# 1

# Introduction

*Data Interpretation forms one of the most critical areas of different general and entrance examinations. It accounts 10-20 questions in the MBA entrance examination, 20-25 questions in Bank examination, 10-15 questions in SSC examination etc., therefore, it's understanding and its inherent concepts will help the students to score maximum in different examination.*

## Data Interpretation

Data Interpretation is drawing conclusions and inference from a comprehensive data presented numerically in tabular form or pictorial form by means of an illustration, graphs, pie charts etc. Thus the act of organizing and interpreting data to get meaningful information is data interpretation.

It is an extension of mathematical skill and accuracy. Soundly knowledge of quantitative techniques is prerequisite for good performance in this section. Since, all such questions may require a fair amount of calculations, one should be able to multiply and divide quickly using shortcut methods. So, here we are providing a quicker and clear concepts, shortcut methods of these chapters in view of their essence in solving the performs of Data Interpretation.

A detailed study on the pattern of questions appearing in this section for various competitive examinations has concluded that Data Interpretation is mainly the game of three chapters of arithmetic namely Percentage, Average and Ratio.

## 1. Percentage

The term per cent means for every hundred. A fraction whose denominator is 100 is called a percentage and the numerator of the fraction is called the rate per cent. It is denoted by the symbol %.

$$x\% = \frac{x}{100} = \frac{1}{100} \times x$$

Percentage is a very useful tool for comparison in the analysis of data. For example, in their captaincy Sourav Ganguly has won 127 matches out of 205 matches and Rahul Dravid has won 64 matches out of 140 matches.

This can however, be better comprehended in a percentage form, which is for

$$\text{Success rate of Ganguly} = \frac{127}{205} \times 100\% = 61.95\%$$

$$\text{Success rate of Dravid} = \frac{64}{140} \times 100\% = 45.71\%$$

This reveals that as a captain, Ganguly is more successful than Dravid.

**Percentage Equivalent of Important Fractions**

| | | |
|---|---|---|
| $\frac{1}{16} = 6\frac{1}{4}\%$ | $\frac{1}{5} = 20\%$ | $\frac{3}{5} = 60\%$ |
| $\frac{1}{11} = 9\frac{1}{11}\%$ | $\frac{1}{4} = 25\%$ | $\frac{2}{3} = 66\frac{2}{3}\%$ |
| $\frac{1}{10} = 10\%$ | $\frac{1}{3} = 33\frac{1}{3}\%$ | $\frac{3}{4} = 75\%$ |
| $\frac{1}{9} = 11\frac{1}{9}\%$ | $\frac{2}{5} = 40\%$ | $\frac{4}{5} = 80\%$ |
| $\frac{1}{8} = 12\frac{1}{2}\%$ | $\frac{9}{20} = 45\%$ | $\frac{7}{8} = 87\frac{1}{2}\%$ |
| $\frac{1}{7} = 14\frac{2}{7}\%$ | $\frac{1}{2} = 50\%$ | $\frac{9}{10} = 90\%$ |
| $\frac{1}{6} = 16\frac{2}{3}\%$ | $\frac{11}{20} = 55\%$ | $1 = 100\%$ |

## Interpretation of Data Involving the Percentage

**Rule 1** To find by how much per cent $x$ is more or less than $y$ (or over $y$) or compared to $y$.

$$\text{Required percentage} = \frac{\text{Value of } x - \text{Value of } y}{\text{Value of } y} \times 100 \quad (\text{when } x > y)$$

$$= \frac{\text{Value of } y - \text{Value of } x}{\text{Value of } y} \times 100 \quad (\text{when } x < y)$$

The denominator part contains the value with which the comparison is made.

**Rule 2** To find the percentage change in any value, say $x$ compared to the other value, say $y$.

$\therefore$ Required percentage change $(c) = \frac{x - y}{y}$

If $c$ is positive, then there is percentage increase in the value of $x$ over $y$ (percentage growth) and if $c$ is negative, then there is percentage decrease (percentage decline) or negative growth.

**Rule 3** Two percentage values can't be compared unless the base values are known.

**Rule 4** Two percentage values can be compared in terms of percentage values but not in absolute values when the base values are same although base values are not known.

## Calculation of Percentage

**1.** Find 79% of 429.

**Sol.** $79\% = 80\% - 1\%$

$80\% = 4/5$ *i.e.*, $4/5 \times 429 = 4 \times 85.8 = 343.2$

$1\% = 4.29$

$\therefore$ 79% of $429 \simeq 343.2 - 4.29 \simeq 339$

**2.** Find 361% of 2345.

**Sol.** $361\% = (300 + 50 + 10 + 1)\%$

$300\% = 3 \times 2345 = 7035$

$50\% = 1/2 \times 2345 = 1172.5$

$10\% = 1/10 \times 2345 = 234.5$

$1\% = 1/100 \times 2345 = 23.45$

Required $361\% = 7035 + 1172.5 + 234.5 + 23.45 \simeq 8465$

**3.** How much per cent of 1795645 is 64598?

**Sol.** $\text{Required percentage} = \frac{64598}{1795645} \times 100\% = 3.6\%$

But you are not required to find the exact value as you have to choose only one option and only approximate value is sufficient to solve your problem.

Therefore, approximate percentage

$$= \frac{6}{178} \times 100\% \simeq \frac{6}{180} \times 100\% = \frac{10}{3}\% = 3.33\%$$

**4.** Find in how many countries the production of cars has increased by less than 5% in 2008 over last year.

| Countries | Figure (in 000 tonne) | |
|---|---|---|
| | 2007 | 2008 |
| India | 700 | 760 |
| USA | 900 | 940 |
| China | 1760 | 1860 |
| Japan | 1500 | 1580 |
| Italy | 1160 | 1218 |

**Sol.** Increment in production of cars in 2008 over 2007

$$\text{in India} = \frac{760 - 700}{700} \times 100\% = 8.57\%$$

$$\text{in USA} = \frac{940 - 900}{900} \times 100\% = 4.44\%$$

$$\text{in China} = \frac{1860 - 1760}{1760} \times 100\% = 5.68\%$$

$$\text{in Japan} = \frac{1580 - 1500}{1500} \times 100\% = 5.33\%$$

$$\text{in Italy} = \frac{1218 - 1160}{1160} \times 100\% = 5\%$$

Clearly, only in one country 'USA' production of cars has increased by less than 5% in 2008 over last year.

**Note** *You can solve this type of questions as given below.*

**5.** Find in how many years the production of sugar has decreased by more than 30% over the previous year.

| Years | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Production in million tonne | 974 | 726 | 524 | 276 | 184 |

**Sol. Method I**

Decrement in the production of sugar over previous year

$$\text{in 2005} = \frac{974-726}{974}\times 100\% = 25.5\%$$

$$\text{in 2006} = \frac{726-524}{726}\times 100\% = 27.8\%$$

$$\text{in 2007} = \frac{524-276}{524}\times 100\% = 47.3\%$$

$$\text{in 2006} = \frac{276-184}{276}\times 100\% = 33.3\%$$

Thus, in two years 2007 and 2008, decreased in the production of sugar is more than 30%.

**Method II** In this case, $\left(1-\frac{x}{100}\right)=\left(1-\frac{30}{100}\right)=0.70$

**Step 1.** $\frac{726}{974}$ $\frac{524}{726}$ $\frac{276}{524}$ $\frac{184}{276}$

**Step 2.** 0.74 0.72 0.52 0.66

Therefore, in two years (2007 and 2008), the production of sugar has decreased by more than 30% over the production in the previous year.

# 2. Ratio

Ratio is compared by division of the measure of two quantities of the same kind.

If $a, b$ are two quantities of the same kind $(a, b \neq 0)$, then the quotient $\frac{a}{b}$ (which is clearly a number without any unit is called the ratio of $a$ and $b$). It is written as $a:b$ (read as $a$ is to $b$). The quantities $a$ and $b$ are called terms of the ratio $a:b$, $a$ is the first term and $b$ is the second term.

A ratio can be expressed in several ways, *i.e.*, $a:b$ is equal to $ma:mb$, since the quotient does not change when we divide (or multiply) the dividend and the divisible by same non-zero number, say $m$. For example, $2:3 = 4:6 = 20:30 = 200:300 = 2m:3m$. In the ratio $2:3$, the two terms 2 and 3 have no common factors other than 1. The ratio expressed in this form is said to be in the simplest form. Usually, a ratio is expressed in the simplest form.

## Ratio of Equality, Greater Inequality or Lesser Inequality

A ratio is said to be a ratio of equality, greater or lesser inequality according as first term also known as antecedent is equal to or greater than or less than to second term also known as consequent. In other words,

- the ratio $a:b$, where $a=b$ is called a ratio of equality. (*e.g.*, 1 : 1 , 2 : 2 etc.)
- the ratio $a:b$, where $a>b$ is called a ratio of greater inequality. (*e.g.*, 3 : 2, 4 : 3 etc.)
- the ratio $a:b$, where $a<b$ is called a ratio of lesser inequality. (*e.g.*, 3 : 5, 4 : 7 etc.)

**Rule 1** A ratio of equality is unaltered, a ratio of greater inequality is diminished and a ratio of lesser inequality is increased, if the same positive quantity is added to both its terms.

Let $a/b$ be the given ratio and $x$ be a positive quantity and $x>b$.

- If $\frac{a}{b}=1$, then $\frac{a+x}{b+x}=\frac{a}{b}=1$
- If $\frac{a}{b}>1$, then $\frac{a+x}{b+x}<\frac{a}{b}$
- If $\frac{a}{b}<1$, then $\frac{a+x}{b+x}>\frac{a}{b}$

**Rule 2** A ratio of equality is unaltered, a ratio of greater inequality is increased and a ratio of lesser inequality is diminished, if same positive quantity is not greater than the smaller term be subtracted from each of its terms.

Let $\frac{a}{b}$ the given ratio, $x$ be a positive quantity and $x<b$.

- If $\frac{a}{b}=1$, then $\frac{a-x}{b-x}=\frac{a}{b}=1$
- If $\frac{a}{b}>1$, then $\frac{a-x}{b-x}>\frac{a}{b}$
- If $\frac{a}{b}<1$, then $\frac{a-x}{b-x}<\frac{a}{b}$

(here, students are advised that they should try assuming certain values and check the results.)

## Interpretation of Data Involving the Ratio

**Rule 1** To evaluate a ratio 7/470 (say), where numerator << denominator, it is always better to reverse it and divide 470 by 7 (reverse operation) as

$$470 \div 7 \simeq 67, \text{ Remainder 1. So, the given ratio} \simeq \frac{1}{67}$$

**Rule 2** To evaluate a ratio $\frac{16.35}{384}$ (say), where numerator << denominator and also the numerator is a decimal number, it is always better to first approximate it to a closest fraction involving integers only and then apply the reverse operation.

Therefore, $\frac{16.35}{384} \simeq \frac{16}{384}$, then dividing 384 by 16, we get 24 as the result.

Therefore, given ratio $\simeq \frac{1}{24} \simeq \frac{4}{96} \simeq \frac{4}{95} \simeq \frac{4}{94}$

**Rule 3** To find the highest and the lowest among the ratios (<1) when numerator << denominator.

**Step 1.** Apply reverse operation, *i.e.*, straight aways divide the denominator of the ratio by the numerator to find how many times the denominator is of the numerator.

**Step 2.** Maximum number of times will indicate the lowest ratio and minimum number of times will correspond to the highest ratio.

**Rule 4** To find the highest and the lowest among the ratio (<1) when numerator < denominator .

**Step 1.** Approximate the given ratio (if the number of digits in numerator / denominator is more than 2).

**Step 2.** Multiply the numerator by 10 and get the resultant fraction.

**Step 3.** Find only integer value of the resultant fraction.

**Step 4.** If any of the integer value of the resultant fraction are same, then find the next decimal place and so on.

**Step 5.** Compare the value of the resultant fraction. The maximum ratio will have the maximum value.

**Rule 5** To find the value which constitutes the maximum part (or portion) or minimum part of the total value.

If $a$ and $b$ are the two values constituting the total value $(=a+b)$, then $\frac{a}{a+b}$ is maximum when $a > b$ and $\frac{a}{a+b}$ is minimum when $a < b$.

**6.** Find the highest and the lowest among the following $\frac{14}{340}, \frac{34}{602}, \frac{29}{571}, \frac{41}{741}$.

**Sol.** **Step 1.** Apply reverse operation.

$$\frac{340}{14}, \frac{602}{34}, \frac{571}{29}, \frac{741}{41}.$$

**Step 2.** Number of times

24 17 19 18 (take only integer values)

↓ ↓

Maximum value Minimum value

↓ ↓

Lowest ratio Highest ratio

**7.** Find the highest and the lowest among the following $\frac{673}{727}, \frac{526}{613}, \frac{850}{951}, \frac{902}{998}$.

**Sol.** **Step 1.** Approximated as $\frac{67}{72}, \frac{52}{61}, \frac{85}{95}, \frac{90}{99}$.

**Step 2.** Multiply by 10; $\frac{670}{72}, \frac{520}{61}, \frac{850}{95}, \frac{900}{99}$.

**Step 3.** 9.3 8.5 8.9 9.0

Hence, $\frac{673}{727}$ is the highest ratio and $\frac{526}{613}$ is the lowest ratio.

## 3. Average

Average is a very simple but effective way of representing an entire group by a single value.

Average of a group is defined as

$$\text{Average} = \frac{\text{Sum of all items in the group}}{\text{Number of items in the group}}$$

'Sum of all the items in the group' means sum of the values of all the items in the group.

A batsman's performance can be expressed as the average number of runs scored per innings rather than giving the scores of individual innings. For example, let us say MS Dhoni scored the following runs in 9 different innings in a test series—45, 66, 134, 39, 10, 97, 108, 55 and 85. Then, his average score per innings in that particular test series

$$= \frac{45+66+134+39+10+97+108+55+85}{9} = 71$$

Similarly, if there are 50 students in a class, instead of talking of the height of each individual student, we can talk of 'average' height of the class. The average height of the class of students is equal to the sum of the heights of all the students in the class divided by the number of students in the class.

Average is also called the 'mean' or mean value of all the values.

In other words, if $x_1, x_2, x_3, ..., x_n$ be $n$ numbers, then their average $= \frac{x_1 + x_2 + ... + x_n}{n}$

**8.** Find the average number of bikes sold over the period 2004-08.

| Year | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|
| Number of bikes | 400 | 500 | 760 | 940 | 1100 |

**Sol.** Average number of bikes sold over the period

$$= \frac{\text{Total number of bikes sold over the period}}{\text{Total number of years}}$$

$$= \frac{400+500+760+940+1100}{5}$$

$$= \frac{3700}{5} = 740$$

### Interpretation of Data Involving the Average

**Rule 1** If the value of each item is increased by the same value $k$, then the average of the group of items will also increase by $k$.

**Rule 2** If the value of each item is decreased by the same value $k$, then the average of the group of items will also decrease by $k$.

**Rule 3** If the value of each item is multiplied by the same value $k$, then the average of the group of items will also be multiplied by $k$.

**Rule 4** If the value of each item is divided by the same value $k$ $(k \neq 0)$, then the average of the group of items will also be divided by $k$.

**Rule 5** The average of a group of items will always lie between the smallest value and the largest value in the group *i.e.,* the average will be greater than the smallest value and less than the largest value in the group.

**Rule 6** To find the value of which year (or the entry in a table) is close to the average value of given period.

**Step 1.** Find the average value of the given period.

**Step 2.** Find the difference = Any value (or entry) − Average value

Minimum the difference, closer the value to average.

**Step 3.** If the difference is same for any two different values (or entries), then find the percentage deviation over the average *i.e.,* $\frac{\text{Difference}}{\text{Average}} \times 100$

Since, difference is same, so more the average, less the percentage deviation, closer the value to the average.

## Weighted Average

When two groups of items are combined together, then we can talk of the average of the entire group. However, if we know only the average of the two groups individually, we cannot find out the average of the combined group by items.

For example, there are two sections $A$ and $B$ of a class where the average height of section $A$ is 150 cm and that of section $B$ is 160 cm. On the basis of this information, we cannot find the average of the entire class (of the two sections together). As discussed earlier, the average height of the entire class is

$$\frac{\text{Sum of the total height of the entire class}}{\text{Total number of students in the entire class}}$$

In other words, if $x_1$ is the average of $n_1$ numbers, $x_2$ is the average of $n_2$ numbers, $x_3$ is the average of $n_3$ numbers and so on, then average of all $(n_1 + n_2 + ...)$ numbers

$$= \frac{n_1 x_1 + n_2 x_2 + n_3 x_3 + \ldots}{n_1 + n_2 + n_3 + \ldots}$$

# Presentation of Data

The raw data collected in any investigation is so voluminous that they are unwieldy and incomprehensible. Having collected and edited the data, the next step is to organize them in a condensed form that will highlight the main characteristics, facilitate comparisons and render them suitable for further processing and interpretation. Top management people rarely find time to go through the entire details of any report, it's daily production or the sales forecast. An effective presentation of data enables them to draw upon the information with the least effort and time.

***Effective presentation of data is broadly classified into the following categories.***

## 1. Data Tables

Tables are often used in reports, magazines and newspapers to present a set of numerical facts. They enable the reader to make comparisons and to draw quick conclusions. It is one of the easiest and most accurate way of presenting data.

One of the main purpose of tables is to make complicated information easier to understand. The advantage of presenting data in a table is that one can see the information at a glance.

While answering questions based on tables, carefully read the table title and the column headings. The title of the table will give you a general idea of the type and often the purpose of the information presented. The column headings tell you the specific kind of information given in that column. Both the table title and the column headings are usually very straight forward.

For Example, The data pertaining to the production of motorbikes in India is represented in the following table.

**Production of Motorbikes in India**

| Years | Pulsar | CBZ | Freedom | Total |
|---|---|---|---|---|
| 2000-01 | 531972 | 291419 | 338577 | 1161968 |
| 2001-02 | 614624 | 318926 | 334583 | 1268133 |
| 2002-03 | 655519 | 329255 | 395970 | 1380744 |
| 2003-04 | 722791 | 350844 | 359287 | 142922 |
| 2004-05 | 1014784 | 798976 | 510924 | 2324684 |

The above table pertains to the data on the production of motorbikes, yearwise from 2000-01 to 2004-05. Further the table also divides the production of motorbikes by categories *viz.* Pulsar, CBZ and Freedom. Thus, it is possible to get a picture of the production of different types of motorbikes in India over a span of five years.

- If we want to find the contribution of CBZ in terms of the percentage of the total production in 2002-03, then its value

$$= \frac{\text{Production of CBZ in 2002-03}}{\text{Total production of motorbikes in India in 2002-03}} \times 100\%$$

$$= \frac{329255}{1380744} \times 100\%$$

$$\simeq 23\%$$

- If we want to find the growth rate of Freedom motorbikes in India from 2001-02 to 2002-03, then its value

$$= \frac{\text{Production of Freedom in 2002-03} - \text{Production of Freedom in 2001-02}}{\text{Production of Freedom in 2001-02}} \times 100\%$$

$$= \frac{395970 - 334583}{334583} \times 100\%$$

$$= \frac{61387}{334583} \times 100\%$$

$$\simeq 18\%$$

**Directions** *(Q. Nos. 9-13) Study the given table carefully and answer the questions given below.*

**Number of employees working in various departments of ABC Ltd.**

| Years | Departments | | | | |
|---|---|---|---|---|---|
| | Production | Marketing | Corporate | Accounts | Research |
| 1999 | 150 | 25 | 50 | 45 | 75 |
| 2000 | 225 | 40 | 45 | 62 | 70 |
| 2001 | 450 | 65 | 30 | 90 | 73 |
| 2002 | 470 | 73 | 32 | 105 | 70 |
| 2003 | 500 | 80 | 35 | 132 | 74 |
| 2004 | 505 | 75 | 36 | 130 | 75 |

**9.** In which year did the total number of employees reach twice the total number of employees that the factory had in the year 1999?

(a) 2000 (b) 2001
(c) 2002 (d) 2003

**Sol.** (*b*) Total number of employees in the year
$1999 = 345, 2000 = 442,$
$2001 = 708, 2002 = 750,$
$2003 = 821, 2004 = 821$

Clearly, figure of year 2001 is closed to the double of figure of the year 1999.

**10.** In which department did the number of employees remain the same during the year 1999 and 2004?

(a) Production (b) Corporate
(c) Research (d) None of these

**Sol.** (*c*) Clearly, number of employees in research department is the same in the year 1999 and 2004.

**11.** What is the approximate percentage increase in the number of employees in production department from 1999-04?

(a) 237% (b) 152%
(c) 201% (d) None of these

**Sol.** (*a*) Number of employees in production department

in 1999 = 150

in 2004 = 505

$\therefore$ Required percentage increase $= \frac{505-150}{150} \times 100\%$

$= \frac{355}{150} \times 100\% \simeq 237\%$

**12.** In which year did each department have a larger number of employees that it had in the immediately preceding year?

(a) 2002 (b) 2004
(c) 2001 (d) 2003

**Sol.** (*d*) From the table, it is clear that in the year 2003, each department has a larger number of employees than it had in the immediately preceding year, *i.e.*, 2002.

**13.** Which department had less than 10% of the total number of employees through all the years shown in the table ?

(a) Marketing (b) Corporate
(c) Accounts (d) None of these

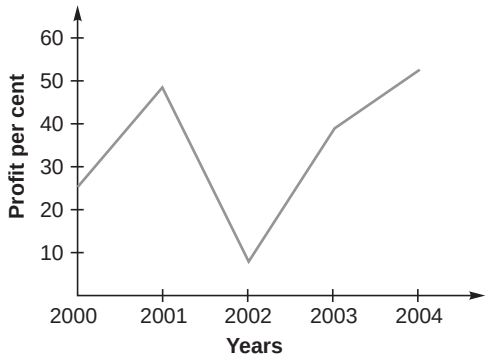
**Sol.** (*a*) Clearly, marketing department had less than 10% of the total number of employees through all the years shown in the table.

## 2. **Line** (Cartesian) **Graph**

The line graph simplifies the data interpretation, as it is a pictorial presentation of data and is therefore very useful for determining trends and rate of change. The slope of the line graph helps in comparing the magnitude of change between any two consecutive points on the graph. Steeper the slope, greater is the change in magnitude between the two consecutive points.

For Example,

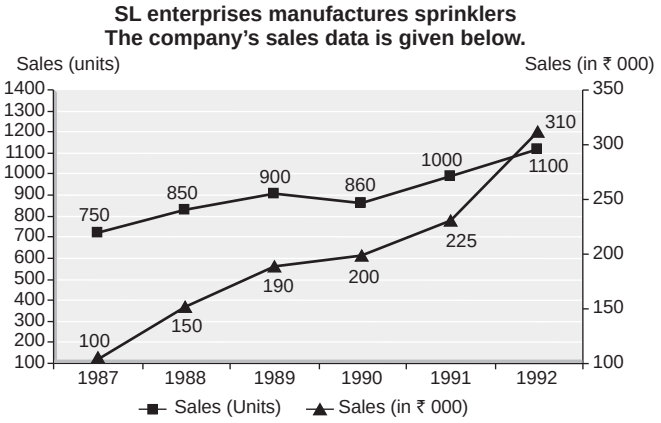
The following graph shows the profit percentage of WIPRO in various respective years.




If we want to find to ratio of the per cent profits of the company in the year 2001 to 2000, then its value

$= \frac{\text{Per cent profit in 2001}}{\text{Per cent profit in 2000}} = \frac{50}{25} = 2:1$

**Directions** *(Q. Nos. 14-15) These questions are based on the following graph.*




**14.** The maximum percentage price rise was displayed in the year

(a) 1987 (b) 1988 (c) 1990 (d) 1991

**Sol.** (*b*) Percentage price rise

$$\text{in } 1988 = \frac{150-100}{100} \times 100\% = 50\%$$

$$\text{in } 1990 = \frac{200-190}{190} \times 100\% = 5.26\%$$

$$\text{in } 1991 = \frac{225-200}{200} \times 100\% = 12.5\%$$

Thus, percentage rise was maximum in the year 1988.

**15.** Find the percentage increase in sales (units) in 1989 as compared to previous year.

(a) 4% (b) 6%
(c) 8% (d) None of these

**Sol.** (*b*) Sales in 1988 = 850 units

Sales in 1989 = 900 units

$$\therefore \text{ Required percentage increase} = \frac{900-850}{850} \times 100\%$$

$$= \frac{50}{850} \times 100\%$$

$$= 5.88\%$$

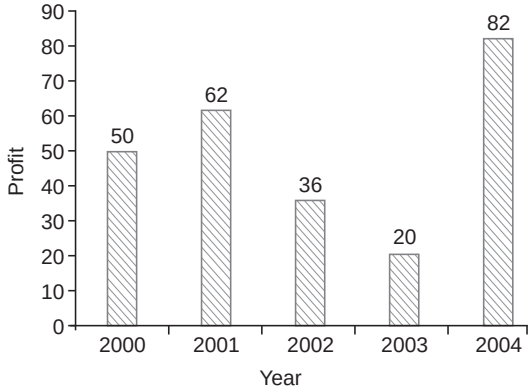
$$\simeq 6\%$$

## 3. Bar Graphs

Given quantities can be compared by the height or length of a bar graph. A bar graph can have either vertical or horizontal bars. You can compare different quantities or the same quantity at different times. In bar graphs, the data is discrete. Presentation of data in this form makes evaluation of parameters comparatively very easy.

For Example,

The following graph shows the total profits of WIPRO (in ₹ crore) in various years.

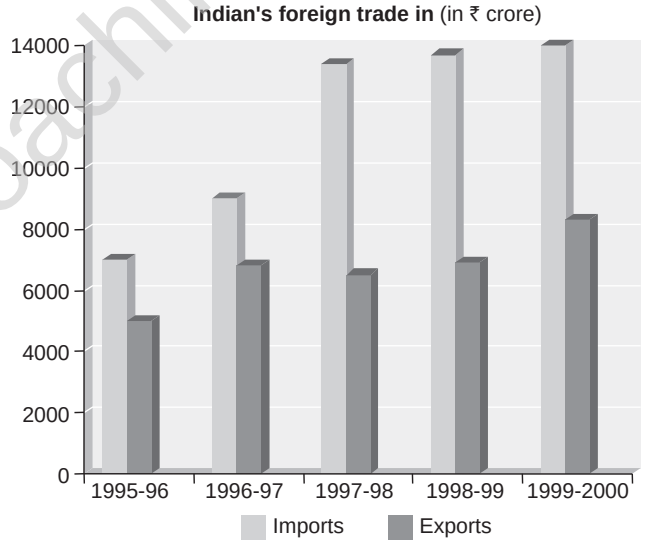



If we want to find the per cent increase in the profit of WIPRO in the year 2004 as compared to previous year, then its value

$$= \frac{82-20}{20} \times 100\%$$

$$= \frac{62}{20} \times 100\% = 310\%$$

**Directions** *(Q. Nos. 16-17) Refer to the following bar chart and answer the questions that follow.*




**16.** The percentage increase in imports between 1995-96 and 1999-2000 was

(a) 25% (b) 125% (c) 100% (d) 75%

**Sol.** (*c*) Import in 1995-96 = ₹ 7000 Crore

Import in 1999-2000 = ₹ 14000 Crore

$$\therefore \text{ Required increase} = \frac{14000-7000}{7000} \times 100\%$$

$$= \frac{7000}{7000} \times 100\% = 100\%$$

**17.** If oil imports constituted 20% of the total imports in 1997-98, then what percentage of the trade gap was due to oil? (assuming that no oil is exported)

(a) 30% (b) 40% (c) 85% (d) 25%

**Sol.** (*b*) Oil imports in 1997-98 $= \frac{20}{100} \times 13000$

$= ₹\ 2600$ crore

Trade gap in 1997–98 $= 13000 - 6500 = ₹\ 6500$

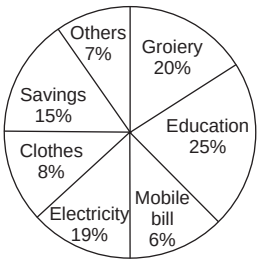
Hence, per cent of trade gap due to oil $= \frac{2600}{6500} \times 100\%$

$= 40\%$

# 4. Pie Chart

A pie chart is a circular chart divided into sectors either in percentagewise or in degreewise. If distribution is percentagewise, then total value of the chart is taken as 100%. If distribution is degreewise, then total value of the chart is taken as 360°. The arc length and the area of each sector is proportional to the quantity it represents.

For Example, following pie chart shows the expenditure of a family.



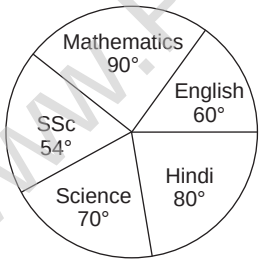

**Total income** = ₹ 20000

- If we want to find the difference between the expenditures on education and clothes sectors, then it's value

  $= 25\%$ of $20000 - 8\%$ of $20000$

  $= 17\%$ of $20000 = ₹\ 3400$

- As an another example, the pie chart given below shows the marks obtained by a student in different subjects.



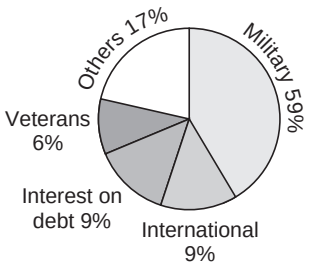

**Maximum marks of each subject 120**

If we want to find the marks got by the student in Mathematics, then its value $= \frac{90°}{360°} \times 120 = 30$

**Directions** (*Q. Nos. 18-19*) *Study to the following pie chart carefully and answer the following questions.*

**National Budget Expenditure in the year 2000**

(Percentage Distribution)




**18.** If India in the year 2000, had a total expenditure of ₹ 120 billion, approximately how many billions did it spend on interest on debt?

(a) ₹ 12.4 billion (b) ₹ 8.4 billion
(c) ₹ 9.3 billion (d) ₹ 10.8 billion

**Sol.** (*d*) Total expenditure $= ₹\ 120$ billion $= 100\%$

$\therefore$ Interest on debt $= 9\%$ of $120 = ₹\ 10.8$ billion

**19.** If ₹ 9 billion were spent in the year 2000 for veterans, what would have been the total expenditure for that year?

(a) ₹ 100 billion (b) ₹ 180 billion
(c) ₹ 120 billion (d) ₹ 150 billion

**Sol.** (*d*) ₹ 9 billion were spent for veterans. This represents 6.0% of the total expenditure for the year 2000. Hence, total expenditure $= \frac{9}{6} \times 100 = ₹\ 150$ billion

# 5. Case Studies

In this form of data presentation, the data is given in the form of a paragraph. The student is required to understand the data presented in the caselet and convert it into a table for solving the questions.

**Directions** (*Q. Nos. 20-22*) *The following caselet is an example of a caselet based on reasoning. Five friends Anand, Ashish, Aishwarya, Deepak and Mani pursue the following professions in their careers : Human Resource, Law, Chartered Accountancy, Engineering and Foreign Relationship. They live in Ranchi, Patna, Kolkata, Delhi and Meerut but not in that order.*

- Mani and Aishwarya do not live in Ranchi or Meerut and neither of them is a lawyer or a chartered accountant.
- Anand and Ashish are neither an expert in foreign relationship nor an engineer and they do not live in Delhi or Ranchi.
- Deepak is neither a chartered accountant nor a human resource professionals.

- The person living in Ranchi is neither an expert in foreign relationship nor an engineer.
- Anand does not live in Kolkata and Ashish is not a chartered accountant.
- Mani is not an expert in foreign relationship.
- The expert in foreign relationship does not live in Delhi.

**20.** Who lives in Ranchi?

**Sol.** We can easily answer the above question by using the information given in the above caselet. The following tables will result by using the direct clues between the person and his place and the person and his profession. The question is answered at this point itself since there is only Deepak who could live in Ranchi.

**21.** Who is Chartered Accountant?

**Sol.** From the table we made, it is clear that Anand is chartered Accountant.

**22.** Who lives in Delhi?

**Sol.** From the table, it is clear that either Deepak or Mani lives in Delhi but we know that, Deepak lives in Ranchi. Hence, Mani lives in Delhi.

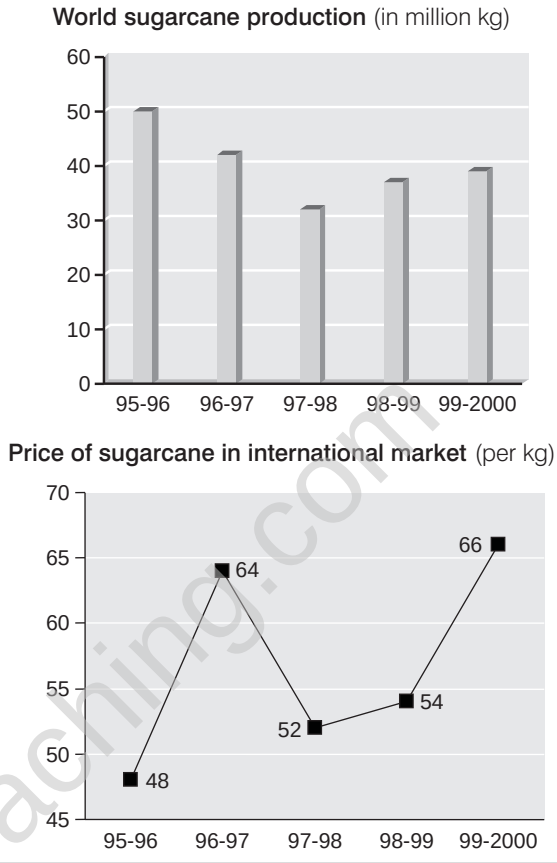
| | HR | Law | CA | Engg. | Foreign Relationship |
|---|---|---|---|---|---|
| Anand | | | | X | X |
| Ashish | | | X | X | X |
| Aishwarya | | X | X | X | |
| Deepak | X | | X | X | X |
| Mani | | X | X | | X |

| | Ranchi | Patna | Kolkata | Delhi | Meerut |
|---|---|---|---|---|---|
| Anand | X | | X | X | |
| Ashish | X | | | X | |
| Aishwarya | X | | | X | X |
| Deepak | | | | | |
| Mani | X | | | | X |

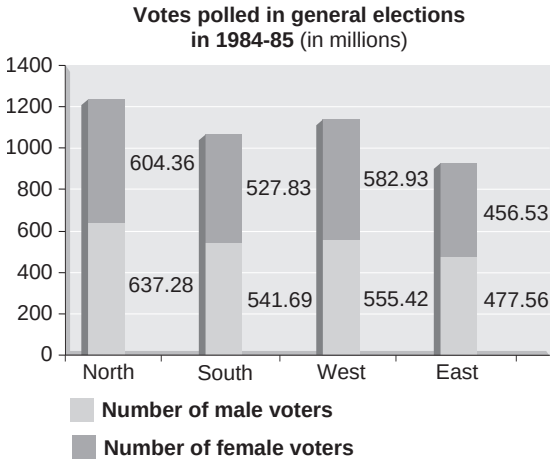
## 6. Mixed Graph

Among the graphs we have studied, if we have the combination of two or more graphs, then it is called mixed graph. It happens in cases when desired parameter is a function of two or three variables. In such cases, information is presented more than one type of graphs together.

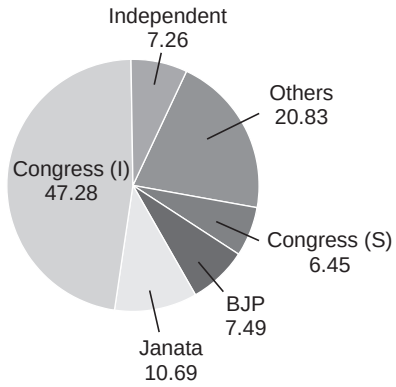
For Example, production of sugarcane in the world can be presented with the help of bar graph and price of sugarcane can be presented by line graph. Now, data represented by these graphs are related to each other in one or other way,




**Directions** *(Q. Nos. 23-25) Refer to the following graphs and answer the questions based on them.*



**Percentage of votes polled by different parties**




**23.** Which region had the highest male-female ratio of voters in 1984-85 ?

(a) North (b) South
(c) West (d) East

**Sol.** (*a*) Male-female ratio of voters

$$\text{in North} = \frac{637.28}{604.36} = 1.05$$

$$\text{in South} = \frac{541.69}{527.83} = 1.03$$

$$\text{in East} = \frac{477.56}{456.53} = 1.046$$

Thus, the male-female ratio is highest in North.

**Note** *No need to calculate for West as the resultant will be less than* 1.

**24.** As per diagrams above in 1985, the number of women in 1985 per 50 men were

(a) 49 (b) 51
(c) 47 (d) Can't be determined

**Sol.** (*d*) The data given in the above graphs shows the number of voters. It means number of men and women who are not eligible for voting are not given. Hence, we cannot solve the above question.

**25.** What was the total number of votes polled by BJP in 1984-85 elections?

(a) 165.67 million (b) 328.33 million
(c) 2072.62 million (d) 471.35 million

**Sol.** (*b*) Total votes polled in 1984-85 elections

$$= 1241.64 + 1069.52 + 1138.35 + 934.09$$

$$= 4383.6 \text{ million}$$

Votes polled in favour of BJP $= 4383.6 \times 7.49\%$

$= 328.33$ million

## Expert's Advice

Before starting any shortcut or calculation technique, students are told about the level of difficulty of questions as Data Interpretation mainly depends on the range of its options *i.e.,* if **values given in different options are very close to each other,** then it requires **more time and more accuracy** in solving the problems. On the other hand, if there is **wide gap among the values provided in different options** of a problem, then it is **easier to solve such type of the problem.** And in such type of the problem, we generally use approximation rather to find the exact answer. Again , range of approximation also depends, on the range of options provided in a given problem.

For Example,

The data pertaining to the production of motorbikes in India is represented in the following table.

| Years | Pulsar | CBZ | Yamaha | Total |
|---|---|---|---|---|
| 2003-04 | 420198 | 347925 | 226495 | 994618 |
| 2004-05 | 510692 | 428724 | 296205 | 1235621 |
| 2005-06 | 584605 | 396254 | 446576 | 1427435 |
| 2006-07 | 705642 | 570264 | 501254 | 1777160 |
| 2007-08 | 843456 | 625704 | 562398 | 2031558 |

Find the contribution of CBZ in terms of percentage of the total production in 2004-05 year.

**Example**

(a) 17.38 (b) 17.35 (c) 17.31 (d) 17.33

**Example of close options to each other**

(a) 17.11 (b) 17.5 (c) 17.35 (d) 17.82

**Example of options having gap**

(a) 16.84 (b) 18.22 (c) 17.35 (d) 19.45

**Example of options having wide gap**

(a) 11.32 (b) 17.35 (c) 20.42 (d) 26.33

From the above example, it is clear that for a single problem we have four levels of difficulty. It depends on the range of the given options. So, students are suggested here before solving the problem, take a glance of all options and then decide the level of difficulty, level of accuracy and level of approximation.