CHAPTER

13 INFORMATION HANDLING

Animation 13.1: Information Handling
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Student Learning Outcomes

After studying this unit, students will be able to:
- Demonstrate data presentation.
- Define frequency distribution (i.e. frequency, lower class limit, upper class limit, class interval).
- Interpret and draw pie graph.

Introduction

In the world around us, there are a lot of questions and situations that we want to understand, describe, explore and access. For example,
- How many hospitals are there in different cities of Pakistan?
- How many children were born during the last 10 years?
- How many doctors will be required in the next 5 years?

To know about such things, we collect information and present it in a manageable way so that useful conclusions can be drawn. The branch of statistics that deals with this process is called information handling.

13.1   Data

Data means facts or groups of information that are normally the results of measurements, observations and experiments. These results help us in reviewing our past performance and future planning. For example, the government of a state prepares its budgets and development plans on the basis of a collected data about the resources and population.

13.1.1   Presentation of Data

After the collection of a data, the most important step is its presentation that provides basis to draw conclusions. Data can be

represented in the form of tables and different kinds of graphs.

We know that a data is collected in raw form and it provides us information about individuals. Data in such form is called ungrouped data. After arranging the data for desired information, it is called grouped data. For example, a teacher collected the score of 20 students in mathematics test:

11, 52 ,40 ,95 , 65 ,45 , 35 , 30 , 88, 56, 75, 90, 81, 82, 28, 49, 67, 98, 64, 92

This is an ungrouped data. Now if we arrange it to represent information into groups, then it is called grouped data.
- Number of students who scored from 11 to 40   = 5
- Number of students who scored from 41 to 70   = 7
- Number of students who scored from 71 to 100 = 8

It can be seen that it is easier to visualize the given information if data is presented in grouped form. We can also represent a grouped data using a table.

Group	Score	Tally Marks	No. of Students
11 − 40	11, 40, 35, 30, 28	卌	5
41 − 70	52, 65, 56, 45, 49, 67, 64	卌 ‖	7
71 − 100	98, 88, 75, 90, 81, 82, 98, 92	卌 ‖‖	8

The method that we used to record the results in the table is called tallying in which we draw tally marks according to the number of individuals of a group. We make the set of fives by crossing the four marks with the fifth mark. This makes easy to count the tally marks. For example, to show 12 individuals of a group we draw tally marks 卌 卌 ‖.

We can also characterize the information presented in the example as;

Scores	Characteristics
71 − 100	Excellent
41 − 70	Good
11 − 40	Poor

13.1.2   Frequency Distribution

The conversion of ungrouped data into grouped data so that the frequencies of different groups can be visualized is called frequency distribution

> **The table which shows the frequency of class intervals is called the frequency table.**

- **Frequency**

The number of values that occurs in a group of a data is called its frequency, e.g. in the above given example,

       The frequency of (11 – 40) is 5.
       The frequency of (41 – 70) is 7.
       The frequency of (71 – 100) is 8.

- **Class Limits**

Upper Class Limit: The greatest value of a class interval is called the upper class limit, e.g. in the class interval (41 – 70), 70 is the upper class limit.

Lower Class Limit: The smallest value of a class interval is called the lower class limit, e.g. in the class interval (71 – 100), 71 is the lower class limit

- **Class Intervals**

Each group of a data is also known as the class interval. For example, (11 – 40), (41 – 70) and (71 – 100) are class intervals. Each interval represents all the values of a group.

Size of the Class Interval: The number of values in a class interval is called its size or length. For example, the size or length of class interval (11 – 40) is 30 that can be checked by counting. It can also be calculated by subtracting the lowest value of the data from greatest value and divide the result by the number of class intervals as shown below:

     Lowest value   = 11
     Greatest value = 100

Now use the formula to calculate the size.

$$\text{Size of interval} = \frac{\text{greatest value} - \text{lowest value}}{\text{no. of intervals}}$$

$$= \frac{100 - 11}{3} = \frac{89}{3} = 29.6$$

Round off the answer, this is the required size of the interval, i.e. $29.6 \simeq 30$

Example 1:   There are 40 students in the class VII who got the following marks in an English test. Make a frequency table by using 5 classes of an equal size.

35, 9, 26, 41, 27, 15, 18, 60, 46, 33, 24, 15, 52, 39, 28, 89, 74, 68, 56, 38, 92, 49, 28, 82,19 ,21, 34 ,23 ,43 ,77 ,65 ,64 ,21 ,59 ,15, 33, 66, 29, 33,65,

Solution:
We know that,

$$\text{Size of class} = \frac{\text{greatest value} - \text{lowest value}}{\text{no. of intervals}}$$

We can see from the above un-grouped data that of:

    Greatest value = 92
    Lowest value   = 9
    No. of classes = 5

$$\text{Size of class} = \frac{92 - 9}{5} = 16.6 \cong 17 \ (round \ up)$$

Class Interval	Tally Marks	Frequency
9 – 25	ЖЖ	10
26 – 42	ЖЖ ‖‖	13
43 – 59	Ж ‖	6
60 – 76	Ж ‖	7
77 – 93	Ж	4

EXERCISE 13.1

1.   The telephone bills paid by 12 consumers are given below.

Make a frequency table of 5 classes of an equal size.

510, 700, 356, 603,422, 674,481, 545, 718, 592, 685, 569

2. In a board examination, 20 students of the Dawn Public School got the following marks out of 850 marks. Construct a frequency table by taking 100 as a class interval.

551, 786, 678, 725, 788, 580, 720, 690, 750, 651, 599, 609, 719, 760, 625, 775, 646,667,753,675

3. The daily wages of 15 workers are given below. Make a frequency table of 4 classes of an equal size.

400, 225, 250, 380, 425, 175, 230, 325, 150, 300, 200, 180, 350, 375, 200

4. A cricket player made the list of his last 18 innings scores which is given below.

122, 102, 72, 99, 89, 106, 99, 85, 92, 108, 102, 98, 95, 76, 80, 65, 101, 96, Make a frequency table of 6 classes of an equal size.

5. The following data shows the distance in km that was travelled by Mr. Usman in last 21 days.

77, 58, 62, 85, 32, 71, 59, 60, 38, 32, 69, 80, 76, 92, 61, 82, 74, 70, 99, 44, 53 Make a frequency table of 5 classes of an equal size.

6. The following data is showing the sale of a bike company during last months.

571, 692, 700, 533, 832, 744, 649, 584, 613, 735, 872, 900, 512, 864, 654, 782, 777, 555, 632, 880, 628, 529, 680, 756, 567, 548, 824, 719, 678, 721

Make a frequency table by taking 100 as a class interval.

13.2   Pie Graph

"The representation of a numerical data in the form of disjoint sectors of a circle is called a pie graph."

A pie graph is generally used for the comparison of some numerical facts classified in different classes. In this graph, the central angle measures 360° which is subdivided into the ratio of the sizes of the groups to be shown through this graph. Following examples will help to understand the concept of a pie graph.

Example 1: It is compulsory for each student to take part in the different games. Out of 1800 students in the school 750 play cricket, 200 play badminton, 400 play hockey and 450 play football. In order to represent their comparison, draw a pie graph.

Solution:

Total number of students = 1800

(i) Find the angle for each sector by using the following formula

$$\text{Required angle} = \frac{\text{No. of students play a game}}{\text{total students}} \times 360^0$$

$$\text{Measure of angle associated with badminton} = \frac{200}{1800} \times 360^0 = 40^0$$

$$\text{Measure of angle associated with cricket} = \frac{750}{1800} \times 360^0 = 150^0$$

$$\text{Measure of angle associated with hockey} = \frac{400}{1800} \times 360^0 = 80^0$$

$$\text{Measure of angle associated with football} = \frac{450}{1800} \times 360^0 = 90^0$$

(ii) In order to draw a pie graph
- Draw a circle of a suitable radius.
- Draw an angle of 40° representing the badminton.
- Draw an angle 150° representing the cricket.
- Draw an angle 80° representing the hockey.
- Remaining angle will be of 90° representing the football.

(iii) Label each sector according to the following figure.
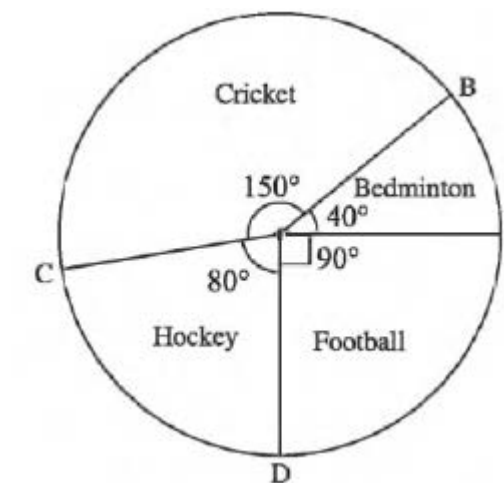
Have you noticed that students like cricket most?

Example 2: The following table shows the favourite food of the students of the grade VII. Plot a pie graph to show the favourite food of the students.

Food	Fried Chicken	Mutton Karahi	Biryani	Minced Meat	Vegetables
No. of Students	40	20	10	6	4

Solution:

(i) Find the angles for each sector by using the following formula.

(a) Required angle $= \dfrac{\text{No. of students like food}}{\text{total students}} \times 360^0$

(b) Angle for fried chicken $= \dfrac{40}{80} \times 360^0 = 180^0$

(c) Angle for mutton karahi $= \dfrac{20}{80} \times 360^0 = 90^0$
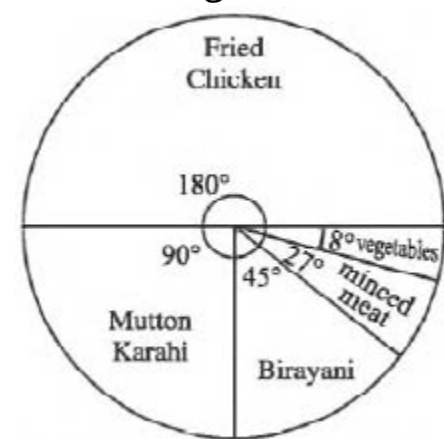
(d) Angle for biryani $= \dfrac{10}{80} \times 360^0 = 45^0$

(e) Angle for minced meat $= \dfrac{6}{80} \times 360^0 = 27^0$

(f) Angle for vegetables $= \dfrac{4}{80} \times 360^0 = 18^0$

(ii) Draw a circle of any suitable radius.

(iii) Divide the circle into the sectors of calculated angles.

(iv) Label each sector according to the following figure.

Did you see that fried chicken is the most favourite food of the students?

EXERCISE 13.2

1. Hina went for shopping and spent 30% of her pocket money for food, 35% on buying books, 20% on school dress and saved 15%. Represent the data on pie graph.

2. A media reporter conducted a survey of persons visiting market during the two hours. He found that there were 720 persons visited the market out of which 320 were women, 220 men and 180 children. Draw a pie graph.

3. In a class, the grades obtained by the students in the final examination are given below. Draw the pie graph.

Grade	A+	A	B	C	D	E	F
No. of students	2	6	10	30	6	4	2

4. Details of students in five classes of a school are given below. Draw a pie graph to show the comparison.

Class	I	II	III	IV	V
No. of students	300	270	225	150	135

5. Noreen has the following types of books in her library. Draw pie graph showing the information.

Subject	English	Islamic	Stories	Poems
No. of books	180	90	60	30

REVIEW EXERCISE 13

1. Answer the following questions.
   (i) What is meant by the grouped data?
   (ii) Define a class interval.
   (iii) Define a pie graph.
   (iv) Write the formula for finding the size of class interval.
   (v) Which method is called tallying

2. Fill in the blanks.

(i) _____ means groups of information that are normally the results of measurements, observations and experiments.

(ii) Each_____represent all the values of a group.

(iii) A data is collected in _____ form and it provides us information about individuals.

(iv) The method which is used to record the result is called_____.

(v) The greatest value of a class interval is called the ___ limit.

(vi) The number of values in a class interval is called its _____.

(vii) The representation of a numerical data in the form of disjoint sectors of a circle is called a _____.

3. Tick (✓) the correct option.

4. The ages of patients in years admitted in a hospital during a week are given below. Group the data taking 10 as the size of an interval.

25, 50, 49, 47, 26, 10, 2, 1, 15, 17, 18, 19, 27, 28, 30, 35, 40, 37, 32, 31, 3, 4, 7, 10, 15, 12, 13, 17, 14, 20, 22, 24, 26, 30, 17, 35, 40, 36, 32, 31, 37

5. The following data shows the distance in km that Mr. Ghani traveled in last month.

90, 44, 15, 19, 28, 9, 92, 17, 8, 84, 50, 60, 77, 69, 24, 89, 63, 74, 35, 48, 39, 81, 58, 37, 55, 67, 46, 30, 26, 79.

Construct the frequency table of 6 classes of an equal size.

6. Ali and his friends eat breads in a day as shown in the table.

Meals	Breakfast	Lunch	Dinner	Supper
No. of Breads	12	24	16	8

By using the table, draw a pie graph.

7. In a party, a host served the guest by following food items.

Food Items	Cold Drink	Sandwich	Burger	Cake
Quantity	180	124	330	86

Use the table to draw a pie graph.

SUMMARY

- Data means facts or groups of information that are normally the results of measurements, observations and experiments.
- Data is collected in raw form and it provides us information about individuals such form of the data is called ungrouped data.
- In a grouped data, each group is also known as the class interval.
- The greatest value of a class interval is called the upper class limit.
- The smallest value of a class interval is called the lower class limit.
- The number of values that occurs in a class interval is called its frequency.
- The table which shows the frequency of class intervals is called frequency tables.
- The representation of a numerical data in the form of disjoint sectors of a circle is called a pie graph.
- In pie graph, the central angle measures 360° which is subdivided into the ratio of the sizes of the groups.