CHAPTER

14

DATA HANDLING

In this chapter, we study the data in frequency distribution table, representation of there data in various types of graph such as Bar graph Pie chart, Line graph etc. and also study probability of event.

Data

A collection of numerical facts regarding a particular type of information is called data.

(i) **Primary Data** The data collected actually in the process of investigation by the investigator is known as primary data.

(ii) **Secondary Data** Data which is already collected by other persons is called secondary data.
e.g. As investigator collects data related to industries through the government publications.

Organising Data

The initial form of data is in unorganised form, i.e. raw data form. To organise the given data in systematic manner, we use a term frequency.

Frequency

The number of times a particular observation occurs is called frequency.
e.g. The frequency distribution table is shown below.

Subjects	Tally marks	Number of students
Art	𝍸 II	7
Mathematics	𝍸	5
Science	𝍸 I	6
English	IIII	4

Here we see that, the number of students corresponding to each subject are the frequencies.

Grouping Data

Sometimes, the given data is very large, so we make a group. The data arranged in each group is known as class-interval (or class).

Each of group 0-10, 10-20, 20-30, etc, is called class-interval. The upper value of a class-interval is called its upper class limit and the lower value of the class-interval is called its lower class limit.

Here, in the class interval 10-20,
the upper class limit =20

and the lower class limit =10.

Some more related terms of grouping data are given below.

(i) **Width** The difference between the upper class limit and lower class limit of a class is called the width or size of the class-interval.

(ii) **Tally marks** Frequency distribution table involves the tally marks for counting purpose. We use bar (i.e.| |) known as tally marks.

(iii) **Class Frequency** The frequency of a class in a continuous frequency distribution is called as class frequency.

(iv) **Class Marks** It is the mid-value of the class interval.

Class mark

$$= \frac{\text{Lower limit of class} + \text{Upper limit of class}}{2}$$

(v) **Range** It is the difference between the highest and the lowest values of the given observation on data.

Example 1 The first and second class interval of a grouped data are 6-12, 12-18. Its fifth class interval is

(a) 20-26 (b) 30-36 (c) 24-30 (d) 31-37

Sol. *(b)* Given, class intervals are 6-12 and 12-18

Here, width of the class is 12 – 6 i.e. 6

∴ Then, next class intervals will be 18-24, 24-30, 30-36 etc.

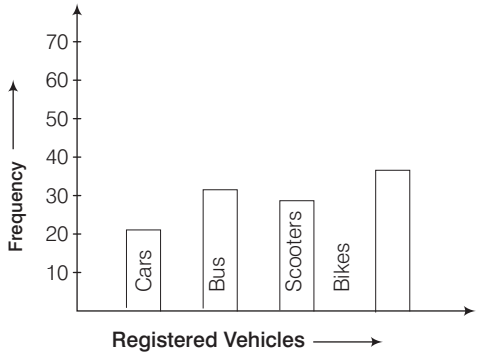
Hence, fifth class interval is 30-36.

Types of Graphical Data

The following types of groups are given below

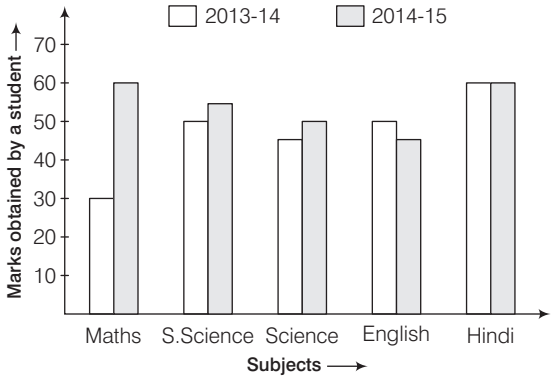
1. Bar Graph

A pictorial representation of numerical data in the form of rectangles (or bars) of uniform width and various heights is called a bar graph, where the commodity taken on the horizontal axis and the heights of the bars (rectangles) show the frequency of the commodity. e.g. The registration of vehicles versus number of vehicles shown through the bar graph.



2. Double Bar Graph

A bar graph showing two sets of data simultaneously is called a double bar graph. It is useful for the comparison of the data.

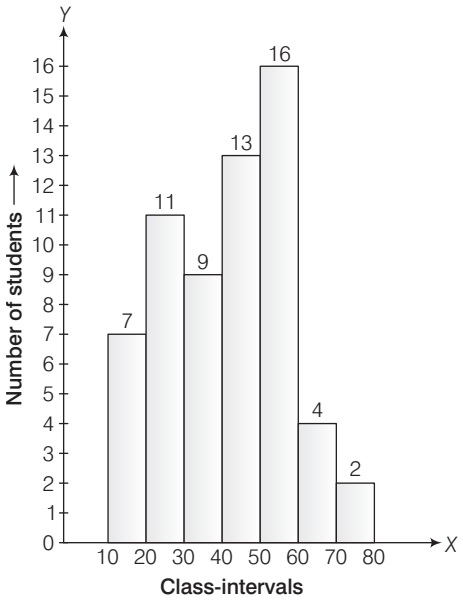


3. Histogram Graph

A histogram is the graphical representation of a grouped frequency distribution in exclusive form with continuous classes in the form of rectangles with class-intervals as bases and the corresponding frequencies as heights.

There is no gap between any two consecutive rectangles.

The shape of the graph is shown below.



4. Pie Chart

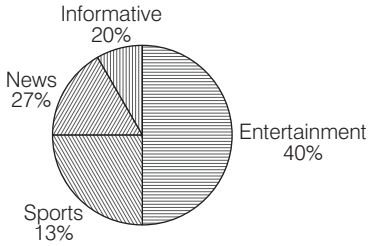
In a pie chart, the various observations or components are represented by the sectors of a circle and the whole circle represents the sum of the values of all components.

The central angle for a component is given by

Central angle for a component

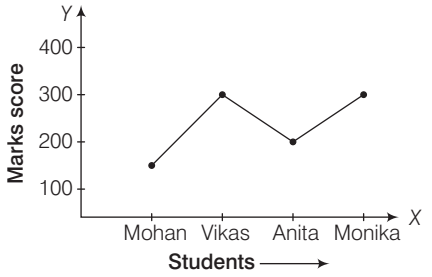
$$= \left(\frac{\text{Value of the component}}{\text{Sum of the values of all components}} \times 360^\circ \right)$$

e.g. The following pie graph shows the percentage of viewers watching different types of TV channels.

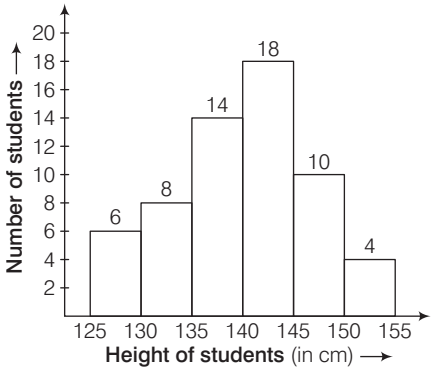


5. Line Graph

A line graph is a graph, which is used to display data that changes continuously over period of time. e.g. The marks score by the students shown through the line graph as given below.



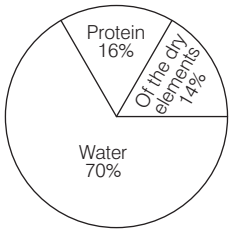
Example 2 In a histogram, the number of students having height less than 140 cm is



(a) 32 (b) 28 (c) 40 (d) 34

Sol. *(b)* Number of students who have height less than 140 cm = 6 + 8 + 14 = 28.

Example 3 The following pie chart gives the distribution of constituents in the human body. The central angle of the sector showing the distribution of protein and other constituents is



(a) 108° (b) 54°
(c) 30° (d) 216°

Sol. *(a)* Distribution of protein and other constituents in human body = 16 + 14 = 30%

Central angle of the sector showing the distribution of protein and other constituents

$$= \frac{30}{100} \times 360° = 108°$$

Experiment

An operation which can produce some well-defined outcomes is called an experiment.

Random Experiment

An experiment in which the outcomes cannot be predicted exactly in advance and all possible outcomes are known, is called random experiment.
e.g. On tossing a coin, head or tail are the two outcomes, but you cannot predict, which outcome you will get.

Event

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

e.g.

(i) Throwing a die and getting each of the outcomes 1, 2, 3, 4, 5 or 6 is an event.

(ii) Tossing a coin and getting a head or a tail is an event.

Negation of an event Negation of an event A is 'not A', which occurs only when A does not occur. It is denoted by '$\overline{A}$'.

Probability of an Event

Let E be an event. Then, the probability of occurrence of E is defined as

$$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$$

Note The probability of any event lies between 0 to 1.

Important Points

(i) In tossing a coin, all possible outcomes are $\{H, T\}$.

(ii) In tossing 2 coins, all possible outcomes are $\{HH, HT, TH, TT\}$.

(iii) On rolling a dice, all possible outcomes are $\{1, 2, 3, 4, 5, 6\}$.

(iv) In drawing a card from a well-shuffled deck of 52 cards, it has 4 suits (spades, clubs, hearts and diamonds), each having 13 cards.

In out of 52 cards, 26 cards are black and 26 cards are red.

(a) Cards of spades and clubs are black cards.

(b) Cards of hearts and diamonds are red cards.

(c) Kings, queens and jacks (or knaves) are known as face cards.

Thus, there are in 12 face cards.

Example 4 The two coins are tossed together. The probability of getting two heads together is?

(a) $\frac{1}{4}$ (b) $\frac{2}{4}$ (c) $\frac{1}{2}$ (d) 1

Sol. *(a)* When two coins are tossed together, all possible outcomes are – $\{HH, HT, TH, TT\}$

$\therefore$ Number of all possible outcomes = 4

Possibility of getting two heads together = $\frac{1}{4}$

Example 5 A dice is thrown. What is the probability of getting a prime number?

(a) $\frac{1}{3}$ (b) $\frac{1}{2}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

Sol. *(b)* In throwing a die, all possible outcomes are 1, 2, 3, 4, 5, 6.

$\therefore$ Number of all possible outcomes = 6

Prime numbers are 2, 3, 5.

Number of prime numbers = 3

$\therefore P(\text{getting a prime number}) = \frac{3}{6} = \frac{1}{2}$

Example 6 From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the card drawn is an ace?

(a) $\frac{2}{13}$ (b) $\frac{3}{13}$ (c) $\frac{1}{13}$ (d) $\frac{5}{13}$

Sol. *(c)* Total number of cards = 52

Total number of possible outcomes = 52.

Number of all aces = 4.

$\therefore \quad P(\text{getting an ace}) = \frac{4}{52} = \frac{1}{13}$

PRACTICE EXERCISE

1. A graph that displays data that changes continuously over periods of time is
(a) bar graph (b) pie chart
(c) histogram (d) line graph

2. The range of the data 30, 61, 55, 56, 60, 20, 26, 46, 28, 56 is
(a) 26 (b) 30
(c) 41 (d) 61

3. Which of the following is not a random experiment?
(a) Tossing a coin
(b) Rolling a die
(c) Choosing a card from a deck of 52 cards
(d) Throwing a stone to the roof of a building

4. Tally marks are used to find
(a) class intervals
(b) range
(c) frequency
(d) upper limit

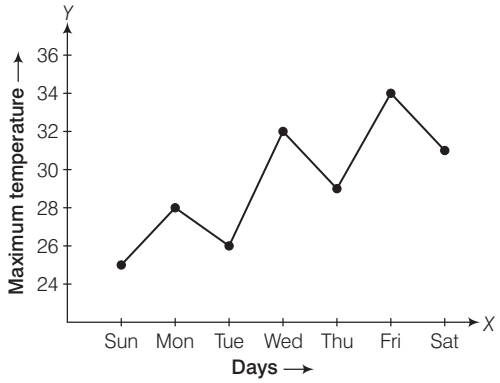
5. In a frequency distribution with classes 0-10, 10-20 etc., the size of the class intervals is 10. The lower limit of fourth class is
(a) 40 (b) 50
(c) 20 (d) 30

6. Monthly salary of a person is ₹ 15000. The central angle of the sector representing his expenses on food and house rent on a pie chart is 60°. The amount he spends on food and house rent, is
(a) ₹ 5000 (b) ₹ 2500
(c) ₹ 6000 (d) ₹ 9000

7. The first and second class interval of a grouped data are 5-15, 15-25, 25-35. Its sixth class interval is
(a) 65-70 (b) 44-55
(c) 45-50 (d) 55-65

8. The class mark of the interval 13.5-18.5 is
(a) 15 (b) 16
(c) 14 (d) 13

Directions (Q. Nos. 9-11) *Study the graph and answer the questions that follow.*

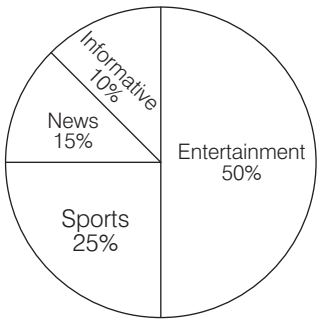


9. On which day the temperature was least?
(a) Sunday
(b) Monday
(c) Friday
(d) None of the above

10. On which day the temperature was 31°C?
(a) Monday (b) Saturday
(c) Tuesday (d) Friday

11. Which was the hottest day?
(a) Monday (b) Friday
(c) Tuesday (d) Saturday

Directions (Q.Nos. 12 and 13) *A pie chart is given below.*



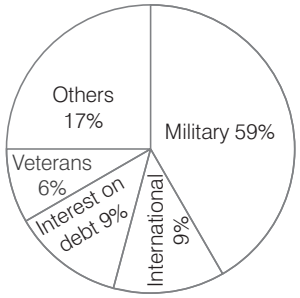
Viewers watching different types of channels on TV

12. Which type of programmes are viewed the most?
(a) Entertainment viewers
(b) Informative viewers
(c) Sports viewers
(d) None of the above

13. Which two types of programmes have number of viewers equal to those watching sports channels?
(a) News and Sports
(b) News and Informative
(c) News and Entertainment
(d) None of the above

Directions (Q. Nos. 14 and 15) *Study the following pie chart and answer the questions that follow.*

National budget expenditure in the year 2012
(Percentage distribution)

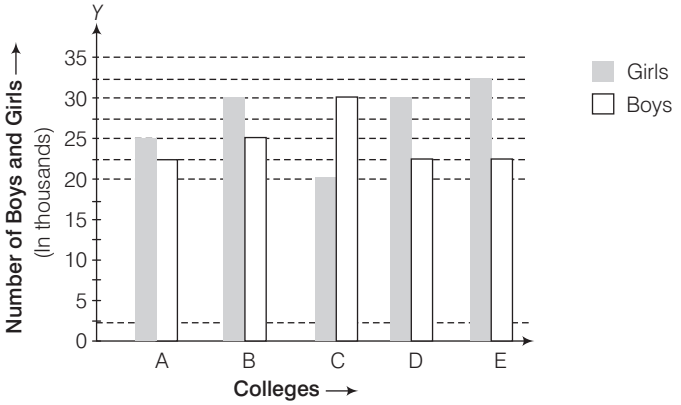


14. In year 2012, if India had a total expenditure of ₹ 120 billion, then how many billions did it spend on interest on debt?
(a) ₹ 10.8 billion
(b) ₹ 11.2 billion
(c) ₹ 11.50 billion
(d) ₹ 11.70 billion

15. If ₹ 9 billion were spent in year 2012 for veterans, then what would have been the total expenditure for that year (in billions)?
(a) ₹ 160 billion
(b) ₹ 165 billion
(c) ₹ 150 billion
(d) ₹ 170 billion

Directions (Q. Nos. 16 and 17) *Study the following graph carefully and answer the questions given below.*

Total Number of Boys and Girls in Various Colleges (Number in Thousands)



16. What is the average number of girls from all the colleges together?
(a) 25000 (b) 27500
(c) 27000 (d) 25500

17. What is the difference between the total number of girls and the total number of boys from all the colleges together?
(a) 13500 (b) 14000
(c) 15000 (d) 16000

18. A dice is throw, find the probability of getting not even number?
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{5}$ (d) $\frac{1}{3}$

19. What is the probability of choosing a vowel from the alphabets?
(a) $\frac{21}{26}$ (b) $\frac{5}{26}$ (c) $\frac{1}{26}$ (d) $\frac{3}{26}$

20. A coin is tossed 12 times and the outcomes are observed as shown below

The chance of occurrence of head is
(a) $\frac{1}{2}$ (b) $\frac{5}{12}$ (c) $\frac{7}{12}$ (d) $\frac{5}{7}$

21. Ram puts some buttons on the table. There were 4 blue, 7 red, 3 black and 6 white buttons in all. All of a sudden, a cat jumped on the table and knocked out one button on the floor. What is the probability that the button on the floor is blue?
(a) $\frac{7}{20}$ (b) $\frac{3}{5}$ (c) $\frac{1}{5}$ (d) $\frac{1}{4}$

22. Two coins are tossed simultaneously. What is the probability of getting one head and one tail?
(a) $\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) $\frac{2}{3}$

23. A bag contains 3 white and 2 red balls. One ball is drawn at random. What is the probability that the ball drawn is red?
(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{1}{5}$ (d) $\frac{2}{5}$

24. A dice is thrown. What is the probability of getting 6?
(a) 1 (b) $\frac{1}{6}$
(c) $\frac{5}{6}$ (d) None of these

25. A dice is thrown. What is the probability of getting an even number?
(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{5}{6}$ (d) $\frac{1}{6}$

26. From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the drawn card is a queen?
(a) $\frac{1}{4}$ (b) $\frac{1}{52}$ (c) $\frac{1}{13}$ (d) $\frac{1}{26}$

27. From a well-shuffled deck of 52 cards, one card is drawn at random. What is the probability that the drawn card is a black 6?
(a) $\frac{3}{26}$ (b) $\frac{1}{26}$ (c) $\frac{1}{13}$ (d) $\frac{1}{52}$

28. Numbers 1 to 10 are written on ten separate slips (one slip of one number), kept in a box and mixed well. One slip is chosen from the box without looking into it. What is the probability of getting a number less than 6?
(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{1}{5}$

Answers

1	*(d)*	2	*(c)*	3	*(d)*	4	*(c)*	5	*(d)*	6	*(b)*	7	*(d)*	8	*(b)*	9	*(a)*	10	*(b)*
11	*(b)*	12	*(a)*	13	*(b)*	14	*(a)*	15	*(c)*	16	*(b)*	17	*(c)*	18	*(b)*	19	*(b)*	20	*(b)*
21	*(c)*	22	*(b)*	23	*(d)*	24	*(b)*	25	*(a)*	26	*(c)*	27	*(b)*	28	*(a)*				

Hints and Solutions

1. Line graph is an important way to represent and compare the data which varies continuously.

A line graph displays the relation between two varying quantities.

In a line graph, we connect all the points by a line segment while in bar graph and histogram, we use rectangles of uniform width.

2. Range of data

= Maximum value – Minimum value

= 61 – 20 = 41

3. Tossing a coin, rolling a die and choosing a card from a deck of 52 cards are the random experiments, as we don't have an idea about the output of these experiments. But if we throw a stone to the roof of a building, we know that output, it will fall on the ground.

4. Tally marks are used to find the frequency of the observations.

5. Given classes are 0-10 and 10-20.

As, the class of given classes is 10, so the next classes will be 20-30 and 30-40.

As, the fourth class is 30-40.

Hence, the lower limit of fourth class is 30.

6. Central angle of the sector representing his expenses on food and house rent on a pie chart

$= 60°$

Part of the monthly salary he is expending on food and house rent $= \frac{60°}{360°} = \frac{1}{6}$

Hence, the amount he spends on food and house rent $= \frac{1}{6} \times$ Monthly salary

$= \frac{1}{6} \times 15000 = ₹\ 2500$

7. Given class intervals are 5-15, 15-25 and 25-35

Here, width of the class is 15-5 i.e. 10.

∴ The next class intervals will be

35-45, 45-55, 55-65 etc

Hence, sixth class interval is 55-65.

8. Class mark $= \frac{\text{Lower limit} + \text{Upper limit}}{2}$

$= \frac{13.5+18.5}{2} = \frac{32.0}{2} = 16$

9. On Sunday, the temperature was 25°C. So, it is least temperature in the week.

10. On Saturday, the temperature was 31°C.

11. On Friday, the temperature was maximum i.e. 34°C. Hence, it is the hottest day of the week.

12. From the given pie chart, we have the following table :

Types of viewers	Percentage
Sports viewers	25
News viewers	15
Informative viewers	10
Entertainment viewers	50

Since, percentage of entertainment is highest, so entertainment programme are viewed the most.

13. Here, the number of viewers watching news = 15%

Number of viewers watching informative = 10%

∴ Sum of number of viewers watching news and informative = (15 + 10)% = 25%

= Number of viewers watching sports

Hence, news and informative programmes have number of viewers equal to those watching sports channel.

14. Total expenditure = ₹ 120 billion

∴ Expenditure of interest on debt = 9% of 120

$= \frac{9}{100} \times 120 = ₹\ 10.8$ billion

15. ₹ 9 billion were spent for veterans. 6% of the total expenditure was spent on veterans in the year 2012.

Hence, the total expenditure

$= \frac{9}{6} \times 100 = ₹\ 150$ billion

16. Total number of girls

=(25+ 30+ 20+ 30+ 32.5) thousands

=137.5×1000=137500

Average number of girls $= \frac{137500}{5} = 27500.$

17. Total number of boys
$= (22.5 + 25 + 30 + 22.5 + 22.5)$ thousands
$= (122.5 \times 1000) = 122500$
Total number of girls $= 137500$
Required difference $= (137500 - 122500) = 15000$.

18. The probability of getting not even number
= Probability of getting odd number
$= \frac{3}{6} = \frac{1}{2}$ [$\because$ Odd numbers in a die are 1, 3, 5]

19. Total number of alphabets $= 26$
Total number of vowels $= 5$
$\therefore$ Probability of choosing a vowel from the alphabets $= \frac{\text{Total number of vowels}}{\text{Total number of alphabets}} = \frac{5}{26}$

20. Total number of times a coin is tossed $= 12$
Total number of occurrence of head $= 5$
$\therefore$ The chance of occurrence of head
$= \frac{\text{Number of times head appeared}}{\text{Number of times a coin is tossed}} = \frac{5}{12}$

21. Total number of buttons $= 4 + 7 + 3 + 6 = 20$
$\therefore$ Probability that button on the floor is blue
$= \frac{\text{Number of blue buttons}}{\text{Total number of buttons}} = \frac{4}{20} = \frac{1}{5}$

22. Total number of outcomes $= 2 \times 2 = 4$
Number of favourable outcomes
$= 2$ [i.e. (H, T), (T, H)]
$\therefore$ Probability of getting one head and one tail
$= \frac{2}{4} = \frac{1}{2}$

23. Total number of balls $= 3 + 2 = 5$ balls
Number of favourable outcomes = Number of red balls $= 2$
$\therefore$ Probability of getting a red ball $= \frac{2}{5}$

24. Total number of outcomes in a die $= 6$
Number of favourable outcomes $= 1$
$\therefore$ P (getting 6) $= \frac{1}{6}$

25. Total number of outcomes in a die $= 6$
Number of favourable outcomes $= 3$
[$\because$ even numbers are 2, 4, 6]
$\therefore P$ (getting even number) $= \frac{3}{6} = \frac{1}{2}$

26. Total number of outcomes in a deck of cards
$= 52$
Number of favourable outcomes (queen) $= 4$
$\therefore P$ (getting queen) $= \frac{4}{52} = \frac{1}{13}$

27. Total number of outcomes $= 52$
Number of favourable outcomes $= 2$
$\therefore P$ (getting card of black 6) $= \frac{2}{52} = \frac{1}{26}$

28. Total number of outcomes $= 10$
Number of favourable outcomes $= 5$
$\therefore P$ (getting number less than 6) $= \frac{5}{10} = \frac{1}{2}$