



# OLYMPIAD

Science and Mathematics  
(For Beginners)

(Class 8-10)

Volume - 4

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Mathematics (Level 2)



# INDEX

| S.N. | Chapter Title                    | P.N. |
|------|----------------------------------|------|
| 1.   | Playing with Numbers             | 1    |
| 2.   | Line and Angles                  | 26   |
| 3.   | The Triangles and Its Properties | 52   |
| 4.   | Congruence of Triangles          | 64   |
| 5.   | Polynomials                      | 73   |
| 6.   | Simple Equations                 | 93   |
| 7.   | Understanding Quadrilaterals     | 116  |
| 8.   | Rational Numbers                 | 134  |
| 9.   | Squares & Square Roots           | 144  |
| 10.  | Cubes and Cube Roots             | 159  |
| 11.  | Exponents and Powers             | 165  |

# 1

## CHAPTER

# Playing With Numbers



"Data is the information in the form of numerical figures or a set of given information."

## 1. ORGANIZING & GROUPING OF DATA

The word data means information in the form of numerical figures or a set of given facts. E.g. The percentage of marks scored by 10 students of a class in a test are 72, 84, 82, 96, 94, 98, 99, 67, 92 and 93.

### 1.1 Some basic definitions

**Raw data:** Data obtained from direct observation is called raw data. The marks obtained by 10 students in a monthly test are an example of raw data or ungrouped data.

**Observation:** Each numerical figure in the set of data is called an observation.

**Array:** Arranging the numerical figures of a set of data in ascending order is called an array.

**Range:** The difference between the highest and lowest values of the observation in a given set of data is called its range.

**Frequency:** The number of times a particular observation occurs is called its frequency.

The collection of a particular type of information in the form of numerical figures is called, a set of data.

This set of data obtained in the original form is called a set of raw (or ungrouped) data.

**Frequency distribution:** The number of times a particular observation occurs is called its frequency. The table showing the frequencies of various observations of data is called a frequency distribution table or simply frequency table.

We take each observation from the data and count them with the help of strokes called tally marks.

For the sake of convenience we use tally marks in bunches of five, i.e. the fifth one crossing the four diagonally.



Five

## 2. Tabulation or Presentation of Data

A systematic arrangement of data in a tabular form is called tabulation or presentation of the data.

The quantitative data that is to be analyzed statistically can be divided into two categories:

- (i) Individual series
- (ii) Discrete series

### 2.1 Individual series

Any raw data that is collected, forms an individual series.

E.g. The weight of 8 students:

35, 40, 36, 42, 32, 30, 50 and 46 (in kg).

## 2.2 Discrete series

A discrete series is formulated from raw data by taking the frequency of the observations into consideration.

If we have our observation as

23, 49, 50, 19, 18, 17, 26, 36, 38, 39,  
12, 6, 8, 5, 4, 22, 40, 47, 42, 43

This above data is difficult to handle & store correctly. So we need to reduce the data by dividing it into groups & then get the frequency of observations.

| Marks | Tally Marks | Number of students |
|-------|-------------|--------------------|
| 0-10  |             | 4                  |
| 10-20 |             | 4                  |
| 20-30 |             | 3                  |
| 30-40 |             | 4                  |
| 40-50 |             | 5                  |

0-10 is known as Class Interval. 0 is the lower limit and 10 is the upper limit. The class size is  $10 - 0 = 10$ . The difference between upper limit and lower limit is called the Class Size/Class Width. The mid-point of a class is known as class mark.

Eg. Class mark of class 10 – 20 is

$$\frac{10+20}{2} = 15.$$

### Illustrations

**Illustration 1.** The marks scored by 35 students in a mathematics test were as under:

60, 65, 100, 70, 85, 75, 95, 90, 65, 70, 80, 95,  
70, 75, 75, 70, 80, 80, 70, 75, 85, 85, 70, 90,  
75, 75, 80, 80, 85, 85, 90, 75, 75, 80, 80.

Prepare a frequency distribution table for the above data.

**Solution** First, we rearrange the given set of data as under:

60, 65, 65, 70, 70, 70, 70, 70, 70, 75, 75, 75,  
75, 75, 75, 75, 75, 80, 80, 80, 80, 80, 80, 80,  
85, 85, 85, 85, 85, 90, 90, 90, 95, 95, 100

The frequency distribution table for the above data is:

| Score(s) | Tally | Frequency |
|----------|-------|-----------|
| 60       |       | 1         |
| 65       |       | 2         |
| 70       |       | 6         |
| 75       |       | 8         |
| 80       |       | 7         |
| 85       |       | 5         |
| 90       |       | 3         |
| 95       |       | 2         |
| 100      |       | 1         |
| Total    |       | 35        |

### 3. Arithmetic Mean

The arithmetic mean in statistics is the same as 'average' in arithmetic.

#### Mean of ungrouped or raw data

The mean of a set of data is found out by dividing the sum of all the observations by the total number of observations in the data. We denote the mean by  $\bar{x}$  (read 'x bar').

$$\text{Mean} = \bar{x} = \frac{\text{Sum of observations}}{\text{Number of observations}}$$

Mean is highly affected by extreme values.

#### Illustrations

**Illustration 2.** Following are the ages (in years) of 10 teachers in a school.

32, 41, 27, 54, 36, 25, 28, 57, 40, 38

(i) What is the age of oldest teacher and that of the youngest teacher?

(ii) Find the range of the ages of the teachers.

(iii) Find the mean age.

**Solution** Arranging in ascending order, we get 25, 27, 28, 32, 36, 38, 40, 41, 54, 57

From the above set of data, we find that

(i) Age of the oldest teacher = 57 years

Age of the youngest teacher = 25 years

(ii) Range = (57 – 25) years = 32 years.

(iii) Mean age =  $\frac{\text{Sum of observations}}{\text{Number of observations}}$   
 $= \frac{32+41+27+54+36+25+28+57+40+38}{10} = \frac{378}{10}$  years = 37.8 years.

**Illustration 3.** The mean age of 5 children of a family is 12 year. If four of them are respectively 6, 11, 13 and 16 years, find the age of the fifth child.

**Solution** Let the age of the fifth child be x years.

Then, mean age =  $\frac{\text{Sum of ages}}{\text{Number of children}}$

$$= \frac{6+11+13+16+x}{5}$$

$$\Rightarrow 12 = \frac{46+x}{5} \Rightarrow x + 46 = 60$$

$$\Rightarrow x = 60 - 46 = 14 \text{ years.}$$

**Illustration 4.** The mean of 5 observation is 15. If mean of the first three observations is 14 and that of the last three is 17, find the third observation.

**Solution** The mean of 5 observations = 15

Total sum of 5 observations =  $5 \times 15 = 75$

Mean of first 3 observations = 14

Total sum of first 3 observations =  $3 \times 14 = 42$

The mean of last 3 observations = 17

Total sum of last 3 observations =  $3 \times 17 = 51$

$\therefore$  Third observation =  $42 + 51 - 75 = 93 - 75 = 18$ .

### 4. Median

The median of a set of numbers is the middle number when all the numbers are arranged in order of size, i.e., in descending or ascending order.

#### 4.1 Method for finding the median of an ungrouped data

To find the median of a set of numbers, arrange the data in an increasing or decreasing order of magnitude. Let the total number of observations be n.

**Case 1:** When n is odd: Median = value of  $\frac{1}{2}(n + 1)^{\text{th}}$  observation.

**Case 2:** When n is even: Then the mean of the two middle scores is the median.

$$\text{Median} = \frac{1}{2} \left\{ \left( \frac{n}{2} \right)^{\text{th}} \text{ observation} + \left( \frac{n}{2} + 1 \right)^{\text{th}} \text{ observation} \right\}$$

## Illustrations

**Illustration 5.** The runs scored by 11 members of a cricket team are 25, 39, 53, 18, 65, 72, 0, 46, 31, 08, 34.

Find the median score.

**Solution** Arranging the number of runs in ascending order, we have:

0, 08, 18, 25, 31, 34, 39, 46, 53, 65, 72.

Here  $n = 11$ , which is odd.

$\therefore$  Median score = value of  $\frac{1}{2}(11 + 1)$ th term

= value of 6th term = 34.

Hence, the median score is 34.

**Illustration 6.** The weights of 10 students (in kg) are

40, 52, 34, 47, 31, 35, 48, 41, 44, 38.

Find the median weight.

**Solution** Arranging the weights in ascending order, we have:

31, 34, 35, 38, 40, 41, 44, 47, 48, 52.

Here  $n = 10$ , which is even.

$\therefore$  Median weight =  $\frac{1}{2} \cdot \left\{ \left( \frac{10}{2} \right) \text{th term} + \left( \frac{10}{2} + 1 \right) \text{th term} \right\}$

=  $\frac{1}{2}$ {5th term + 6th term}

=  $\frac{1}{2}$ {40 + 41}kg

=  $\frac{81}{2}$  kg = 40.5kg.

Hence, median weight = 40.5 kg.

## 5. Mode of Ungrouped Data

The mode of a set of numbers is the number which occurs most frequently in the set. If  $n$  numbers occurs more than once, the set of data is said to have no mode. If different numbers occur the same number of times, the set of data has more than one mode.

### Empirical formula for calculating mode

We use the formula

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

### Illustrations

**Illustration 7.** Find the mode of the following yeas of experience of teachers in a school:

10, 12, 5, 4, 7, 6, 7, 4, 2, 7, 1, 2, 3, 10, 1, 7, 5, 4.

**Solution** By inspection, the largest frequency is 4. Therefore, 7 years of experience is the mode.

More teachers have 7 years of experience than any other number of years.

| Years of experience | Frequency |
|---------------------|-----------|
| 12                  | 1         |
| 10                  | 2         |
| 7                   | 4         |
| 6                   | 1         |
| 5                   | 2         |
| 4                   | 3         |
| 3                   | 1         |
| 2                   | 2         |
| 1                   | 2         |

Note that if the number of teachers with 7 years is only 3, and with 3 years is 2, then the second table would represent the situation.

| Years of experience | Frequency |
|---------------------|-----------|
| 12                  | 1         |
| 10                  | 2         |
| 7                   | 3         |
| 6                   | 1         |
| 5                   | 2         |
| 4                   | 3         |
| 3                   | 2         |
| 2                   | 2         |
| 1                   | 2         |

The mode would now be 4 years and 7 years. When two scores appear with the same highest frequency we call such a frequency distribution bimodal.

## 6. Representation of Data

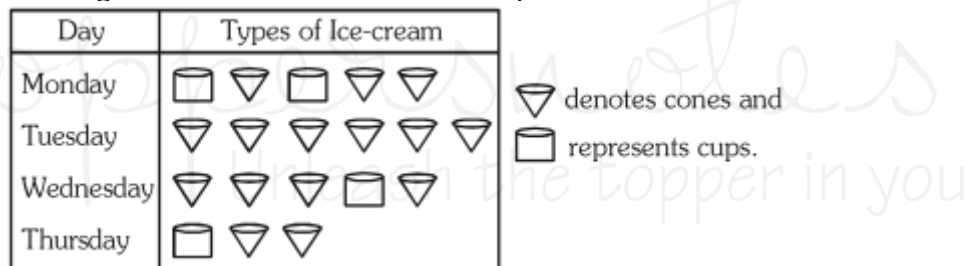
For data to be useful, it is very important to collect complete, accurate & relevant data.



After collection of data, it is necessary to represent data in a precise manner so that it is easily understood. Representation of data in a visual manner is known as its Graphical Presentation or simply, Graphs. Data can also be presented in the form of a table; however a graphical form is easier to understand.

Consider the family of Mr. Khanna. They are very fond of eating ice-creams. Some like butterscotch, some like vanilla flavor, some like strawberry and the rest of them likes chocolate. Some demand cones & some of them demand cups. A child of VIII class decides to construct the graphs according to their amount of ice-creams consumed. There are 7 ways of representing the data.

### 6.1 Pictograph

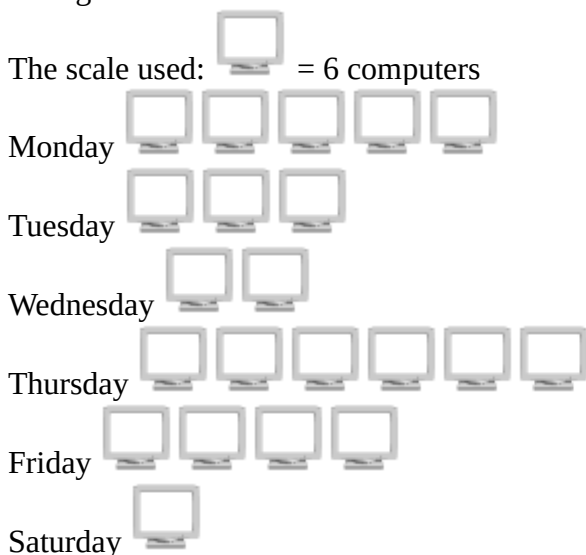
Pictorial representation of numerical data, using picture symbol is known as a pictograph. Most business and industrial organizations use this method to represent their data.



If we draw the pictograph, it will be in the above way where  represents cone &  represents cups.

#### Illustrations

**Illustration 8.** The following pictograph shows the number of computers sold by a company during a week.



Look at the pictograph and answer the equations given below.

- (i) How many computers were sold on Friday?
- (ii) How many computers were sold on Monday?
- (iii) How many computers were sold during the week?
- (iv) On which day was the sale maximum ?

**Solution**

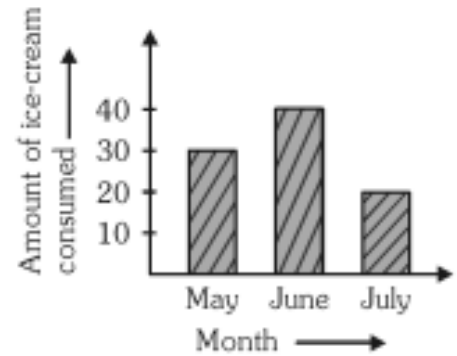
- (i) Number of computers sold on Friday =  $(4 \times 6) = 24$
- (ii) Number of computers sold on Monday =  $(5 \times 6) = 30$
- (iii) Number of computers sold during the week  
 $= [(5 + 3 + 2 + 6 + 4 + 1) \times 6] = (21 \times 6) = 126.$
- (iv) Clearly, the sale was maximum on Thursday.

**6.2 Bar Graph**

A bar graph represents observations using rectangles of equal width. The height of the rectangles [known as "BARS"] are of length depending upon the value of observation.

**Remark: (i)** The distance between 2 bars is same. **(ii)** Width of all bars is same.

If we draw the bar graph for the Khanna's family about the amount of ice-creams consumed in 3 months, then it will be shown in the following way.



**Illustrations**

**Illustration 9.** The number of cycles produced in a factory during five consecutive weeks is given below:

| Week                      | First | Second | Third | Fourth | Fifth |
|---------------------------|-------|--------|-------|--------|-------|
| Number of cycles produced | 800   | 1300   | 1060  | 920    | 1440  |

Draw a bar graph representing the above information.

**Solution** We can draw the bar graph by following these steps:

**Step 1.** On a graph paper, draw a horizontal line OX and a vertical line OY, representing the x-axis and the y-axis respectively.

**Step 2.** Along OX, mark the weeks at points taken at equal gaps.

**Step 3.** Choose the scale: 1 small division = 20 cycles.

**Step 4.** The heights of the bars are:

Production in the 1st week =  $(\frac{1}{20} \times 800) = 40$  smalldivisions.

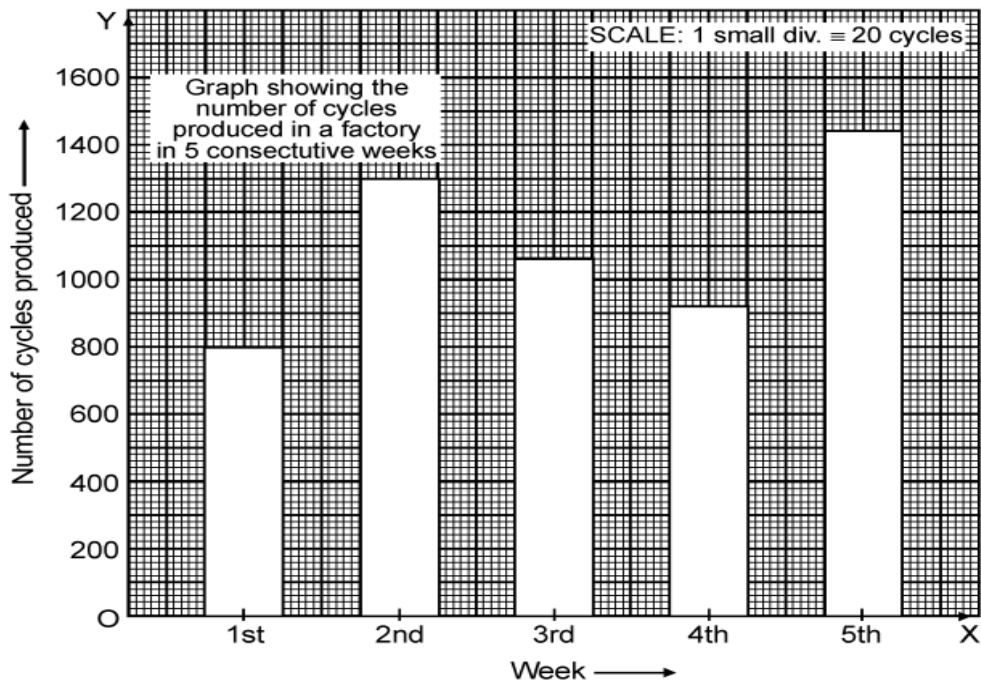
Production in the 2nd week =  $(\frac{1}{20} \times 1300) = 65$  smalldivisions.

Production in the 3rd week =  $(\frac{1}{20} \times 1060) = 53$  smalldivisions.

Production in the 4th week =  $(\frac{1}{20} \times 920) = 46$  smalldivisions.

Production in the 5th week =  $(\frac{1}{20} \times 1440) = 72$  smalldivisions.

**Step 5.** Draw bars of equal width and of heights calculated in Step 4 at the points marked in Step 2. The completed bar graph is shown below.

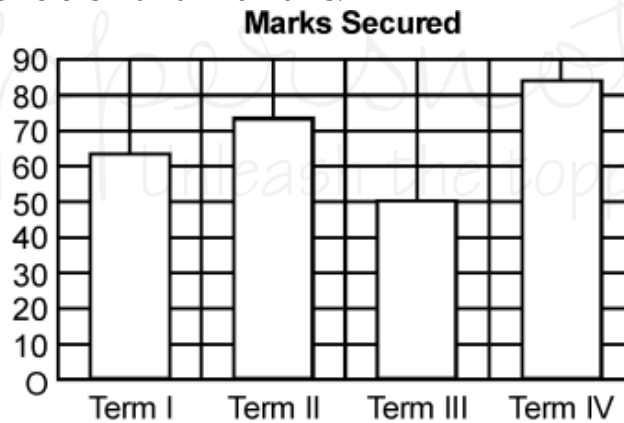


**Illustration 10.** The table shows the marks scored by Rahul in the four terminal exams.

- In which term did Rahul score the most and how much?
- What is his lowest score and in which term ?
- What is the scale used to draw the graph?

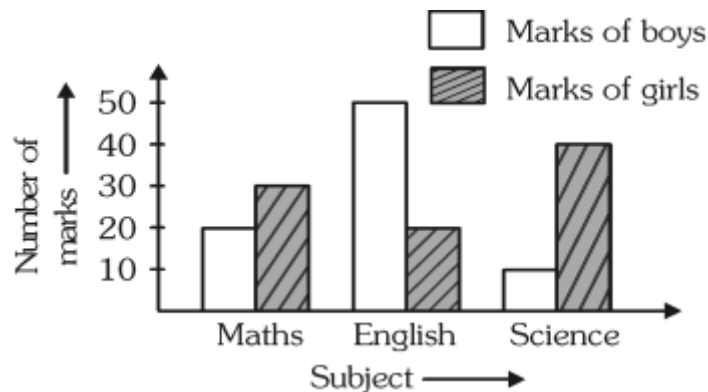
**Solution**

- Rahul scored the most, i.e., 85 marks in Term IV.
- The lowest score is 50 marks in Term III.
- The scale that is used here is 1 unit = 10 marks.



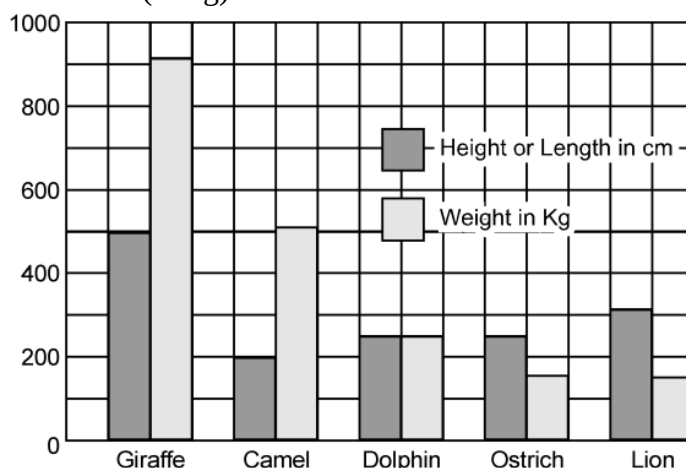
**6.3 Double Bar Graph**

A bar graph having two sets of data together is known as double bar graph. It is mostly used to compare the values.



## Illustrations

**Illustration 11.** The graph given below compares the heights and weights of various animals. The scale that is taken here is 1 unit = 100 cm (or kg)



### Say True or False?

- (i) The range of the heights is around 300 cm.
- (ii) The tallest animal has the greatest weight.
- (iii) The weight of the ostrich is around 300 kg.
- (iv) The ratio of the height to weight for a lion is about 2: 1.

**Solution** From the above graph, we can say that the length and the weight of a dolphin are 250 cm and 250 kg respectively (approx.). The height of both the bars in this case lies between 200 and 500.

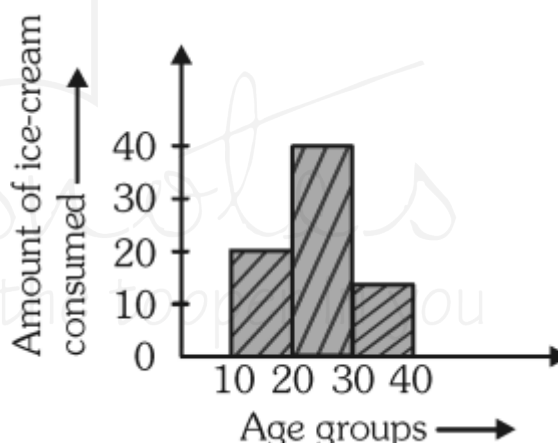
- (i) True (ii) True (iii) False (iv) True

## 6.4 Histogram

A histogram is a bar graph that is used to show the class intervals of different activities. It has adjacent bars over the given class intervals.

The histograms are useful for grouped frequency distribution.

Consider the example of Khanna's family, if we draw the histogram for the data of ice-creams consumed by different age-groups then it will be in the following way.

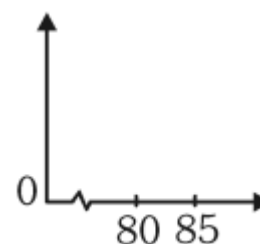


## 6.5 Bar graph vs Histogram

### Difference between a Bar graph & a Histogram.

- (i) In a bar graph, the bars are at a distance from one another, while in a histogram, the bars (rectangles) touch one another.
- (ii) In a bar graph, we generally have a scale for either the X-axis or Y-axis (generally Y-axis as vertical bars are more popular), but in a histogram, we have scales for both X-axis and Y-axis and both scales need not be the same.
- (iii) In a bar graph, one axis may not have numerical values but have names, subjects, flavours etc. along it, but in a histogram we display numerical values along both the axes.

Sometimes, the class intervals do not start from 0. So, a KINK or a sign is given to indicate that the distance from 0 to that class interval is not shown completely.

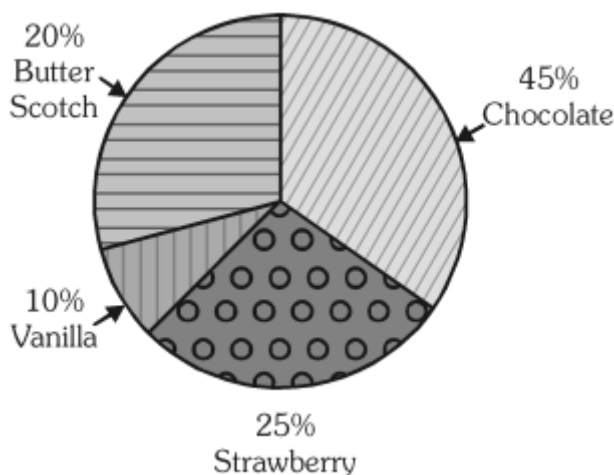


**Remark:** Whenever a histogram is given, certain conclusions can be drawn from the graph. This is known as **INTERPRETATION of the histogram.**

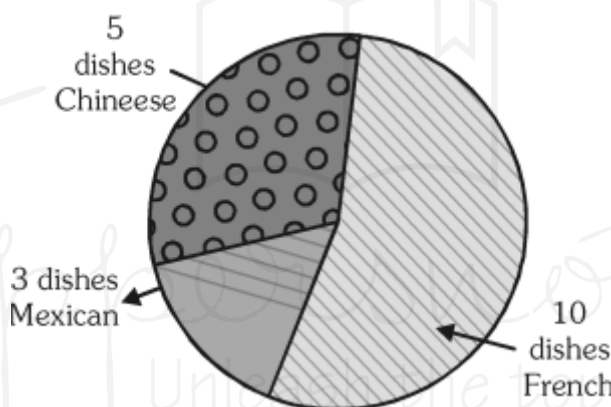
## 6.6 Pie-charts / Pie-diagrams / Circle graph

Pie-charts shows the relationship between a whole & its parts. Here, the whole circle is divided into sectors. Its size is proportional to the information it represents.

For the Khanna's family, if we draw the pie-chart of flavors of ice-creams, then it will be in the form as shown in fig-1.



Let us draw a pie-chart for the amount of food ordered in a hotel. There are total 18 dishes. Out of 18, 3 are Mexican, 5 are Chinese & 10 are French (See fig-2).



This way of representation is known as **pie-chart** as it looks like a pie & the parts look like the slices of the pie.

In the above pie chart, the proportion of French food ordered =  $\frac{\text{Amount of french food ordered}}{\text{Whole food ordered}} = \frac{10}{18} = \frac{5}{9}$

### Illustrations

**Illustration 12.** Rashmi watches the following TV channels in the given number of hours as shown in the table. Construct a pie chart for the given information.

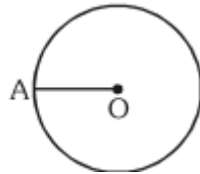
| TV Channels     | No. of Hours Seen |
|-----------------|-------------------|
| Disney          | 2                 |
| Pogo            | 1                 |
| Cartoon Network | 3                 |
| TOTAL           | 6                 |

### Solution

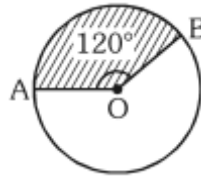
**Step-1:** Calculate the central angle of each sector.

| TV Channels     | In Fractions | Fraction of 360°                   |
|-----------------|--------------|------------------------------------|
| Disney          | 2/6          | $2/6 \times 360^\circ = 120^\circ$ |
| Pogo            | 1/6          | $1/6 \times 360^\circ = 60^\circ$  |
| Cartoon Network | 3/6          | $3/6 \times 360^\circ = 180^\circ$ |

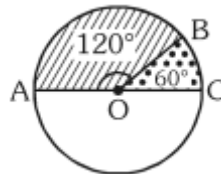
**Step-2:** Draw a circle of any radius with centre O (fig-3).



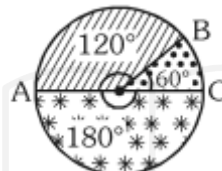
**Step-3:** Join O & A. At O, draw an angle of 120° with the help of protractor & name it as ZAOB (fig-4).



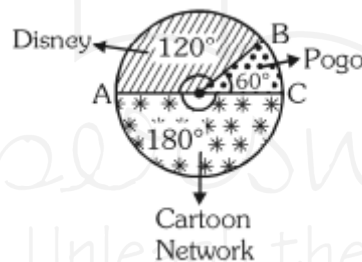
**Step-4:** In the similar way, construct an angle of 60° taking OB as base & name it



**Step-5:** Now, taking OC as base, construct an angle of 180° (fig-6).



**Step-6:** Mark the respective sectors with their names (fig-7).



## 6.7 Reading & Interpreting Pie-Charts

Reading a pie-chart just means to find out what part of the entire chart does each sector represent. To find the central angle, we use

$$\text{Central angle} = \frac{\text{Particular part}}{\text{Total of all parts}} \times 360^\circ$$

and to find the particular sector, we use

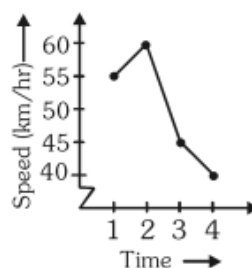
$$\text{Particular sector} = \frac{\text{Central angle} \times \text{Total of all parts}}{360^\circ}$$

## 6.8 Line Graph

A line graph is used to display the data that is continuously changing with time. We can take the example of a car moving on a road. It's speed is continuously changing with time.

| Time        | 1 pm | 2 pm | 3 pm | 4 pm |
|-------------|------|------|------|------|
| Speed km/hr | 55   | 60   | 45   | 40   |

To plot the graph, we take time on x-axis & the changing variable i.e. speed on y-axis.



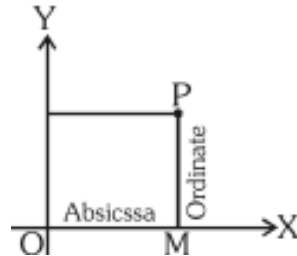
## 6.9 Linear Graph

Sometimes, it is not necessary that we get a continuous line segment. We may get a whole unbroken line, which we call as **Linear Graph**.

To plot a linear graph, we need to find the location [or **co-ordinates** of the points].

## 6.10 Co-ordinate Axes

The horizontal number scale is called the **x-axis** and the vertical number scale the **y-axis**. The point where the two scales cross each other is called the **origin**.

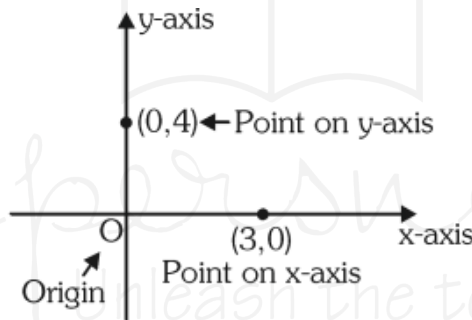


The distance OM of the point P from the y-axis is called x-coordinate (or **abscissa**) and the distance PM of the point P from the x-axis is called the y-coordinate (or **ordinate**).

### Illustrations

**Illustration 13.** A point (3, 2) is located 3 points from the left edge and 2 points from the bottom edge. '3' is known as x-coordinate (or abscissa) of the point and '2' is known as y-coordinate of the point.

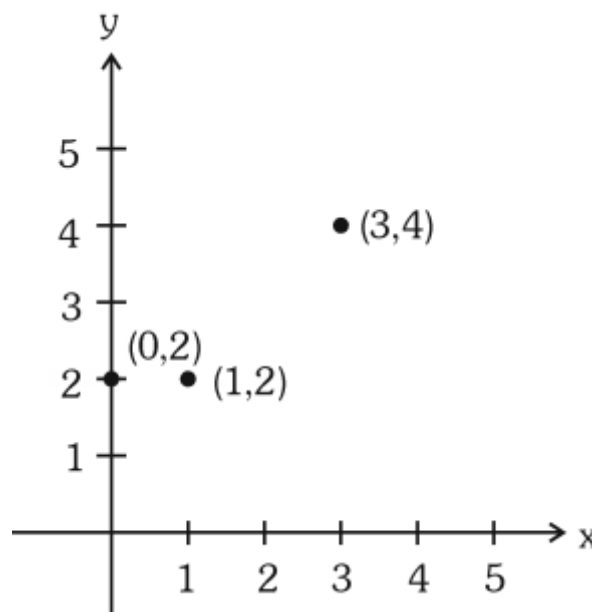
**Solution** (3, 2) is known as coordinates of the point.



**Illustration 14.** Plot the following points on a graph:

- (a) (1, 2)                      (b) (3, 4)                      (c) (0, 0)

**Solution**



---

## 7. CHANCES AND PROBABILITY

There are many situations in life where we are not sure of the results of some events, like when a coin is tossed, will it be head or tail?

We don't know what the outcome will be. But there is certainty that either it will be head or tail.

So, the chance of happening of an event ranges from being certain to happen.

We define probability as the measure of the chance of happening or non happening of an event.

Probability P(E) of an event is defined as

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

### 7.1 Some terms related to probability

**Experiment:** An operation which can produce some well-defined outcomes, is called an experiment. Each outcome is called an event.

**Random experiment:** An experiment in which all possible outcomes are known and the exact outcome can not be predicted in advance is called a random experiment.

**Trial:** By a trial, we mean performing a random experiment.

(i) Throwing two coins: Clearly, in throwing two coins, all possible outcomes are two heads, two tails, Head on the first coin and Tail on the second, Tail on the first coin and head on the second.

i.e., {HH, TT, HT, TH}

(ii) Throwing a dice: A dice is a solid cube having 6 faces, each one of which is a square. We mark these faces as 1, 2, 3, 4, 5, 6 respectively.

Let us throw a dice and let it fall freely on the ground, resting on one of its faces. Then, the number on the upper face is the outcome. Thus, in throwing a dice, all possible outcomes are 1, 2, 3, 4, 5, 6.

**Chance factor:** There are events in our daily life which are possible or likely but uncertain. We can not be sure whether they would happen or not. E.g.

When you play the play cards it is possible that you may win. You are not sure

### 7.2 Equally likely

(i) If you toss a coin, you are not sure, which one, the head or tail will show up. The chances of it being either head or tail will show up. The chances of it being either head or tail are even/ equal. We say that it is equally likely that it will be either head or tail.

(ii) We say that cricket is a game of luck or chance. We can not say with certainty which team will win. In a cricket match between two good teams, both teams have an even chance of winning. You may also express it by saying that it is equally likely that team A or team B will win.

### 7.3 Unlikely Outcomes

When you buy a lottery ticket it is possible that you may win. But since lakh of people would have bought the tickets, the chances of your winning are very less. We may say that there is a very poor chance of your winning or to put it in other words it is very unlikely that you will win.

Ravi is a brilliant student while Rekha is an average student. It is very likely or we may say there is a good chance that both will get promotion to next class. However, it is very unlikely, that is, there is a poor chance that Rekha will get first position in the class.

### 7.4 More likely outcomes

Suppose there are 16 apples and 8 bananas in a basket. Sangita wants to pick up an apple from basket. It is more likely that Sangita will pick up an apple without looking.

Probability of an outcome is represented by a number that lies from 0 & 1.

Probability of an event not occurring = 1 - Probability of an event occurring.

**Remark:** If the probability of an outcome is 0, it means it is an **Impossible event** & if it is 1, we say it is a **certain event**.

### 7.5 Outcomes as events

Each outcome of an experiment or a collection of outcomes makes an event. For example, on tossing a coin, getting a head or a tail is an event.



|       |    |
|-------|----|
| 40-50 | 11 |
| 50-60 | 4  |
| 60-70 | 8  |
| 70-80 | 7  |

5. The class interval having highest frequency is

- (1) 30-40 (2) 50-60  
(3) 20-30 (4) 40-50

6. The class-mark of class 50-60 is

- (1) 50 (2) 60  
(3) 55 (4) None of these

7. The size of the each class intervals is

- (1) 5 (2) 0  
(3) 10 (4) None of these

8. The lower limit of class having lowest frequency is

- (1) 0 (2) 50  
(3) 10 (4) None of these

9. If  $P(A)$  be the probability of an event A, then

- (1)  $-1 \leq P(A) \leq 1$  (2)  $0 < P(A) < 1$   
(3)  $0 \leq P(A) \leq 1$  (4) None of these

10. Which of the following represents statistical data?

- (1) The names of owners of shops located in a shopping complex.  
(2) A list giving the names of all states of India.  
(3) A list of all European countries and their respective capital cities.  
(4) The volume of rainfall in a certain geographical area recorded every month for 24 consecutive months.

11. In statistics, a suitable graph for comparing the data easily is:

- (1) A bar graph (2) A picto graph  
(3) A pie chart (4) A line graph

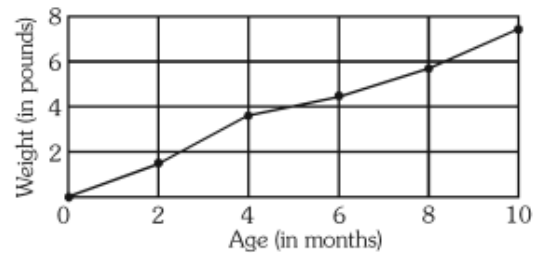
12. Which of the following statements is not correct for a bar graph?

- (1) All bars have different thickness.  
(2) Distance between two consecutive bars is the same.  
(3) The bars can touch each other.  
(4) The thickness has no significance.

13. You want to display a set of data showing the number of students in the line for lunch in the school canteen every 15 minutes during the lunch-break. Which graph shall display the data most appropriately?

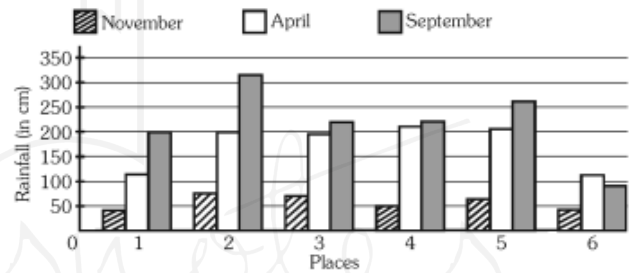
- (1) Bar Graph (2) Line Graph  
(3) Pie Graph (4) Pictograph

14. The given line graph shows the growth rate of a kitten. During which 2 month period, the kitten's weight increased the most.



- (1) 0 to 2 months (2) 2 to 4 months  
(3) 4 to 6 months (4) 6 to 8 months

15. The following bar graph shows the rainfall at selected locations in certain months.



Which of the following statements is correct?

- (1) November rainfall exceeds 100 cm in each location.  
(2) September rainfall exceeds April rainfall by 50 cm in each location.  
(3) November rainfall is lower than April rainfall in each location.  
(4) None of the above.

16. The data given below are the times in minutes, it takes seven students to go to school from their homes. Which statement about the data is false?

11, 6, 22, 7, 10, 6, 15

- (1) The median is 11 (2) The mean is 11  
(3) The range is 16 (4) The mode is 6

17. From a series of 50 observations, an observation with the value of 45 is dropped, but the mean remains the same. What was the mean of 50 observation?

- (1) 50 (2) 49  
(3) 45 (4) 40

18. The mean of the marks in Statistics of 100 students in a class was 72. The mean of marks for boys was 75, while their number was 70. The mean of marks of girls in the class was
- (1) 35 (2) 65  
(4) 68 (4) 86
19. If the mean of 13, 16, 18, 25, a, 23, is 19 then find the value of 'a'.
- (1) 18 (2) 19  
(3) 16 (4) 17
20. At a certain place the rainfall is 217 cm during the month of August. Find the average daily rainfall.
- (1) 6 cm (2) 8 cm  
(3) 10 cm (4) 7 cm
21. The mean of 10 numbers is 7. If each number is multiplied by 12, then the mean of new set of numbers is
- (1) 82 (2) 48  
(3) 78 (4) 84
22. The average length of 20 bricks is 360 cm. When another brick is added, the average length becomes 355 cm. Find the length of the twenty-first brick.
- (1) 250 cm (2) 253 cm  
(3) 255 cm (4) None of these
23. If the median of  $\frac{x}{5}$ ,  $x$ ,  $\frac{x}{4}$ ,  $x$ ,  $\frac{x}{2}$  and  $\frac{x}{3}$  (where  $x > 0$ ) is 8, then the value of x would be:
- (1) 24 (2) 32  
(3) 8 (4) 16
24. A variate takes 11 values which are arranged in descending order. It is found that 4th, 6th and 8th observations are 8, 6 and 4 respectively. What is the median of the distribution?
- (1) 4 (2) 6  
(3) 8 (4) 10
25. The event of drawing a red card from a pack of blue, white and black cards is
- (1) unlikely (2) certain  
(3) impossible (4) likely
26. On the probability line, we would describe the event -A new born child will be a girl as
- (1) unlikely (2) even chance  
(3) certain (4) impossible
27. In a class there are 14 boys and 10 girls. If one child is absent, the probability that it is a boy is
- (1)  $\frac{5}{12}$  (2)  $\frac{7}{12}$   
(3)  $\frac{10}{14}$  (4)  $\frac{1}{3}$
28. A box contains 8 slips of paper which are numbered 0 to 7. If one slip of paper is drawn unseen, the probability of drawing a number greater than 4 is
- (1)  $\frac{0}{8}$  (2)  $\frac{1}{8}$   
(3)  $\frac{1}{4}$  (4)  $\frac{3}{8}$
29. A dice is rolled once. What is the probability of rolling a prime number?
- (1)  $\frac{2}{3}$  (2)  $\frac{1}{2}$   
(3)  $\frac{1}{6}$  (4)  $\frac{5}{6}$
30. A bag contains red, white and blue marbles. The probability of selecting a red marble is  $\frac{2}{15}$  and that of selecting a blue marble is  $\frac{4}{15}$ . The probability of selecting a white marble is
- (1)  $\frac{13}{15}$  (2)  $\frac{11}{15}$   
(3)  $\frac{3}{5}$  (4)  $\frac{2}{5}$
31. A letter is chosen at random from the word 'PROBABILITY'. The probability that it is a vowel is
- (1)  $\frac{3}{11}$  (2)  $\frac{6}{11}$   
(3)  $\frac{4}{11}$  (4)  $\frac{7}{11}$
32. Eight sided dice are used in adventure games. They are marked with the numbers 1 to 8. The score is the upper most face. The probability of scoring a square number is
- (1)  $\frac{3}{8}$  (2)  $\frac{1}{2}$   
(3)  $\frac{1}{8}$  (4)  $\frac{1}{4}$
33. The scores in mathematics test (out of 25) of 15 students is as follows: 19, 25, 23, 20, 9, 20, 15, 10, 5, 16, 25, 20, 24, 12, 20  
Find the median of this data.
- (1) 23 (2) 20  
(3) 15 (4) 19

34. The heights of 10 girls were measured in cm and the results are as follows:

135, 150, 139, 128, 151, 132, 146, 149, 143, 141

Find the range of the data.

- (1) 23 cm                      (2) 20 cm  
(3) 3 cm                        (4) 10 cm

35. There are 6 marbles in a box with numbers from 1 to 6 marked on each of them. What is the probability of drawing a marble with number 9?

- (1)  $\frac{1}{6}$                               (2) 1  
(3) 0                                (4)  $\frac{1}{2}$

### True or false

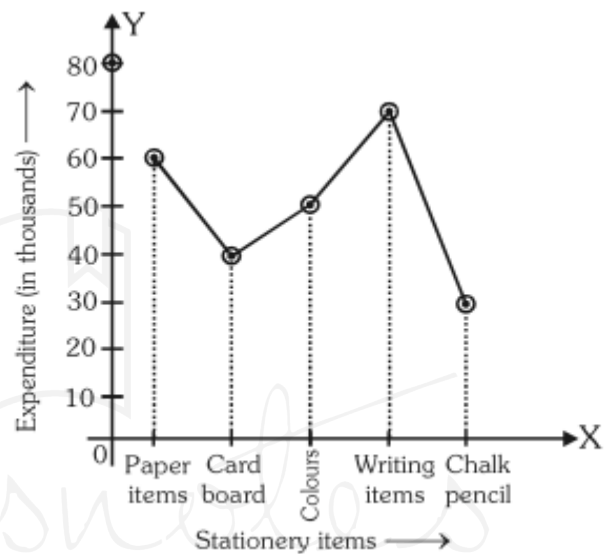
- The difference between the upper limit and lower limit of any class interval is called frequency.
- In the interval 10-20, 10 is called the lower class limit.
- All points with x-coordinate as zero lie on the x-axis.
- Mean of a data set is the value which divides the values into two equal parts.
- A data set may have more than one mode.
- The value of median changes if the values in a data set are arranged in ascending order instead of descending order.
- The median and mean of the data set 17, 30, 38 and 42 is the same.
- Rolling the number 7 on a standard die is an impossible event.
- If your chances of being stuck in a traffic jam are  $\frac{1}{10,000}$  it is a likely event.
- The probability of impossible event is 0.

### Fill in the blanks

- The horizontal axis is called \_\_\_\_\_ axis
- The coordinates of a point on \_\_\_\_\_ axis are (0, y)
- The abscissa of the point (-3, 2) is \_\_\_\_\_.
- The ordinate of a point on the x-axis is \_\_\_\_\_.
- The probability of getting head or tail in a throw of a coin is \_\_\_\_\_.
- The probability of getting number 10 in a throw of a dice is \_\_\_\_\_.
- The probability of \_\_\_\_\_ event is 1.

- The relationship between a whole and its part is graphically represented using \_\_\_\_\_.
- The class mark of the class interval 40-50 is \_\_\_\_\_.
- In pie chart the total angle at the centre of a circle is \_\_\_\_\_.
- Probability of an event is always less than or equal to \_\_\_\_\_.
- If a ball is drawn from a bag containing 20 balls of different colours, then probability of a white ball is \_\_\_\_\_.

Direction-(Q.13-17): Observe the graph and fill in the blanks:



- The information given by the graph is \_\_\_\_\_.
- \_\_\_\_\_ item is the least expenditure.
- The total expenditure on stationery is \_\_\_\_\_.
- The expenditure is maximum in \_\_\_\_\_ items.
- The ratio of expenditure on writing items to that on paper items is \_\_\_\_\_.
- A year has 12 months is a \_\_\_\_\_ event (certain/impossible/likely)
- The probability of an impossible event is \_\_\_\_\_.
- A probability scale has values from \_\_\_\_\_ to \_\_\_\_\_.
- An event with a 70% probability is a \_\_\_\_\_ event. (likely/even chance/unlikely)
- The difference between the highest and lowest values of observations in a set of data is called the \_\_\_\_\_.

23. The mean of the first five multiples of 2 is \_\_\_\_\_.
24. If the data set has even number of values, the median is the \_\_\_\_\_ of two \_\_\_\_\_ values.
25. The mode of the data set 4, 8, 4, 11, 4, 12, 8 is \_\_\_\_\_.
26. If there are 19 values in a data set arranged in descending order, then the median is the \_\_\_\_\_ term.

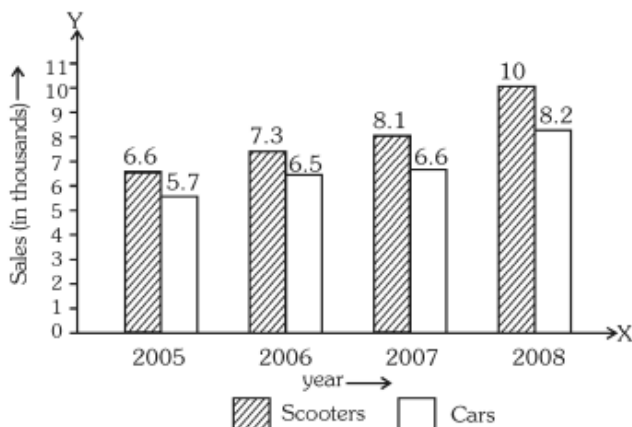
### Exercise 2

**Direction (Q.1 to Q.3):** Read the passage and answer the following questions.

| Item      | Expenses |
|-----------|----------|
| Food      | 4800     |
| Clothing  | 2400     |
| Rent      | 1800     |
| Education | 600      |
| Misc      | 1600     |
| Savings   | 800      |
| Total     | 12000    |

- What will be the angle representing food?
  - 72 deg
  - 54 deg
  - 18 deg
  - 144 deg
- What will be the angle representing rent?
  - 72 deg
  - 54 deg
  - 18 deg
  - 144 deg
- The item clothing represents the angle at the centre is
  - 72 deg
  - 54 deg
  - 18 deg
  - 144 deg
- The mean of first 5 natural numbers is
  - 6
  - 3
  - 5
  - 10

**Direction (Q.5 to Q.9):** These questions are based on the following data. Read the following bar graph and answer the following questions.



- In which year the difference between the sales of the scooters and the sales of cars is the least?
  - 2005
  - 2006
  - 2007
  - 2008
- Total number of vehicles (scooters and cars) sold in the years 2005 and 2006 is
  - 26100
  - 28500
  - 25100
  - 27500
- Find the maximum difference between sales of scooters and that of cars, in any year, in the given period:
  - 1500
  - 1700
  - 1800
  - 2000
- Find the total number of scooters sold in the four years.
  - 26000
  - 27000
  - 31000
  - 32000
- Find the ratio between the total number of vehicles sold (scooters and cars) in the year 2006 and that in the year 2008.
  - 41:46
  - 69:91
  - 147: 182
  - 46:49
- When a dice is rolled, find the probability of getting an even prime number.
  - $\frac{1}{6}$
  - $\frac{1}{3}$
  - $\frac{1}{2}$
  - $\frac{5}{6}$
- There are 100 cards numbered 1 to 100 in a box. If a card is drawn from the box and the probability of an event is  $\frac{1}{2}$ , then the number of favourable cases to the event is \_\_\_\_\_.
  - 20
  - 25
  - 40
  - 50

**Direction (Q.12 & Q.13):** Select the correct alternative from the given choices.

- The arithmetic mean of 13 observations is 60. If one of the observation 50 is deleted and another observation 63 is included. Find the new arithmetic mean. The following are the steps involved in solving the above problem. Arrange them in sequential order.
  - New sum of observations =  $780 - 50 + 63 = 793$

(b) The sum of the observation =  $13 \times 60 = 780$

(c)  $\therefore$  New arithmetic mean =  $\frac{793}{13}$

(d) The required mean = 61

- (1) bacd                                      (2) bcad  
(3) bdca                                      (4) abcd

**13. If a dice is rolled, find the probability of getting a composite number. The following are the steps involved in solving the above problem. Arrange them in sequential order.**

(a) The possible composite numbers when a dice is rolled are 4 and 6. When a dice is rolled, the possible outcomes are 1, 2, 3, 4, 5, 6.

(b) The required probability =  $\frac{1}{3}$

(c) The probability of getting a composite number =  $\frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} = \frac{2}{6}$

- (1) abc                                      (2) cba  
(3) cab                                      (4) acb

**14. In pie graph, a component is represented as a sector with sector angle  $72^\circ$ . Find the percentage of the component value in the total.**

- (1) 21%                                      (2) 27.5%  
(3) 22.5%                                      (4) 20%

**15. A person contributed his total salary of a month for three social welfare societies A, B and C. The ratio of total salary, share of A and share of B is 20: 5: 8. Find the central angle of sector, which represents the share of C.**

- (1)  $72\frac{1}{2}^\circ$                                       (2)  $126^\circ$   
(3)  $105^\circ$                                       (4)  $67\frac{1}{2}^\circ$

**16. The median, mode and mean of a data is 9. If there are five integers in the data and the range of the data is 4. If the least value of the data is 7, then find the number of different observations in the data**

- (1) 3                                      (2) 4  
(3) 2                                      (4) Cannot say

**17. The range of a data is x, the median and the mode of the data is 7 each. If the number of observations is odd and all observations are integers, then find the least value of x (Range  $\neq$  0)**

- (1) 1                                      (2) 2  
(3) 3                                      (4) 4

**18. A bag contains 4 green balls, 4 red balls and 2 blue balls. If a ball is drawn from the bag then, what is the probability of getting neither green nor red ball?**

- (1)  $\frac{2}{5}$                                       (2)  $\frac{1}{2}$   
(3)  $\frac{4}{5}$                                       (4)  $\frac{1}{5}$

**19. At National Public School, 200 students were asked to name a career they would like to pursue. The results are shown in the table below.**

#### Career Choice

| Career        | Number of Students |
|---------------|--------------------|
| Actor/Actress | 30                 |
| Athlete       | 40                 |
| Business      | –                  |
| Executive     | 70                 |
| Pilot         | 20                 |
| Politician    | 10                 |
| Musician      | 22                 |
| Teacher       | 8                  |

**Which of the following statements is supported by the data in the table?**

- (1) More than 25% of the students would like to pursue a career in acting or music.  
(2) The least number of students choose teaching because of the college preparation required.  
(3) The mode of the data is 30.  
(4) Exactly 10% of the students would like to pursue a career in politics.

**20. The relation between mean, median and mode is**

- (1) Mode = 3(Median) - 2(Mean)  
(2) Mode = 2(Median) + 3(Mean)  
(3) Mode = 3(Mean) - 2(Median)  
(4) Mode = 2(Mean) - 3(Median)

**21. The marks (out of 100) obtained by a group of students in a Mathematics test are 80, 74, 62, 56, 48, 72, 79, 80, 96, 68, 52, 92.**

Based on this information, choose the statement(s) which is/are correct?

- (1) The range of the data is 44.  
(2) The mode of the data is 52.  
(3) Median of the data is 63.  
(4) None of these