above data can be represented in a stem and leaf diagram as given below.

Stem	Leaf			
0	2	3	6	
1	0	2	3	5
2	1	3	4	7

(key : 1/0 means 10)

Example 2

Following are the daily expenses of a student for 16 days.

101 103 103 112 112 114 119 120
121 125 130 131 133 136 138 139

Let us represent the above data in a stem and leaf diagram.(key : 11/2 means 112)

Stem	Leaf					
10	1	3	3			
11	2	2	4	9		
12	0	1	5			
13	0	1	3	6	8	9

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Example 3

Following data shows the birth weights of 15 babies in kilograms.

0.7 0.8 0.9 1.2 1.2 1.4 1.9 2.0
2.1 2.5 3.0 3.1 3.3 3.6 3.8

Let us represent the above data in a stem and leaf diagram. (key : 1/2 means 1.2)

Stem	leaf
0	7 8 9
1	2 2 4 9
2	0 1 5
3	0 1 3 6 8

When representing data in a stem and leaf diagram the data should be arranged in ascending order.

Study the given examples and do the following exercise.

Exercise 2

1. The numbers of coconut collected from 12 coconut trees are given below. Represent the data in a stem and leaf diagram.
   9 12 15 20 27 28 39 40 32 43 52 58

2. The masses of twenty travelling bags in kilograms are given below. Represent the given information in a stem and leaf diagram.
   30 29 27 28 19 22 18 21 20 24
   28 13 23 30 08 21 17 25 27 26

3. Numbers of runs scored by 20 cricketers in a cricket tournament are given below. Represent the above data in a stem and leaf diagram.
   210 214 213 223 226 237 236 243 241
   258 254 264 268 267 273 279 275 283
   286 289

4. A company provides the service period of their ten employees in months to consider their promotions. Represent this data in a stem and leaf diagram.
   120 145 164 156 134 129 132 148 154 163
5. A whole sale vegetable shop sold 18 pumpkins which have the following masses in kilograms. Represent this data in a stem and leaf diagram.
   6.5 7.8 5.7 4.3 5.7 6.2 6.9 7.8 7.2
   5.5 6.7 4.5 8.2 6.8 8.6 8.4 7.6 6.9

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27.3 Finding the range of data represented in a stem and leaf diagram

Example

Given stem and leaf diagram is about the age of employees in a certain workplace. Age has given in years.

stem	leaf				
2	2	3			
3	0	2	4		
4	1	1	3	4	5
5	0	1	6	8	

Key : 5| 8 is 58

Using the given stem and leaf diagram answer the following questions.

i. What is the age of the youngest? The youngest is 22 years old.

ii. What is the age of the eldest? The eldest is 58 years old.

iii. What is the range of the set of data? Range = Maximum – Minimum
= 58 – 22 = 36

The range is dispersion of the set of data.

Range = Maximum value – Minimum value

Exercise 3

1. Following stem and leaf diagram represents the test marks of 15 students.

Stem	leaf				
1	1	3			
2	0	2	4		
3	1	1	3	4	5
4	0	2	2	3	8

Key: 3 | 1 is 31

i. What is the highest mark?

ii. What is the lowest mark?

iii. Find the range.

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27.4 Interpreting a collection of numerical data

A single value that is used to give an idea regarding a collection of data, called a representative value. There are few representative values.

- Range
- Mode
- Median
- Mean

Now let us consider them one by one.

27.4.1 Range

Example

Let us consider the following set of numerical data.

12 14 23 25 31 36 49

The greatest value = 49 The least value = 12

Range of the given collection of data = 49 – 12 = 37

27.4.2 Mode

The value which occurs most often is called the mode of that collection of data.

Example

i. Students' marks in a class are given below.

82 74 65 82 75 91 68 76 82

Here, three students got 82 marks. Therefore, the mode is 82

ii. The numbers of members in 10 families are given below.

5 8 4 6 3 4 3 7

Here, both 2 and 4 are modes. Therefore this collection has two modes and it is a bimodal distribution.

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27.4.3 Median

The median of a collection of data is the value of the datum in the centre, when the data is arranged in ascending order.

- If the number of values in a collection of data is an odd number, there is only one value in the center when arranged in ascending order.
- If there is an even number of data, the median is half of the sum of the values of two data in the center, when the data arranged in ascending order.

Example 1

Find the median of the following data collection.

2 5 1 7 3 9 6

When arranged in ascending order,

1 2 3 5 6 7 9

The value at the centre is 5. The median is 5.

When there is odd number of data there is only one value at the centre.

$\frac{\text{Number of data} + 1}{2}$, the value in that place is the median.

Example 2

Find the median of the following data collection.

3 4 2 8 6 7

Let us arrange the data in ascending order.

2 3 4 6 7 8

Median of this collection is $\frac{4+6}{2} = 5$

When the number of data is an even number there are two values at the centre.
Therefore, we find the median as follows,
Get the sum of the values in the places

$$\left(\frac{(number\ of\ data\ +1)}{2}\right)$$

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27.4.4 Mean

Average value of a collection of data is considered as its mean. The sum of all the values of the collection data is divided by the number of data is the mean.

$$\text{Mean} = \frac{\text{Sum of all the values of the collection of data}}{\text{Number of data}}$$

Example

Marks taken by a student for 9 subjects in the term test are given below. Find its mean.

72 65 74 82 91 78 80 64 60

$$\text{Mean} = \frac{72 + 65 + 74 + 82 + 91 + 78 + 80 + 64 + 60}{9}$$

$$= \frac{\quad}{\quad}$$

$$= 74$$

Mean value of the given mark is 74

Study the given examples and do the following exercise.

Exercise 4

1. Find the range, the mode, the median, the mean of each collection of data.
   - **(i)** 8, 9, 11, 12, 10, 7, 8, 6, 10, 5, 8
   - **(ii)** 33, 32, 28, 18, 33, 45, 53, 29
   - **(iii)** 3.5, 2.5, 4.7, 1.4, 3.9, 2.5, 4.2
2. The number of exercise books sold in a cooperative shop during 15 days are given below.

   17 , 26, 35, 23, 32, 30, 28, 31, 35, 25, 22,35,21,40,34

   - (i) Find the range of the data collection.
   - (ii) What is the mode?
   - (iii) Find the median.
   - (iv) Find the mode.

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3. Find the mode and the median of following collection of data represented in the stem and leaf diagram.

Stem	leaf				
3	4	8	9		
4	2	3	8	9	
5	0	5	5	7	9
6	1	3	6		

4. The number of ice cream sold by an ice cream seller during a week is given below. Find the mean of the number of ice cream sold in a day.

38 , 40, 45, 36, 50,55,72

5. A set of data with three digit numbers are represented in the given stem and leaf diagram.

Stem	leaf				
12	2	4	8		
13	0	3	3	5	7
14	3	6	9		
15	1	8			

Using the above stem and leaf diagram

(i) What is the mode?
(ii) Find the median.
(iii) Find the mean.
(iv) Find the range.

Practice exercises –Exercise 27.2 and Exercise 27.3

Answers

Exercise 1

1 2. 3. 4. 5. 6. 7. 8.

Exercise 2

(i)

Stem	leaf	
0	9	
1	2	5
2	0	
3	2	9
4	0	3
5	2	8

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(ඉදහස්)

stem	leaf
0	8
1	3 7 8 9
2	0 1 1 2 3 4 5 6 7 7 8 8 9
3	0 0

(ඉදහස්දහස්)

Stem	leaf
21	0 3 4
22	3 6
23	6 7
24	1 3
25	4 8
26	4 7 8
27	3 5 9
28	3 6 9

(දහය)

stem	leaf
12	0 9
13	2 4
14	5 8
15	4 6
16	3 4

(iv)

stem	leaf
4	3 5
5	5 7 7
6	2 5 7 8 9 9
7	2 6 8 8
8	2 4 6

Exercise 3

(i) 48 (ii) 11 (iii) 37

Exercise 4

1. (i) Mode - 8 Median - 8 Mean - 8 .5
   (ii) Mode - 33 Median - 32.5 Mean - 33.8
   (iii) Mode - 2.5 Median - 3.5 Mean - 3.2
2. (i) 23 (ii) 35 (iii) 30 (iv) 28.9
3. Mode - 55 Median - 50 Mean - 32
4. 48
5. (i) 133 (ii) 135 (iii) 36

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