# UPSC – CSAT

## Civil Services Exam

## Union Public Service Commission

## Part - 3

**Data Interpretation, Data Sufficiency and Comprehension**

# UPSC – CSAT (ENGLISH)

## CONTENTS

# Data Interpretation

Data Interpretation refers to the process of reviewing the data provided and using these data to calculate the required value.

Data can be provided in various forms such as tables, line diagrams, bar diagrams, pie charts, radar graphs, compound graphs and caselets. Also, check the data adequacy concepts once through the data interpretation concepts.

Data Interpretation Methodology is a way of analyzing and helping people make sense of numerical data that has been collected, analyzed and presented. When the data is collected, it usually remains in the form of a row which can be difficult for the lay person to understand and that is why analysts always divide the collected information so that others can understand it. For example, when founders present their pitches to or to their potential investors, they may seek a better understanding of the market.

 The following concepts are useful for solving data interpretation –

* Average
* Ratio and Proportion
* Percent

## Average

The average or arithmetic mean or mean of two or more quantities is equal to their sum divided by the number of those quantities.

$$\text{Average} = \frac{\text{Sum of all quantities}}{\text{Number of quantities}}$$

It is defined as the central value of the values of all quantities. It is the result of the sum of the values of all the quantities divided by the number of quantities. The average is always between the highest and lowest values of all quantities. It is necessary that the quantities taken into account have the same features and must be expressed either in the same unit or in comparable units. In order to calculate the average, students must learn the various properties related to the average.

## Ratio and Proportion

The comparative relation between two quantities of the same type by division is called ratio. In other words, ratio means how much of one quantity belongs to another.

The ratio is always between the same units like kg : kg, hour : hour, litre : litre etc.

Let us consider two quantities x and y in the ratio x : y or x/y or x y.

The two quantities being compared here are called terms. The first quantity 'x' is called antecedent. The second quantity 'y' is called the resultant.

## Percent

Percent means every hundred. It is a ratio with a base of 100. Percentage calculation is the most important aspect in representation as well as in the interpretation of data.

Percentage increase = (Final value - Initial value) / (Initial value) × 100

Percentage reduction = Initial value - Final value) / (Initial value) × 100

## Tips and Tricks for data interpretation

**Read the question asked carefully**

Firstly, before going through the given data, go through all the questions asked. Now, you get some information about the given topic.

**Try to analyze the given data**

Start reading the given data and analyze it carefully keeping in mind the questions.

**Don't make assumptions**

Do not try to make any assumptions while answering the questions. Answer it when you are absolutely sure that it is correct. There is a risk of negative marking if you answer with guesses. (Questions with negative marking cases)

**The approximation of values can be considered:**

When making calculations, consider approximate values to make simplification easier.

**Learn to calculate fast and maintain accuracy**

Instead of using a calculator or lengthy methods when simplifying, try to calculate in your mind. Initially, it may take some time but with regular practice you can master it. Everyone can solve a problem but those who have time management and efficiency, they succeed in the exam are eligible for.

**Identify the questions that are time consuming and skip them**

Try to identify the questions that are time consuming, even if you think you can get the answers, skip them because of the lengthy calculations. It can waste your time and you may miss solving simple questions left with you. If you have time after covering all the questions then come back to such questions and give an attempt.

**Master these techniques by regularly practicing on various model questions**

Once you have all the concepts of Data Interpretation in your mind, get clarity on those topics by solving various example problems. Now, start applying your knowledge on Data Interpretation to solve various model questions and then try to solve previous year question papers.

Data Interpretation is broadly classified as follows -

1. Table
2. Line diagram
3. Bar graph
4. Pie chart
5. Radar graph
6. Mixed graph
7. Caselet

**Table**

In tabular method, data is arranged in vertical and horizontal rows. It is the easiest way to represent statistics but not the easiest way to interpret statistics. Generally, questions based on tabular method include data related to production/profit/sales of different companies in a year, list of students in a class, list of defective goods, income of different persons etc. In the tabular method, either row is used to represent discrete non-connected data.

## How to Solve Tabular Method

Generally, there are two types of tables in the Table Data Interpretation (DI) : (i) Complete Data Tables (ii) Missing data tables.

**Missing Data Tables**

While solving the missing data table, try to complete the data in the table if it can be completed initially, as it will help you solve the questions.

To solve the question, first of all, note down all the variables against which you have to extract the data from the table.

**Example :**

**Directions: Read the following information carefully and answer questions accordingly.**

**The table shows the population (in thousands) of six different cities and the percentage of males, females and children in them. It is also given that there is no other person who is outside the category of men, women and children. Furthermore, children are exclusive of man and woman.**

| City | Population | Male | Women | Children |
|------|-----------|------|-------|----------|
| A | 36 | 45% | 33% | 22% |
| B | 54 | 36% | , | , |
| C | 72 | 24% | 52% | , |
| D | 28 | , | 25% | , |
| E | 86 | , | , | 42% |
| F | 94 | 44% | 25% | , |

**Q.   What is the average number of children in cities A, C, E and F ?**

**Sol:** Number of children in city A = 22% of 36000 = 7920

Number of children in city E = 42% of 86000 = 36120

Percentage of children in city C = (100 – 24 – 52) = 24%

Number of children in city C = 24% of 72000 = 17280

Percentage of children in city F = (100 – 44 – 25) = 31%

Number of children in city F = 31% of 94000 = 29140

Average number of children = (total number of children in city A, C, E, F) × 100 / 4

$$\Rightarrow \frac{7920 + 36120 + 17280 + 29140}{4} = \frac{90460}{4} = 22615 \text{ Children}$$

## Practice Questions with Their Solution

**Instructions (Q.1-3): Study the given table carefully to answer the following questions.**

**Number of students studying in five different sections of five institutes -**

| Discipline Institutes | Arts | Commerce | Science | Management | Computer Science |
|---|---|---|---|---|---|
| A | 350 | 260 | 450 | 140 | 300 |
| B | 240 | 320 | 400 | 180 | 320 |
| C | 460 | 300 | 360 | 160 | 380 |
| D | 440 | 480 | 420 | 120 | 340 |
| E | 280 | 360 | 340 | 200 | 330 |

**Q.1** **What is the average number of students studying in commerce institute from all the institutes together?**

(a) 356　　　　　(b) 360　　　　　(c) 348　　　　　(d) 344

**Sol:** **(d)**

$$\text{Average of students} = \frac{\text{Sum of all institutes of students}}{\text{Total number of institutes}}$$

$$= \frac{260 + 320 + 300 + 480 + 360}{(A + B + C + D + E)}$$

$$= \frac{1720}{5}$$

Average of students = 344

**Q.2** **The total number of students studying Arts section from institutes A and B together is what percent of the total number of students studying Computer Science section from these two institutes together?**

(a) 84　　　　　(b) 85　　　　　(c) 88　　　　　(d) 95

**Sol:** **(d)**

Number of students of arts from institute A & B = (350 + 240) = 590

Number of computer science students from institute A & B = (300 + 320) = 620

$$\text{Required percentage} = \frac{590}{620} \times 100$$

$$= 96.61 \cong 95\%$$

**Q.3** **What is the respective ratio of the total number of students studying in science section from institutes C and D together to the total number of students studying in Computer Science section from these two institutes together?**

(a) 13 : 12　　　　　(b) 12 : 13　　　　　(c) 13 : 15　　　　　(d) 15 : 13

**Sol:** **(a)**

Total number of students form the section C and D of science = (360 + 420) = 780

Total number of students form the section C and D of computer = (380 + 340) = 720

Required ratio = 780 : 720

= 13 : 12

**Direction (Question 4-6):** The following table shows the total number of students appeared in an entrance examination from six schools in different years and the ratio of passed students to failed students. Answer the given questions on the basis of this table.

**Note** - Total Attended = Total Passed + Total Failed in a given year

| School | 2010 Total Attendance | 2010 Passed : Fail | 2011 Total Attendance | 2011 Passed : Fail | 2012 Total Attendance | 2012 Passed : Fail |
|--------|----------------------|--------------------|-----------------------|--------------------|-----------------------|--------------------|
| A | 646 | 11 : 8 | 754 | 7 : 6 | 672 | 3 : 5 |
| B | 847 | 4 : 7 | 845 | 8 : 5 | 952 | 9 : 8 |
| C | 810 | 8 : 7 | 792 | 7 : 4 | 637 | 4 : 3 |
| D | 876 | 7 : 5 | 828 | 11 : 7 | 988 | 7 : 12 |
| E | 870 | 3 : 2 | 726 | 7 : 4 | 725 | 8 : 5 |
| F | 986 | 17 : 12 | 867 | 12 : 5 | 924 | 8 : 13 |

**Q.4** What is the difference between the total number of failed students from school Q in the year 2010 and 3/4th of the failed students from school B in the year 2012?

(a) 165      (b) 176      (c) 175      (d) 180

**Sol:** **(c)**

The total attendance of the school in the year 2010 was 876, out of which passed

$$= 876 \times \frac{7}{12} = 511$$

The total attendance of the school in the year 2012 was 952, out of which failed

$$= 952 \times \frac{8}{17} = 448$$

**Q.5** What is the total number of failed students in schools A and D together in all the three years together?

(a) 1036      (b) 1311      (c) 2351      (d) 2446

**Sol:** **(c)**

Failed from school $A = 646 \times \frac{8}{19} + 754 \times \frac{6}{13} + 672 \times \frac{5}{8} = 1040$

Failed from school $D = 876 \times \frac{5}{12} + 828 \times \frac{7}{18} + 988 \times \frac{12}{19} = 1311$

Total failed = 1040 + 1311 = 2351

**Q.6** What is the difference between the number of passed students in the year 2011 from A, B and D together and the number of failed students in the year 2012 from A, C and F together?

(a) 167      (b) 177      (c) 217      (d) 157

**Sol:** **(a)**

Passed in year 2011 from $A = 754 \times \dfrac{7}{13} = 406$

Passed in year 2011 from $B = 754 \times \dfrac{7}{13} = 406 = 845 \times \dfrac{8}{13} = 520$

Passed in year 2011 from $D = 828 \times \dfrac{11}{18} = 506$

Total passed = 1432

Failed in 2012

$A = 672 \times \dfrac{5}{8} = 420$

$C = 637 \times \dfrac{3}{7} = 273$

$F = 924 \times \dfrac{13}{21} = 572$

Total failed = 1265

Required difference = 1432 – 1265 = 167

**Directions (Q.7-9): Study the given table carefully to answer the following questions**

| Friend | Salary (In rupees) | Incentives (In rupees) | Expenditure (In rupees) | | | | Savings (In rupees) |
|---|---|---|---|---|---|---|---|
| | | | Journey | Party | Home | Marketing | |
| Babu | 46000 | 6900 | 13035 | 5480 | 5290 | 7935 | 21160 |
| Gaurav | 48000 | 7200 | 7640 | 8500 | 6200 | 10730 | 22080 |
| Anand | 42000 | 6300 | 5796 | 3864 | 13524 | 5796 | 19320 |
| Mohit | 44000 | 6600 | 9846 | 7560 | 4554 | 8400 | 20240 |
| Kamal | 40000 | 6000 | 2300 | 15480 | 4200 | 5620 | 18400 |
| Mohan | 30000 | 5700 | 4200 | 3496 | 11664 | 6860 | 17480 |

**Q.7** **Find the total amount (in Rs.) spent by all the friends on the journey together?**
(a) 42817 Rs.        (b) 42871 Rs.        (c) 41817 Rs.        (d) 41781 Rs.

**Sol:** **(a)**

Total spent in journey = 1350 + 7640 + 5796 + 9846 + 2300 + 4200

= 42817 Rs.

**Q.8** **Find the difference between the amount spent by Gaurav on party and marketing together and the amount spent by Anand on housing.**
(a) 5656        (b) 5776        (c) 5756        (d) 5576

**Sol:** **(c)**

Total spent by Gaurav in party and marketing = 8500 + 10780 = 19280

Spent by Anand in housing = 13524

Required difference = 19280 – 13524 = 5756 Rs.

**Q.9** **The amount spent by Babu on the journey is what percent of Mohan's salary (approximately)?**

(a) 30%           (b) 38%           (c) 32%           (d) 34%

**Sol:** **(d)**

Spent by Babu in journey = 13035 Rs.

Mohan's salary = 38000 Rs.

Required percentage = $\dfrac{\text{Spent by Babu}}{\text{Mohan's salary}} \times 100 = \dfrac{13035}{38000} \times 100 = 34\%$

## Line Graph

It is a type of graph in which the variables do not change according to any rule but change suddenly. It indicates the variation of one parameter with respect to another (X-axis, Y-axis). It determines trends and rates of change over time. We can easily see the speed of data in case of line graph.

This graph can be classified into the following categories -

(i) Straight line graph

(ii) Multiple Line Graphs

**(i)** **Straight Line Graph –** It is also known as single dependent variable graph. A straight line graph is a type of graph that can be drawn with only one line.

**Example –**

**Directions to the questions: Line graph with the questions given below which show the annual food grain production from 1992 to 1997. Read the line graph and solve the given question.**



**Q.** **What is the approximate percentage reduction in production from 1993 to 1994?**

(a) 87.5%           (b) 37.5%           (c) 9.09%           (d) none of these
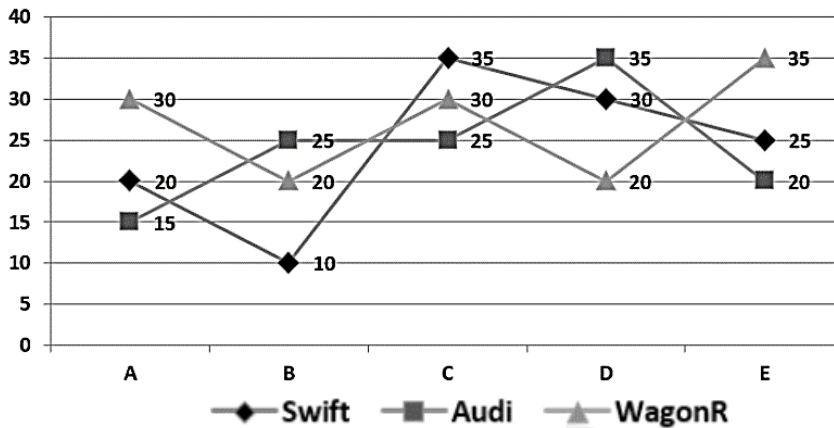
**Sol:** **(c)**

Here we look at the production values for the first 2 years. Find 1993 on the X-axis, which represents the years. Move vertically upwards in the direction of Y-axis in 1993 and the value of output in 1993 is obtained as 110. Similarly, we get the value of production in 1994 as 100.

In calculating % increase and decrease: in this case 1993, it is very important to remember that the original year is the one that is used as the reference year. First, we calculate the absolute reduction which is 110 - 100 = 10. Now we have to express 10 as a percentage of production in 1993, which is 110. So, the required answer is 100 × 10/110 = 9.09%.

**(ii)** **Multiple Line Graphs** – A multiple line graph is a line graph that is drawn with two or more lines. It is used to depict two or more variables that change over the same period.

**Example:**

**Directions: The line graph given below shows five dealers A, B, C, D and E who are selling three different types of cars (in thousands). Swift, Audi and Wagonr. Read the following line graph and solve the given question.**



**Q.** **The number of cars sold by A and B is what percent more than the cars sold by C?**

**Sol:** Cars sold by A and B = (65 + 55) thousand = 1,20,000

Cars sold by C = 90,000

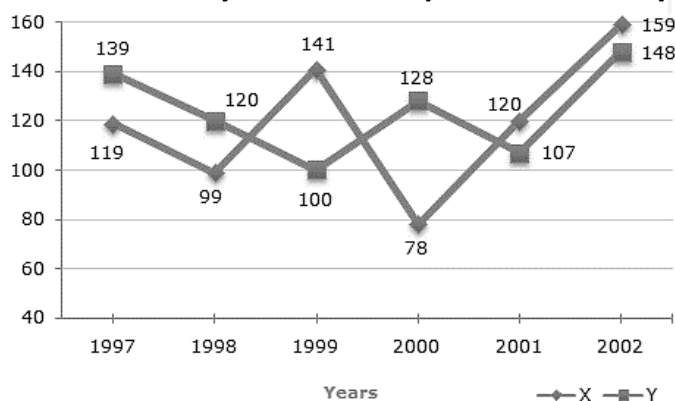Required percentage = (Cars sold by A and B – Cars sold by C) × 100/ (Cars sold by C)

$$= \frac{1,20,000 - 90,000}{90,000} \times 100 = \frac{30,000}{90,000} \times 100$$

= 33.33%

## Practice Questions with Solutions

**Direction (Q.1-3): Study the following line graph and answer the questions based on it.**

**Number of vehicles manufactured by the two companies over the years (in thousands),**



**Q.1** **What is the average number of vehicles manufactured by company X in the given period? (rounded off to the nearest integer)**

(a) 119333        (b) 113666        (c) 112778        (d) 111223

**Sol:** **(a)**

Average number of vehicles manufactured by company X

$$= \frac{1}{6} \times (119000 + 99000 + 141000 + 78000 + 120000 + 159000)$$

= 119333

**Q.2** In which of the following year the difference between the production of company X and Y in the given years was maximum ?

(a) 1997        (b) 1998        (c) 1999        (d) 2000

**Sol:** **(d)**

The difference between the production of company X and Y in different years is:

For 1997 (139000 – 119000) = 20000

For 1998 (120000 – 99000) = 21000

For 1999 (141000 – 100000) = 41000

For 2000 (128000 – 78000) = 50000

For 2001 (120000 – 107000) = 13000

For 2002 (159000 – 148000) = 11000

So, the maximum difference was in the year 2000.

**Q. 3** The production of company Y in the year 2000 was approximately what percent of the production of company X in the same year?

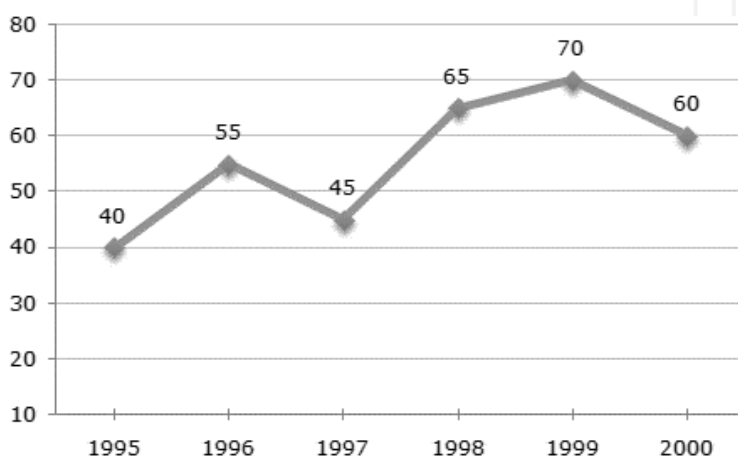(a) 173        (b) 164        (c) 132        (d) 97

**Sol:** **(b)**

Production of company Y in the year 2000 = 128000

Production of company X in the year 2000 = 78000

Required percentage $= \dfrac{128000}{78000} \times 100$

= 164%

**Instructions (Q.4-6):** The following line graph shows the annual percentage profit earned by the company during the period 1995 - 2000.



**Q.4** If the expenditure in 1996 and 1999 are same then what is the approximate ratio of income in 1996 and 1999 respectively?

(a) 1:1        (b) 2:3        (c) 13:14        (d) 9:10

**Sol:** **(d)**

Let the expenditure in 1996 = x

Also, suppose the incomes in 1996 and 1999 are respectively $I_1$ and $I_2$.

Then, for the year 1996,

$$55 = \frac{I_1 - x}{x} \times 100 \Rightarrow \frac{55}{100} = \frac{I_1}{x} - 1 \Rightarrow I_1 = \frac{155x}{100}$$ ....(i)

$$70 = \frac{I_2 - x}{x} \times 100 \Rightarrow \frac{70}{100} = \frac{I_2}{x} - 1 \Rightarrow I_2 = \frac{170x}{100}$$ ....(ii)

from (i) and (ii),

$$\frac{I_1}{I_2} = \frac{\left(\dfrac{155x}{100}\right)}{\left(\dfrac{170x}{100}\right)} = \frac{155}{170} \approx \frac{0.91}{1} \approx 9 : 10$$

**Q.5** **If the income in the year 1998 are 264 crore Rupees. How much did it cost in 1998?**

(a) 104 crores Rs.    (b) 145 crore Rs.    (c) 160 crores Rs.    (d) 185 crore Rs.

**Sol:** **(c)**

Suppose the expenditure of 1998 is Rs. x

Then, $65 = \dfrac{264 - x}{x} \times 100$

$$\frac{65}{100} = \frac{264}{x} - 1$$

$$x = \frac{264 \times 100}{165} = 160$$

Hence expenditure in 1998 = 160 crore Rs.

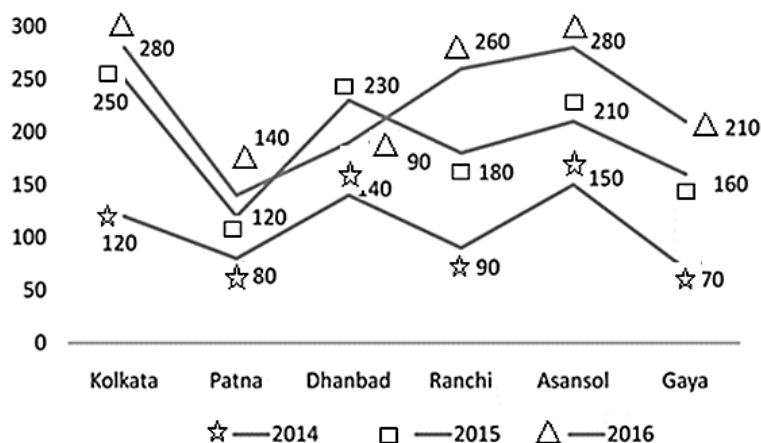**Q.6** **If the profit in 1999 is 4 crore Rs. If so, what was the profit in the year 2000?**

(a) 4.2 crores Rs.    (b) 6.6 crore Rs.    (c) 6.8 crore Rs.    (d) cannot be determined

**Sol:** **(d)**

The line graph gives us the information of percentage profit only. To find profit in the year 2000, we should have the data of income or expenditure in the year 2000.

Hence profit for 2000 cannot be determined.

**Instructions (Q.7-9): The given line graph data interpretation chart shows the sales (in thousands) of shoes during three consecutive years 2014, 2015 and 2016 from six stores in six different cities Kolkata, Patna, Dhanbad, Ranchi, Asansol and Gaya.**

**Q.7**   **What is the ratio of total sales of Patna store for three years to that of Asansol store for three years?**

(a) 33: 17          (b) 17: 33          (c) 32: 17          (d) 17 : 32

**Sol:**   **(d)**

Number of campus shoes sold at Patna store in 2014 = 80

Number of campus shoes sold at Patna store in 2015 = 120

Number of campus shoes sold at Patna store in 2015 = 140

Total number of campus shoes sold at Patna store in these three years = 80 + 120 + 140 = 340

Number of campus shoe sales at Asansol stores in 2014 = 150

Number of campus shoe sales at Asansol stores in 2015 = 210

Number of sales of campus shoes at Asansol store in 2015 = 280

Total number of campus shoes sold at Asansol store in these three years = 150 + 210 + 280 = 640

So, required ratio

$= \dfrac{340}{640} = 17 : 32$

**Q.8**   **What percent of average sales of campus shoes at Kolkata store, Patna store and Dhanbad store in 2014 is what is the average sale of campus shoes at Ranchi store, Asansol store and Gaya store in 2015?**

(a) 61.81%          (b) 62.23%          (c) 62.81%          (d) 63.43%

**Sol:**   **(a)**

Number of campus shoes sold at Kolkata store in 2014 = 120

At Patna store in 2014campus Number of shoes sold = 80

Number of sales of campus shoes at Dhanbad store in 2014 = 140

At Kolkata Store, Patna Store and Dhanbad Store in 2014campus Total number of shoe sales

= (120 + 80 + 140) = 340

At Kolkata Store, Patna Store and Dhanbad Store in 2014campus Average sales of shoes

of $= \dfrac{340}{3} = 113 : 33$

Number of sales of campus shoes at Ranchi store in 2015 = 180

Number of campus shoes sold at Asansol store in 2015 = 210

Number of campus shoes sold at Gaya store in 2015 = 160

Total number of shoes sold at Ranchi Stores, Asansol Stores and Gaya Stores campus in 2015

= (180 + 210 + 160) = 550

Average sales of campus shoes at Ranchi Stores, Asansol Stores and Gaya Stores in the year 2015

$$= \frac{550}{3} = 183.33$$

Hence, the required percentage

$$= \frac{113.33}{183.33} \times 100 = 61.81\%$$

**Q.9** **What is the ratio of average sales of campus shoes of all the stores for the year 2014 to the average sales of campus shoes of all the stores for the year 2015?**

(a) 23 : 14      (b) 14 : 23      (c) 13 : 23      (d) 23 : 13

**Sol:** **(c)**

Number of campus shoes sold at Kolkata store in 2014 = 120

Number of campus shoes sold at Patna store in 2014 = 80

Number of sales of campus shoes at Dhanbad store in 2014 = 140

Number of sales of campus shoes at Ranchi store in 2014 = 90

Number of campus shoes sold at Asansol store in 2014 = 150

Number of campus shoes sold at Gaya store in 2014 = 70

Average sales of Campus Shoes across all stores for the year 2014 –

$$= \frac{120 + 80 + 140 + 90 + 150 + 70}{6} = \frac{650}{6}$$

Number of campus shoes sold at Kolkata store in 2015 = 250

Number of campus shoes sold at Patna store in 2015 = 120

Number of sales of campus shoes at Dhanbad store in 2015 = 230

Number of campus shoes sold at Ranchi store in 2015 = 180

Number of campus shoes sold at Asansol store in 2015 = 210

Number of campus shoes sold at Gaya store in 2015 = 160

Average sales of campus shoes of all the stores for the year 2015 =

$$= \frac{250 + 120 + 230 + 180 + 210 + 160}{6} = \frac{1150}{6}$$

Required ratio $= \dfrac{\dfrac{650}{6}}{\dfrac{1150}{6}} = 13 : 23$

## Bar Graph

Bar diagrams are the most commonly used way to represent statistics among graphs. It is drawing the form of rectangular bars of equal width with equal spaces between them where the length of the bars is proportional to the values they represent. It can be drawn horizontally or vertically.
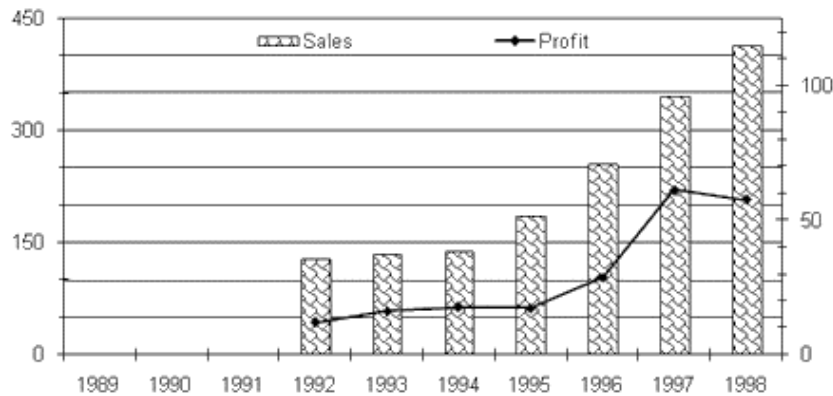
Effective representations of bar graphs are mainly classified into the following categories:

(i) Simple bar diagram

(ii) Multiple bar diagram

**(i)** **Simple Bar Diagram –** It represents only one variable with the same width but different heights in proportion to the values of the variables.

**Directions: Look at the following graph of sales and profit figures of ABC Ltd. and answer the following question.**



**Q.** **In which year was the profit on sales (Profit/Sales) highest?**

(a) 1995                (b) 1996                (c) 1997                (d) 1998

**Sol:** **(c)**

Return on Sales in 1995 = 20/180 or 0.111

Return on Sales in 1996 = 30/260 or 0.115
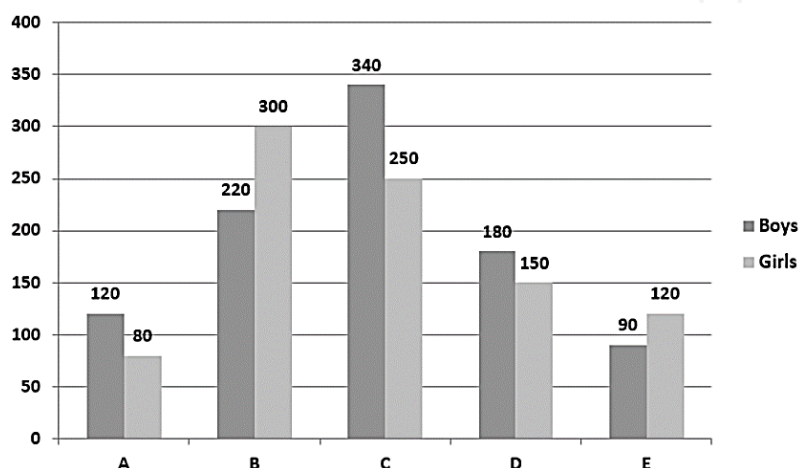
Return on Sales in 1997 = 60/345 or 0.173

Return on Sales in 1998 = 55/420 or 0.130

The highest return comes in 1997.

**(ii)** **Multiple Bar Diagram –** In this graph, two or more bar graphs are drawn with each other in the same graph, representing either different multiple variables or different components of a single variable.

**Direction: Study the following bar graph carefully and answer the question given below.**

**The bar graph given below shows the number of boys and the number of girls studying in five different colleges.**



**Q.** **What is the ratio of the sum of boys studying in colleges A, B and C together to the number of girls studying in colleges B, C and D together?**
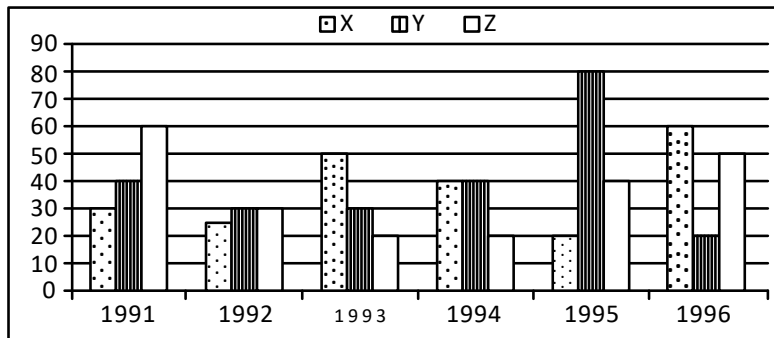
**Sol:** Number of boys studying in colleges A, B and C = 120 + 220 + 340 = 680

Number of girls studying in colleges B, C and D = 300 + 250 + 150 = 700

Required ratio = 680 : 700 = 34 : 35

## Practice Questions with solutions

**Direction (Q.1-3):** The following diagram shows the profit percentage of other companies that were incorporated in the given six years.



**Q.1** If the income of X in the year 1992 is equal to the expenditure of Y in the year 1994, then what will be the profit of X in the year 1992, if the income of Y in the year 1994 is Rs 7 lakh?

(a) 2,00,000        (b) 3,00,000        (c) 1,00,000        (d) 1,54,000

**Sol:** **(c)**

According to question, Income of X in the year 1992 = Expenditure of Y in the year 1994

$$= 700000 \times \frac{100}{140} = 500000 \text{ Rs.}$$

Expenditure of X in 1992 $= 500000 \times \dfrac{100}{125} = 400000$ Rs.

Thus, profit = 500000 − 400000 = 100000 Rs.

**Q.2** In the year 1995, the ratio of expenditure of x, y and z is 2:3:5, then what will be the ratio of their profit?

(a) 1 : 6        (b) 2 : 5 : 6        (c) 1 : 3 : 2        (d) 2 : 3 : 2

(e) 1 : 6 : 8

**Sol:** **(a)**

According to question –

The ratio of expenditure of x, y and z is 2:3:5

Let, the expenditure of x = 200

Income of

$$X = 200\left(\frac{120}{100}\right) = 240$$

Profit = 40

The expenditure of Y= 300

Income of $Y = 300\left(\dfrac{180}{100}\right) = 540$

Profit = 240

The expenditure of Z = 500

Income of $Z = 500\left(\dfrac{140}{100}\right) = 700$

Profit = 200

Profit ratio = 40 : 240 : 200 = 1 : 6 : 5

**Q.3** In which of the following years, the average profit percentage of all three together is minimum?

(a) 1991        (b) 1992        (c) 1993        (d) 1994

**Sol:** **(b)**

Clearly, from the graph –

Average of 30 + 40 + 60 in the year

$1991 = \dfrac{130}{3}$

Average of 25 + 30 + 30 in the year of 1992 $= \dfrac{85}{3}$

Average of 50 + 30 + 20 in the year 1993 $= \dfrac{100}{3}$

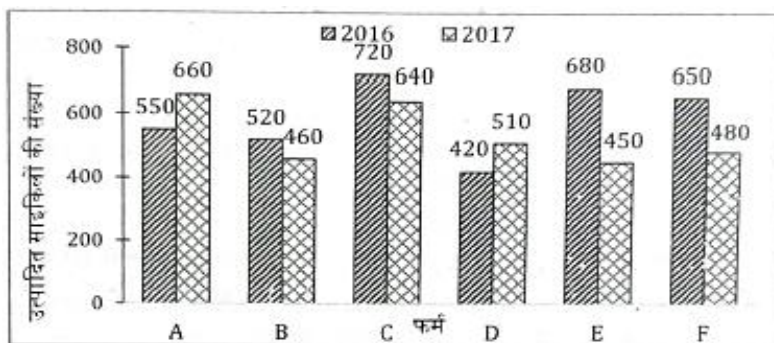Average of 40 + 40 + 20 in the year 1994 $= \dfrac{100}{3}$

Average of 20 + 80 + 40 in the year 1995 $= \dfrac{140}{3}$

Average of 60 + 20 + 50 in the year 1996 $= \dfrac{130}{3}$

Hence, the average of profit of all three in the year 1992 is minimum.

**Direction (Q.4-6):** The bar diagram given below shows the production of cycles in two consecutive years 2016 and 2017 by six firms A, B, C, D, E & F.



**Q.4** If in the year 2018 the production of cycles of firm C is increased by $37\dfrac{1}{2}\%$ as compared to the previous year and in the year 2018 there is increase of $17\dfrac{11}{17}\%$ in the production of the cycle of firm D as compared to the previous year, then what is the production of firms C and D together in the year 2018?

(a) 1140        (b) 1320        (c) 1480        (d) 1460

**Sol:** **(c)**

Production of firm C in the year 2018 $= 640 \times \dfrac{137.5}{100} = 880$

Production of firm D in the year 2018 $= 510 + 510 \times \dfrac{300}{17} \times \dfrac{1}{100} = 510 + 90 = 600$

Required sum = 880 + 600 = 1480

**Q.5** If $14\dfrac{13}{11}\%$ & $36\dfrac{4}{11}\%$ of the total production of the firm A in the year 2016 and 2017 respectively is unsold and the ratio of sold and unsold cycles of firm C for both the same years is 109:27, then total unsold cycles from both firms together is what percent of total bicycles sold by both firms together is? (Approx)

(a) $31\dfrac{6}{49}\%$      (b) $35\dfrac{6}{49}\%$      (c) $21\dfrac{6}{49}\%$      (d) 33%

**Sol:** **(a)**

Sold bicycle by firm A in the year 2016 $= 550 \times \dfrac{200}{11} \times \dfrac{1}{100} = 100$

Unsold bicycle by firm A in the year 2017 $= 660 \times \dfrac{400}{11} \times \dfrac{1}{100} = 240$

Total production by the firm C in both years = 720 + 640 = 1360

The number of unsold bicycle of firm C in both years $= \dfrac{1360}{(109 + 27)} \times 27 = 270$

Required value $= \dfrac{(100 + 240 + 270)}{(550 - 100) + (660 - 240) + (1360 - 270)} \times 100$

$= \dfrac{610}{1960} \times 100 = 31\dfrac{6}{49}\%$

**Q.6** The total production cost of firm D in the year 2016 is Rs. 787500 and the cost of transport per cycle is Rs. 125. With respect to the year 2016, the total cost price per cycle increases by $21\dfrac{7}{8}\%$ in the year 2017 then what was the cost price per cycle (in Rs.) of firm D in the year 2017?
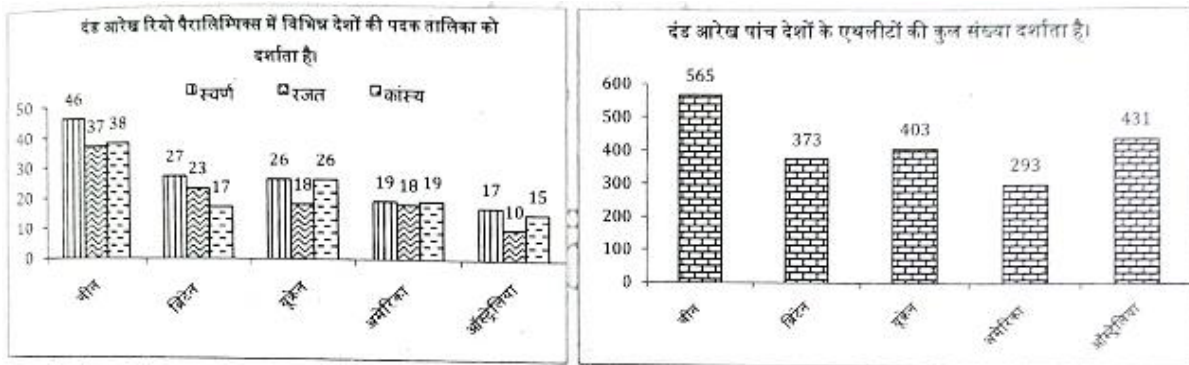
(a) 2437.5      (b) 2337.5      (c) 2415.5      (d) 2435.5

**Sol:** **(a)**

Total production cost per cycle of firm D in the year 2016 $= \dfrac{787500}{420} = 1875$ Rs.

Per cycle cost in the year 2016 = 1875 + 125 = 2000

Per cycle cost of firm D in the year 2017 $= 2000 + 2000 \times \dfrac{175}{8} \times \dfrac{1}{100}$

$= 2000 + 437.5 = 2437.5$ Rs.

**Direction (7-9): Study the bar diagram carefully and answer the questions given below:**



**Q.7** The total number of all medal winners other than China is what percent of the total number of athletes from those countries?

(a) $15\dfrac{2}{3}\%$  (b) $16\dfrac{2}{3}\%$  (c) $17\dfrac{2}{3}\%$  (d) $18\dfrac{2}{3}\%$

**Sol:** **(a)**

Total medal count of medal winning athletes excluding China

= 67 + 70 + 56 + 42 = 235

Total number of athletes participating excluding China = 373 + 403 + 293 + 431 = 1500

Required percentage $=\dfrac{235}{1500}\times 100 = 15\dfrac{2}{3}\%$

**Q.8** If the total number of medals won by USA in the last Paralympics was 25% less than that of Rio Paralympics, then what was the total number of medals won by USA in the last Paralympics?

(a) 40  (b) 56  (c) 50  (d) 42  (e) 48

**Sol:** **(d)**

Total number of medals won by the US in this Paralympics = 19 + 18 + 19 =56

Medals of the previous year $=56\times\dfrac{75}{100}=42$

**Q.9** If each gold medalist from America gets $180,000. Each silver medalist gets $90000 and each bronze medalist gets $45000 then what is the sum of the total amount received by the US athletes?

(a) $6000000  (b) $5695000  (c) $5800000  (d) $5895000

**Sol:** **(d)**

In America –

Money won by Gold medalist = $180000

Money won by Silver medalist = $90000

Money won by Bronze Medalist = $45000

Total money won by the medalist = 180000 × 19 + 90000 × 18 + 45000 × 19

= 3420000 + 1620000 + 855000 = 5895000

## Pie Chart

It is a circular representation of data where the data is represented as part of a circle. The total volume is distributed at a total angle of 360°. The circle represents the total value (360° or 100%) and the different parts or areas represent a fixed proportion (degree or percentage value) of the total. The value of each component is proportional to the circular area (or central angle) that the component represents.
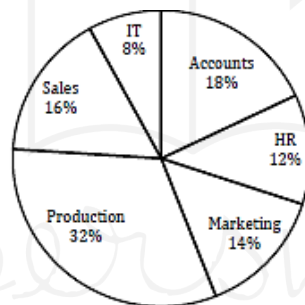
**Note -** The sector of the circle is mainly divided into two types -

1.      **In Degrees** - In this representation, the given data is distributed over a total angle of 360 degrees. Each part forms a certain angle called the central angle.

Central angle of sector = [(value of area) / (total value)] × 360°

2.      **In Percentage -** In this representation, the given data is distributed over 100% of the total. For the solution, we take base 100.

Percentage value of sector = [(Value of area) / (Total value)] × 100

**Directions: Study the following pie chart carefully and answer the questions given below.**

**Percentage distribution of employees in different departments of a company,**

Total number of employees = 8000



**Q.**      **What is the total number of employees in the Accounts and Marketing departments together?**

**Sol:**      Number of employees in Account and Marketing together = (18% + 14%) of total employees

= 32% of 8000 = 2560

## Practice Questions with Solutions

**Instructions (Q.1-3) – The following pie-graph shows the investments made by five friends in a business for one year. Answer the questions based on the information given in it.**

Total investment = 60,000