Data Handling

- In a pictograph, pictures of objects are used for representing data. Tally marks cannot be used for representing huge numbers. However, these numbers can be represented with the help of pictographs.

- Data can also be represented by using bar diagram or bar graph. In a bar graph, bars of uniform width are drawn horizontally or vertically. These bars are placed at equal distance from each other. The length of each bar gives the required information.

- The data in an unorganised form is called raw data. In order to draw meaningful inferences from a data, we need to organise the data systematically.

  We can organise a data in the following ways:

  - Frequency distribution table
  - Histogram
  - Pie chart

- **Construction of grouped frequency distribution table:**

  There are two ways to group the data to make frequency distribution table. These are as follows:

  Inclusive method (Discontinuous form):
  The classes can be defined in inclusive method as 1 - 10, 11 - 20, 21 - 30 and 31 - 40. Here, both limits are inclusive in each class.

  Exclusive method (Continuous form):
  In exclusive method, we take the class intervals as 0 – 10, 10 – 20, 20 – 30. The observations which are more than 0 but less than 10 will come under the group 0 – 10; the numbers which are more than 10 but less than 20 will come under the group 10 – 20 and so on. Here, the common observation will belong to the higher class, i.e. 10 will be included in the class interval 10 – 20 and similarly we follow this for the other observations also.
  For example, the ages of some residents of a particular locality are given as follows:
  7, 28, 30, 32, 18, 19, 37, 36, 14, 27, 12, 8, 17, 24, 22, 2, 21, 5, 21, 36, 38, 25, 10, 25, 9.
  Frequency distribution table can be drawn as follows:

  Inclusive method:

Class intervals	Tally marks	Frequency
1 – 10	𝍸 |	6
11 – 20	𝍸	5

21 – 30	𝍸 ||||	9
31 – 40	𝍸	5

Exclusive method:

Class intervals	Tally marks	Frequency
1 – 10	𝍸	5
10 – 20	𝍸 |	6
20 – 30	𝍸 |||	8
30 – 40	𝍸 |	6

- **Few points to be remembered while choosing class intervals:**

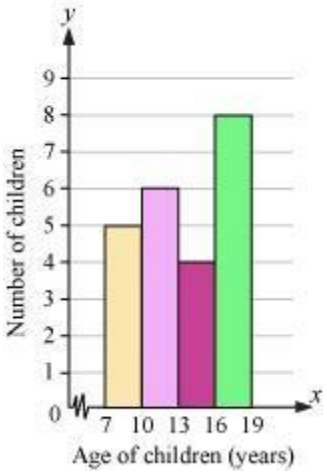
1. Classes should not be overlapping and all values or observations should be covered in these classes.
2. The class size for all classes should be equal.
3. The number of class intervals is normally between 5 and 10.
4. Class marks and class limits should be taken as integers or simple fractions.

- **Histogram**

A histogram is a bar graph that is used to represent grouped data. In a histogram, the class intervals are represented on the horizontal axis and the heights of the bars represent frequency. Also, there is no gap between the bars in a histogram.

Class interval (Age of children)	**Tally mark**	**Frequency (Number of children)**
7 – 10	𝍸	5
10 – 13	𝍸 |	6
13 – 16	||||	4
16 – 19	𝍸 |||	8

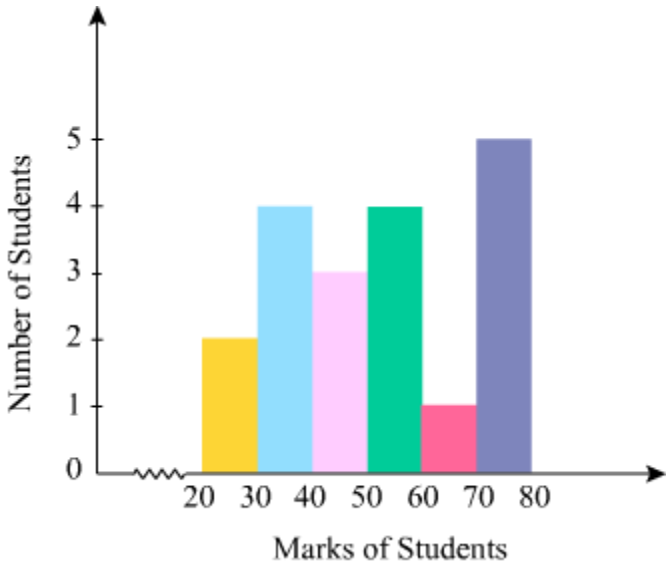
The above frequency distribution table can be displayed in a histogram as follows:



In a histogram, a broken line can be used along the horizontal axis to indicate that the numbers between 0 to7 are not included.

- We can interpret a histogram by reading and analyzing it.

  For example, the given figure represents the marks of various students in a class.



We can analyze the given histogram and answer the following questions.

1. How many students got more than 50 marks?

Solution: Number of students who got more than 50 marks = 4 + 1 + 5 = 10

2. How many students got marks between 20 and 40?

Solution: Number of students who got marks between 20 and 40 = 2 + 4 = 6

3. In which group students got the maximum marks?

Solution: Students got maximum marks in the group 70 – 80.

- **Pie chart**

  A pie chart or a circle graph shows the relationship between a whole and its parts.

- **Construction of pie charts**

  Example: Construct a pie chart for the following data which gives the brands of laptop preferred by the people of a locality.

  Brand A : 100

  Brand B : 120

  Brand C : 180

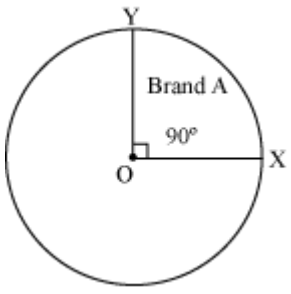
  Solution: The total number of people is 100 + 180 + 120 = 400.

  We can form the following table to find the central angle of each sector:

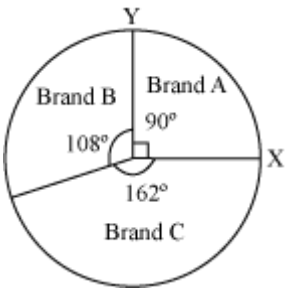
Brand of laptop	Number of people	Fraction	Central angle
A	100	$\frac{100}{400} = \frac{1}{4}$	$\frac{1}{4} \times 360° = 90°$
B	180	$\frac{120}{400} = \frac{3}{10}$	$\frac{3}{10} \times 360° = 108°$
C	120	$\frac{180}{400} = \frac{9}{20}$	$\frac{9}{20} \times 360° = 162°$

  Steps of construction:

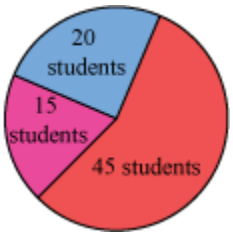
  - Draw a circle with any convenient radius. Let O be the centre of the circle and OX be its radius.
  - Draw the angle of the sector for brand A, which is 90°. Using protractor, draw $\angle XOY = 90°$.



  - Now, draw the angle of the sectors for brands B and C.



- For example: Consider the given pie chart which shows the favourite colours of the class-VIII students of a school.



In this pie chart, the portion of the sector for the colour red is given by,

$$\frac{\text{Number of students whose favourite colours is red}}{\text{Total number of students}}$$

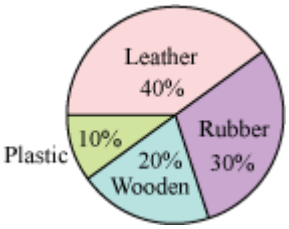
$$= \frac{45}{80}$$

$$= \frac{9}{16}$$

Therefore, the sector representing red colour is $\left(\frac{9}{16}\right)^{th}$ part of the circle.

- **Interpretation of a pie chart**

The given pie chart shows the footwears preferred by the people of a locality.



From the above pie chart, we can infer that most people of the locality prefer wearing leather footwears. Also, we can infer that the least number of people prefer wearing plastic footwears.

Now, suppose the total number of people in the locality is 1000. Then, we can say that the number of people who prefer wearing rubber footwears
is 30100×1000 = 30030100×1000 = 300

- Some of the terms related to probability are:

  - **Experiment**: When an operation is planned and done under controlled conditions, it is known as an experiment. For example, tossing a coin, throwing a die etc., are all experiments.

  - **Outcomes**: Different results obtained in an experiment are known as outcomes. For example, on tossing a coin, if the result is a head, then the outcome is a head; if the result is a tail, then the outcome is a tail.

  - **Random**: An experiment is random if it is done without any conscious decision. For example, drawing a card from a well-shuffled pack of playing cards is a random experiment if it is done without seeing the card.

  - **Trial**: A trial is an action or an experiment that results in one or several outcomes. For example, if a coin is tossed five times, then each toss of the coin is called a trial.

  - **Sample space**: The set of all possible outcomes of an experiment is called the sample space. It is denoted by the letter 'S'. Sample space in the experiment of tossing a coin is {H, T}.

  - **Event**: The event of an experiment is one or more outcomes of the experiment. For example, tossing a coin and getting a head or a tail is an event.

- The outcomes of an experiment having the same chances of occurrence are known as equally-likely outcomes. For example, if we toss a coin, then the possible outcomes are head or tail, and both of them have an equal chance of occurring. So, these are equally-likely outcomes.

- When the outcomes of the experiment are equally-likely, the probability of an event is given by:

$$\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

  Certain events: Events which are definite to happen.
  For example, the day after Saturday will be Sunday or the sun will rise from the east.

- **Impossible events:** Events which are impossible to happen.

  For example, March comes before February in a year, the apple goes up when dropped from the tree.

- **Matter of Chance:** Results of events which can not be known before they happen.

  In a cricket match, India will win or it will rain tomorrow.

- **Probability** is the measure or estimation of likelihood of happening of an event in a particular way.

- Each outcome of an experiment or collection of outcomes make an event.

  For example, when a coin is tossed, the possible outcomes are head or tail.
  When two coins are tossed, the possible outcomes are:
  1. Two heads (i.e. head on both the coins)
  2. Two tails (i.e. tail on both the sides)
  3. One head and one tail

  Example: What is the probability of getting one head and one tail when two coins are tossed together?

  Solution: When two coins are tossed together, the possible outcomes are:

  - Head on first coin, head on second coin(H, H)
  - Head on first coin, tail on second coin (H, T)
  - Tail on first coin, head on second coin (T, H)
  - Tail on first coin, tail on second coin (T, T)

  ∴ Total number of outcomes = 4

  Outcomes in favour of the event are (H, T) and (T, H).

  Number of favourable outcomes = 2

  Therefore, probability of getting one head and one tail

$$\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

$$= \frac{2}{4} = \frac{1}{2}$$