39. LINE-GRAPHS

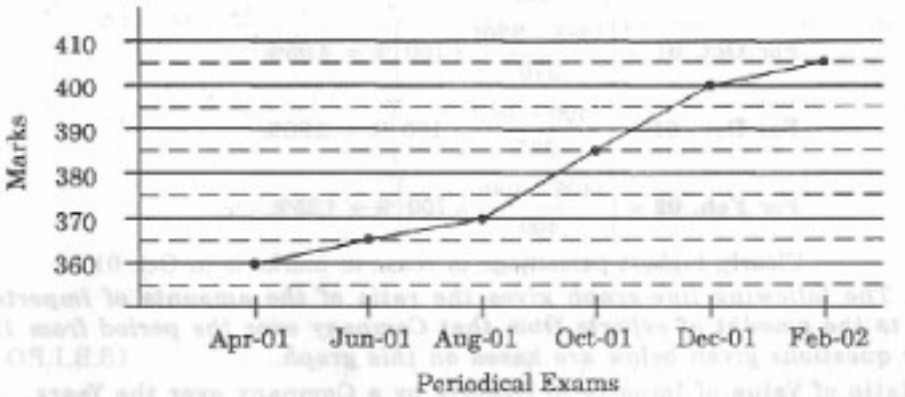
This section comprises of questions in which the data collected in a particular discipline are represented by specific points joined together by straight lines. The points are plotted on a two-dimensional plane taking one parameter on the horizontal axis and the other on the vertical axis. The candidate is required to analyse the given information and thereafter answer the given questions on the basis of the analysis of data.

SOLVED EXAMPLES

Ex. 1. ***In a school the periodical examinations are held every second month. In a session during Apr. 2001 – Mar. 2002, a student of Class IX appeared for each of the periodical exams. The aggregate marks obtained by him in each periodical exam are represented in the line-graph given below. Study the graph and answer the questions based on it.*** (S.B.I.P.O. 2003)

MARKS OBTAINED BY A STUDENT IN SIX PERIODICAL EXAMS HELD IN EVERY TWO MONTHS DURING THE YEAR IN THE SESSION 2001-02

Maximum Total Marks in each Periodical Exam = 500



1. The total number of marks obtained in Feb. 02 is what percent of the total marks obtained in Apr. 01 ?
   (a) 110% (b) 112.5% (c) 115% (d) 116.5% (e) 117.5%
2. What are the average marks obtained by the student in all the periodical exams during the session ?
   (a) 373 (b) 379 (c) 381 (d) 385 (e) 389
3. What is the percentage of marks obtained by the student in the periodical exams of Aug. 01 and Oct. 01 taken together ?
   (a) 73.25% (b) 75.5% (c) 77% (d) 78.75% (e) 79.5%
4. In which periodical exams there is a fall in percentage of marks as compared to the previous periodical exams ?
   (a) None (b) Jun. 01 (c) Oct. 01 (e) Feb. 02 (e) None of these
5. In which periodical exams did the student obtain the highest percentage increase in marks over the previous periodical exams ?
   (a) Jun. 01 (b) Aug. 01 (c) Oct. 01 (d) Dec. 01 (e) Feb. 02

Sol. Here it is clear from the graph that the student obtained 360, 365, 370, 385, 400 and 405 marks in periodical exams held in Apr. 01, Jun. 01, Aug. 01, Oct. 01, Dec. 01 and Feb. 02 respectively.

1. (*b*) : Required percentage $= \left(\frac{405}{360} \times 100\right)\% = 112.5\%$.

2. (*c*) : Average marks obtained in all the periodical exams

$$= \frac{1}{6} \times [360 + 365 + 370 + 385 + 400 + 405] = 380.83 \approx 381.$$

3. (*b*) : Required percentage $= \left[\frac{(370 + 385)}{(500 + 500)} \times 100\right]\% = \left(\frac{755}{1000} \times 100\right)\% = 75.5\%$.

4. (*a*) : As is clear from the graph, the total marks obtained in periodical exams, go on increasing. Since, the maximum marks for all the periodical exams are same, it implies that the percentage of marks also goes on increasing. Thus, in none of the periodical exams, there is a fall in percentage of marks compared to the previous exam.

5. (*c*) : Percentage increase in marks in various periodical exams compared to the previous exams are :

For **Jun. 01** $= \left[\frac{(365 - 360)}{360} \times 100\right]\% = 1.39\%$

For **Aug. 01** $= \left[\frac{(370 - 365)}{365} \times 100\right]\% = 1.37\%$

For **Oct. 01** $= \left[\frac{(385 - 370)}{370} \times 100\right]\% = 4.05\%$

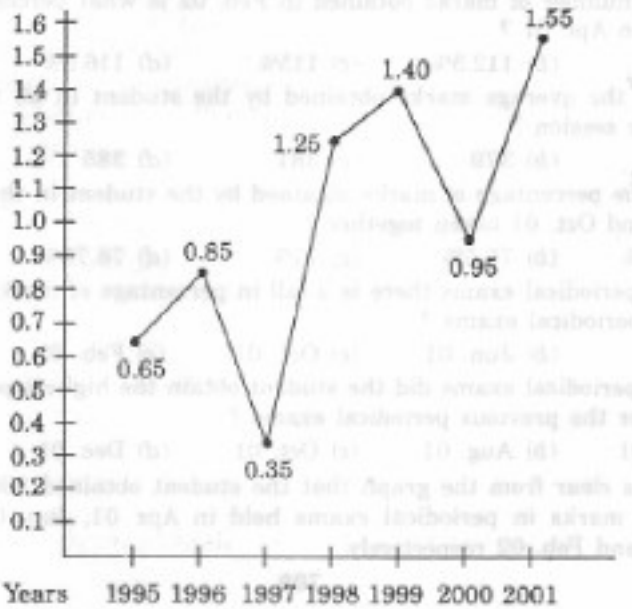
For **Dec. 01** $= \left[\frac{(400 - 385)}{385} \times 100\right]\% = 3.90\%$

For **Feb. 02** $= \left[\frac{(405 - 400)}{400} \times 100\right]\% = 1.25\%$.

Clearly, highest percentage increase in marks is in Oct. 01.

Ex. 2. ***The following line-graph gives the ratio of the amounts of imports by a Company to the amount of exports from that Company over the period from 1995 to 2001. The questions given below are based on this graph.*** (S.B.I.P.O. 2001)

Ratio of Value of Imports to Exports by a Company over the Years



1. In how many of the given years were the exports more than the imports ?
(a) 1 (b) 2 (c) 3 (d) 4 (e) None of these

2. The imports were minimum proportionate to the exports of the Company in the year :
(a) 1995 (b) 1996 (c) 1997 (d) 2000 (e) 2001

3. If the imports of the Company in 1996 was Rs. 272 crores, the exports from the Company in 1996 was :
(a) Rs. 370 crores (b) Rs. 320 crores (c) Rs. 280 crores
(d) Rs. 275 crores (e) Rs. 264 crores

4. What was the percentage increase in imports from 1997 to 1998 ?
(a) 72 (b) 56 (c) 28 (d) None of these (e) Data inadequate

5. If the imports in 1998 was Rs. 250 crores and the total exports in the years 1998 and 1999 together was Rs. 500 crores, then the imports in 1999 was :
(a) Rs. 250 crores (b) Rs. 300 crores (c) Rs. 357 crores
(d) Rs. 420 crores (e) None of these

Sol. 1. (d) : The exports are more than the imports implies that the ratio of value of imports to exports is less than 1.

Now, this ratio is less than 1 in the years 1995, 1996, 1997 and 2000.

Thus, there are four such years.

2. (c) : The imports are minimum proportionate to the exports implies that the ratio of the value of imports to exports has the minimum value.

Now, this ratio has a minimum value of 0.35 in 1997, *i.e.*, the imports are minimum proportionate to the exports in 1997.

3. (b) : Ratio of imports to exports in the year 1996 = 0.85.

Let the exports in 1996 = Rs. x crores.

Then, $\frac{272}{x} = 0.85 \Rightarrow x = \frac{272}{0.85} = 320.$

$\therefore$ Exports in 1996 = Rs. 320 crores.

4. (e) : The graph gives only the ratio of imports to exports for different years. To find the percentage increase in imports from 1997 to 1998, we require more details such as the value of imports or exports during these years. Hence, the data is inadequate to answer this question.

5. (d) : The ratio of imports to exports for the years 1998 and 1999 are 1.25 and 1.40 respectively.

Let the exports in the year 1998 = Rs. x crores.

Then, the exports in the year 1999 = Rs. $(500 - x)$ crores.

$\therefore \quad 1.25 = \frac{250}{x} \Rightarrow x = \frac{250}{1.25} = 200$ [Using ratio for 1998]

Thus, the exports in the year 1999 = Rs. (500 – 200) crores = Rs. 300 crores.

Let the imports in the year 1999 = Rs. y crores.

Then, $1.40 = \frac{y}{300} \Rightarrow y = (300 \times 1.40) = 420.$

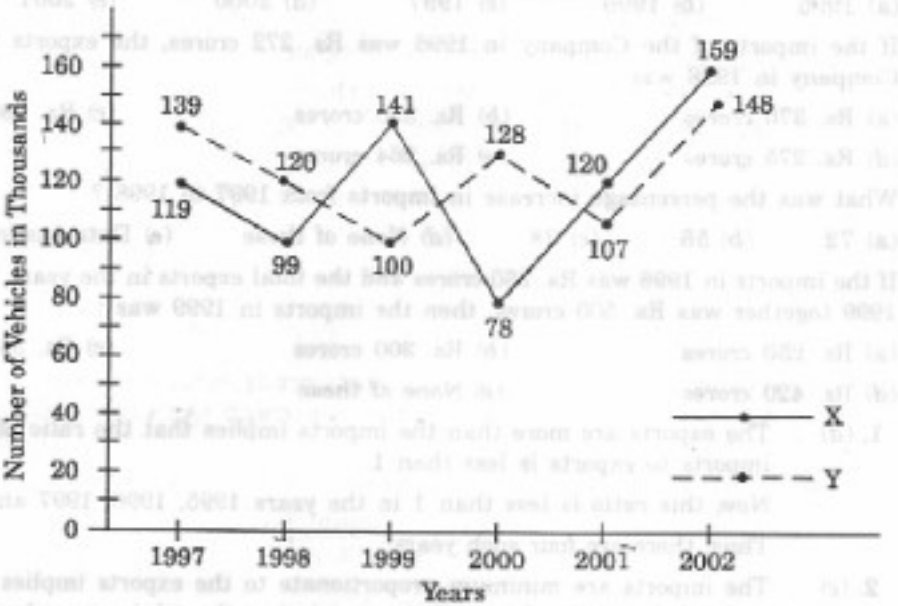
$\therefore$ Imports in the year 1999 = Rs. 420 crores.

Ex. 3. ***Study the following line-graph and answer the questions based on it.***

(R.B.I. 2003)

Number of Vehicles Manufactured by Two Companies over the Years

(Number in Thousands)



1. What is the difference between the total productions of the two Companies in the given years ?

   (*a*) 19000 (*b*) 22000 (*c*) 26000 (*d*) 28000 (*e*) 29000

2. What is the difference between the numbers of vehicles manufactured by Company Y in 2000 and 2001 ?

   (*a*) 50000 (*b*) 42000 (*c*) 33000 (*d*) 21000 (*e*) 13000

3. What is the average number of vehicles manufactured by Company X over the given period ? (rounded off to the nearest integer)

   (*a*) 119333 (*b*) 113666 (*c*) 112778 (*d*) 111223 (*e*) None of these

4. In which of the following years, the difference between the productions of Companies X and Y was the maximum among the given years ?

   (*a*) 1997 (*b*) 1998 (*c*) 1999 (*d*) 2000 (*e*) 2001

5. The production of Company Y in 2000 was approximately what percent of the production of Company X in the same year ?

   (*a*) 173 (*b*) 164 (*c*) 132 (*d*) 97 (*e*) 61

Sol. From the line-graph it is clear that the productions of Company X in the years 1997, 1998, 1999, 2000, 2001 and 2002 are 119000, 99000, 141000, 78000, 120000 and 159000 respectively and those of Company Y are 139000, 120000, 100000, 128000, 107000 and 148000 respectively.

1. (*c*) : Total production of Company X from 1997 to 2002

   = 119000 + 99000 + 141000 + 78000 + 120000 + 159000 = 716000.

   and total production of Company Y from 1997 to 2002

   = 139000 + 120000 + 100000 + 128000 + 107000 + 148000 = 742000.

   Difference = 742000 − 716000 = 26000.

2. (*d*) : Required difference = 128000 − 107000 = 21000.

3. (*a*) : Average number of vehicles manufactured by Company X

$$= \frac{1}{6} \times (119000 + 99000 + 141000 + 78000 + 120000 + 159000) = 119333.$$

4. (*d*) : The difference between the productions of Companies X and Y in various years are :

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.

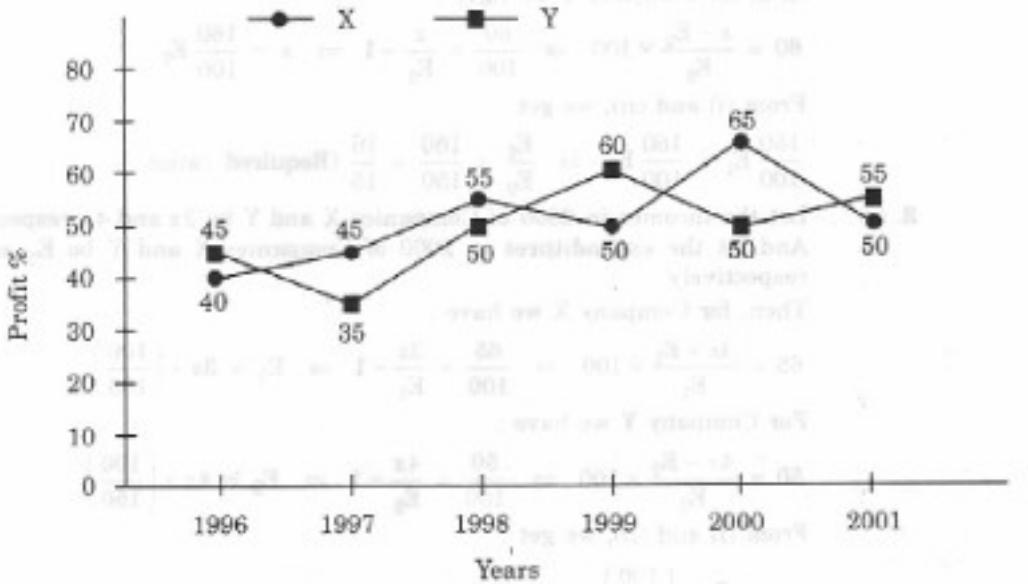
Clearly, maximum difference was in 2000.

5. (*b*) : Required percentage $= \left(\frac{128000}{78000} \times 100\right)\% \approx 164\%$.

Ex. 4. ***The following line-graph gives the percent profit earned by two Companies X and Y during the period 1996 – 2001. Study the line-graph and answer the questions that are based on it.*** (NABARD, 2002)

Percentage Profit Earned by Two Companies X and Y over the Given Years

$$\%\text{Profit / Loss} = \frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}} \times 100$$



1. If the expenditure of Company Y in 1997 was Rs. 220 crores, what was its income in 1997 ?
   (*a*) Rs. 312 crores (*b*) Rs. 297 crores (*c*) Rs. 283 crores
   (*d*) Rs. 275 crores (*e*) Rs. 261 crores
2. If the incomes of the two Companies were equal in 1999, then what was the ratio of expenditure of Company X to that of Company Y in 1999 ?
   (*a*) 6 : 5 (*b*) 5 : 6 (*c*) 11 : 6 (*d*) 16 : 15 (*e*) 15 : 16
3. The incomes of the Companies X and Y in 2000 were in the ratio of 3 : 4 respectively. What was the respective ratio of their expenditures in 2000 ?
   (*a*) 7 : 22 (*b*) 14 : 19 (*c*) 15 : 22 (*d*) 27 : 35 (*e*) 33 : 40

4. If the expenditures of Companies X and Y in 1996 were equal and the total income of the two Companies in 1996 was Rs. 342 crores, what was the total profit of the two Companies together in 1996 ? (Profit = Income – Expenditure)

(*a*) Rs. 240 crores (*b*) Rs. 171 crores (*c*) Rs. 120 crores
(*d*) Rs. 102 crores (*e*) None of these

5. The expenditure of Company X in the year 1998 was Rs. 200 crores and the income of Company X in 1998 was the same as its expenditure in 2001. The income of Company X in 2001 was :

(*a*) Rs. 465 crores (*b*) Rs. 385 crores (*c*) Rs. 335 crores
(*d*) Rs. 295 crores (*e*) Rs. 255 crores

Sol. 1. (*b*) : Profit percent of Company Y in 1997 = 35.

Let the income of Company Y in 1997 be Rs. x crores.

Then, $35 = \frac{x-220}{220} \times 100 \Rightarrow x = 297.$

$\therefore$ Income of Company Y in 1997 = Rs. 297 crores.

2. (*d*) : Let the incomes of each of the two Companies X and Y in 1999 be Rs. x. And let the expenditures of Companies X and Y in 1999 be E_1 and E_2 respectively.

Then, for Company X we have :

$$50 = \frac{x-E_1}{E_1} \times 100 \Rightarrow \frac{50}{100} = \frac{x}{E_1} - 1 \Rightarrow x = \frac{150}{100} E_1 \quad ...(i)$$

Also, for Company Y we have :

$$60 = \frac{x-E_2}{E_2} \times 100 \Rightarrow \frac{60}{100} = \frac{x}{E_2} - 1 \Rightarrow x = \frac{160}{100} E_2 \quad ...(ii)$$

From (*i*) and (*ii*), we get :

$$\frac{150}{100} E_1 = \frac{160}{100} E_2 \Rightarrow \frac{E_1}{E_2} = \frac{160}{150} = \frac{16}{15} \text{ (Required ratio).}$$

3. (*c*) : Let the incomes in 2000 of Companies X and Y be $3x$ and $4x$ respectively. And let the expenditures in 2000 of Companies X and Y be E_1 and E_2 respectively.

Then, for Company X we have :

$$65 = \frac{3x-E_1}{E_1} \times 100 \Rightarrow \frac{65}{100} = \frac{3x}{E_1} - 1 \Rightarrow E_1 = 3x \times \left(\frac{100}{165}\right) \quad ...(i)$$

For Company Y we have :

$$50 = \frac{4x-E_2}{E_2} \times 100 \Rightarrow \frac{50}{100} = \frac{4x}{E_2} - 1 \Rightarrow E_2 = 4x \times \left(\frac{100}{150}\right) \quad ...(ii)$$

From (*i*) and (*ii*), we get :

$$\frac{E_1}{E_2} = \frac{3x \times \left(\frac{100}{165}\right)}{4x \times \left(\frac{100}{150}\right)} = \frac{3 \times 150}{4 \times 165} = \frac{15}{22} \text{ (Required ratio).}$$

4. (*d*) : Let the expenditures of each of the Companies X and Y in 1996 be Rs. x crores. And let the income of Company X in 1996 be Rs. z crores so that the income of Company Y in 1996 = Rs. $(342 - z)$ crores.

Then, for Company X we have :

$$40 = \frac{z-x}{x} \times 100 \Rightarrow \frac{40}{100} = \frac{z}{x} - 1 \Rightarrow x = \frac{100z}{140} \quad ...(i)$$

Also, for Company Y we have :

$$45 = \frac{(342 - z) - x}{x} \times 100 \Rightarrow \frac{45}{100} = \frac{(342 - z)}{x} - 1 \Rightarrow x = \frac{(342 - z) \times 100}{145} \quad ...(ii)$$

From (*i*) and (*ii*), we get :

$$\frac{100z}{140} = \frac{(342 - z) \times 100}{145} \Rightarrow z = 168.$$

Substituting $z = 168$ in (*i*), we get : $x = 120$.

∴ Total expenditure of Companies X and Y in 1996 = $2x$ = Rs. 240 crores.

Total income of Companies X and Y in 1996 = Rs. 342 crores.

∴ Total profit = Rs. (342 – 240) crores = Rs. 102 crores.

5. (*a*) : Let the income of Company X in 1998 be Rs. x crores.

Then, $55 = \frac{x - 200}{200} \times 100 \Rightarrow x = 310$.

∴ Expenditure of Company X in 2001

= Income of Company X in 1998 = Rs. 310 crores.

Let the income of Company X in 2001 be Rs. z crores.

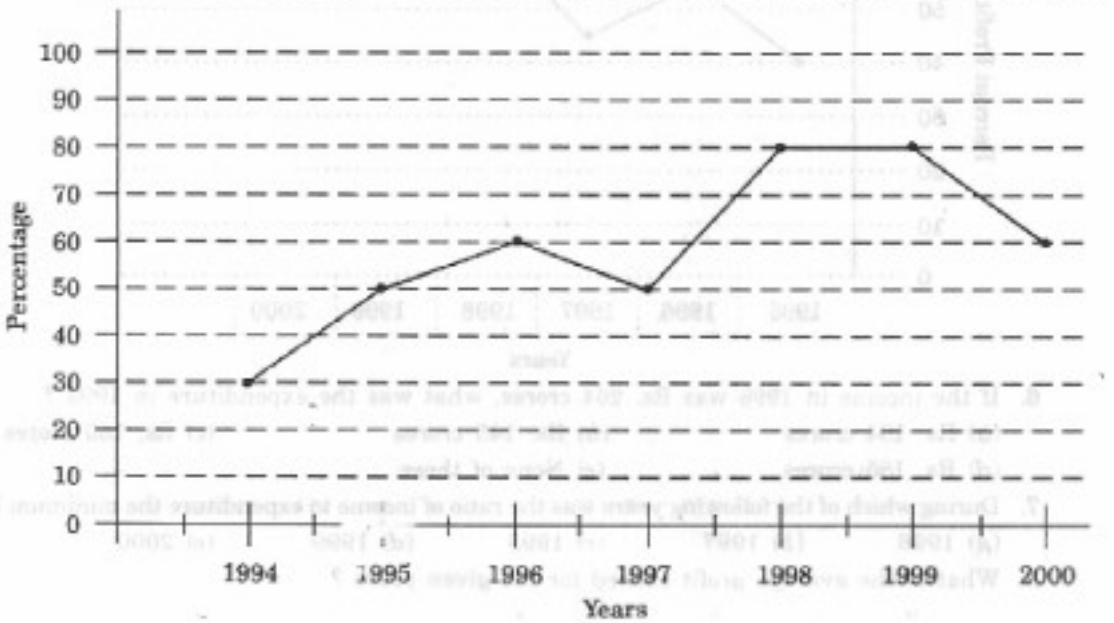
Then, $50 = \frac{z - 310}{310} \times 100 \Rightarrow z = 465$.

∴ Income of Company X in 2001 = Rs. 465 crores.

EXERCISE 39

Directions (Questions 1 to 5) : ***The following line-graph gives the percentage of the number of candidates who qualified an examination out of the total number of candidates who appeared for the examination over a period of seven years from 1994 to 2000. Study the graph and answer the questions based on it.*** **(Bank P.O. 2000)**

Percentage of Candidates Qualified to Appeared in an Examination Over the Years

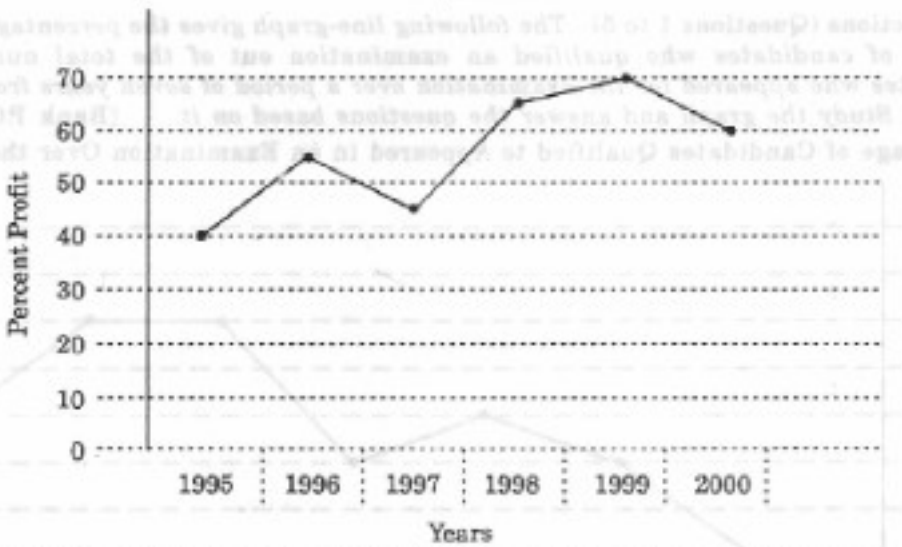


1. The difference between the percentages of candidates qualified to appeared was maximum in which of the following pairs of years ?
   (*a*) 1994 and 1995 (*b*) 1997 and 1998 (*c*) 1998 and 1999
   (*d*) 1999 and 2000 (*e*) 1994 and 1997
2. In which pair of years was the number of candidates qualified, the same ?
   (*a*) 1995 and 1997 (*b*) 1995 and 2000 (*c*) 1998 and 1999
   (*d*) 1996 and 2000 (*e*) Data inadequate
3. If the number of candidates qualified in 1998 was 21200, what was the number of candidates appeared in 1998 ?
   (*a*) 32000 (*b*) 28500 (*c*) 26500 (*d*) 25000 (*e*) 24500
4. If the total number of candidates appeared in 1996 and 1997 together was 47400, then the total number of candidates qualified in these two years together was :
   (*a*) 34700 (*b*) 32100 (*c*) 31500
   (*d*) None of these (*e*) Data inadequate
5. The total number of candidates qualified in 1999 and 2000 together was 33500 and the number of candidates appeared in 1999 was 26500. What was the number of candidates appeared in 2000 ?
   (*a*) 24500 (*b*) 22000 (*c*) 20500 (*d*) 19000 (*e*) 18500

Directions (Questions 6 to 13) : ***The following line-graph gives the annual percent profit earned by a Company during the period 1995-2000. Study the line-graph and answer the questions that are based on it.*** **(R.B.I. 2003)**

Percent Profit Earned by a Company Over the Years

$$\%\,\text{Profit} = \frac{\text{Income} - \text{Expenditure}}{\text{Expenditure}} \times 100$$



6. If the income in 1998 was Rs. 264 crores, what was the expenditure in 1998 ?
   (*a*) Rs. 104 crores (*b*) Rs. 145 crores (*c*) Rs. 160 crores
   (*d*) Rs. 185 crores (*e*) None of these
7. During which of the following years was the ratio of income to expenditure the minimum ?
   (*a*) 1996 (*b*) 1997 (*c*) 1998 (*d*) 1999 (*e*) 2000
8. What is the average profit earned for the given years ?
   (*a*) $50\frac{2}{3}$ (*b*) $55\frac{5}{6}$ (*c*) $60\frac{1}{6}$ (*d*) 335 (*e*) None of these

9. During which year the ratio of percentage profit earned to that in the previous year is the minimum ?
(*a*) 1996 (*b*) 1997 (*c*) 1998 (*d*) 1999 (*e*) 2000

10. If the expenditures in 1996 and 1999 are equal, then the approximate ratio of the incomes in 1996 and 1999 respectively, is :
(*a*) 1 : 1 (*b*) 2 : 3 (*c*) 9 : 10
(*d*) 13 : 14 (*e*) Cannot be determined

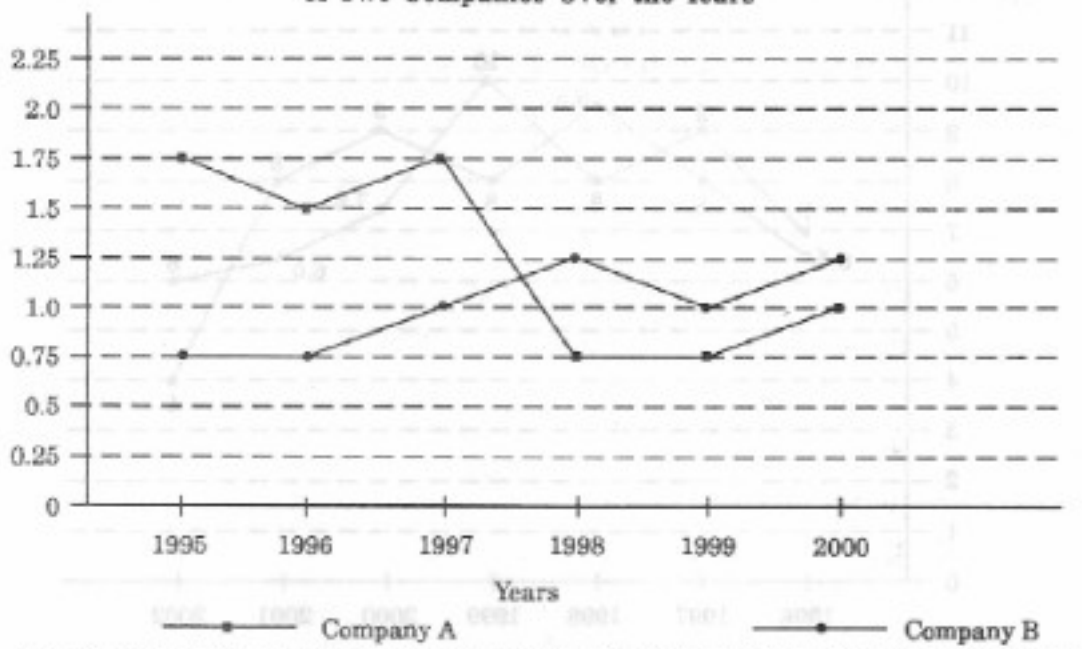
11. If the expenditure in 2000 is 25% more than the expenditure in 1997, then the income in 1997 is what percent less than the income in 2000 ?
(*a*) 22.5% (*b*) 25% (*c*) 27.5% (*d*) 31.25% (*e*) 32.5%

12. If the profit in 1999 was Rs. 4 crores, what was the profit in 2000 ?
(*a*) Rs. 4.2 crores (*b*) Rs. 6.6 crores (*c*) Rs. 6.8 crores
(*d*) Cannot be determined (*e*) None of these

13. In which year is the expenditure minimum ?
(*a*) 2000 (*b*) 1997 (*c*) 1996
(*d*) Cannot be determined (*e*) None of these

Directions (Questions 14 to 18) : ***Answer the questions based on the line-graph given below.*** **(Bank P.O. 2003)**

Ratio of Exports to Imports (in terms of money in Rs. crores) of Two Companies Over the Years



14. In how many of the given years were the exports more than the imports for Company A ?
(*a*) 2 (*b*) 3 (*c*) 4 (*d*) 5 (*e*) 6

15. In which year(s) was the difference between imports and exports of Company B the maximum ?
(*a*) 2000 (*b*) 1996 (*c*) 1998 and 2000
(*d*) Cannot be determined (*e*) None of these

16. If the exports of Company A in 1998 were Rs. 237 crores, what was the amount of imports in that year ?
(*a*) Rs. 189.6 crores (*b*) Rs. 243 crores (*c*) Rs. 281 crores
(*d*) Rs. 316 crores (*e*) None of these

17. If the imports of Company A in 1997 were increased by 40 percent, what would be the ratio of exports to the increased imports ?

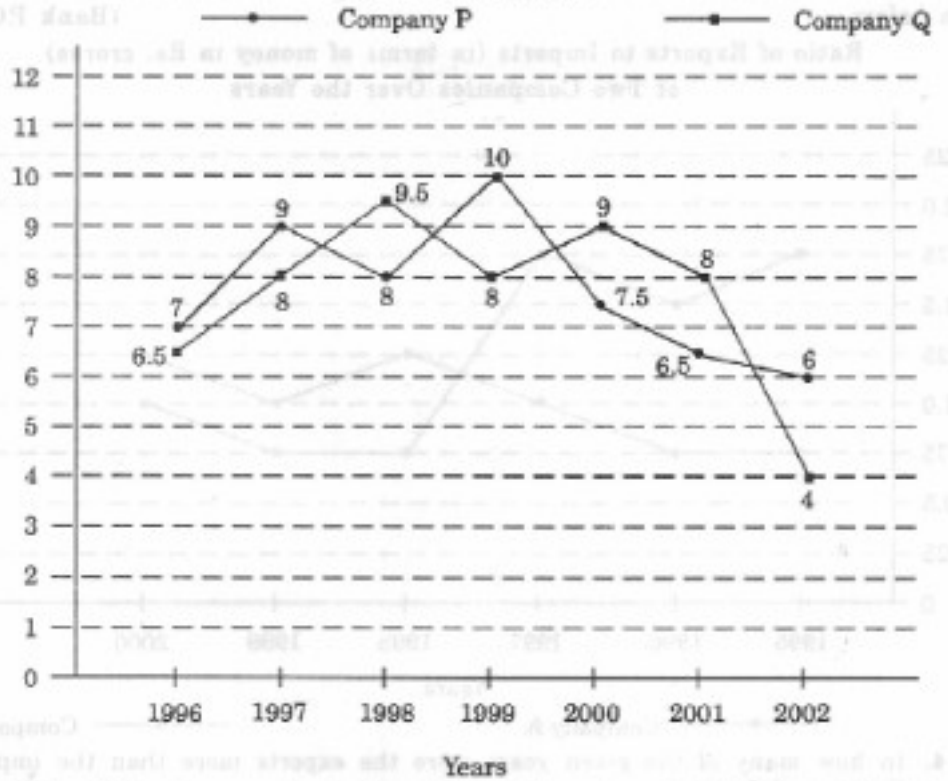
(a) 1.20 (b) 1.25 (c) 1.30
(d) None of these (e) Cannot be determined

18. In 1995, the export of Company A was double that of Company B. If the imports of Company A during the year was Rs. 180 crores, what was the approximate amount of imports of Company B during that year ?

(a) Rs. 190 crores (b) Rs. 210 crores (c) Rs. 225 crores
(d) Cannot be determined (e) None of these

Directions (Questions 19 to 23) : ***Two different finance companies declare fixed annual rate of interest on the amounts invested with them by investors. The rate of interest offered by these companies may differ from year to year depending on the variation in the economy of the country and the banks' rate of interest. The annual rate of interest offered by the two Companies P and Q over the years are shown by the line-graph provided below. Answer the questions based on this graph.*** (Bank P.O. 2003)

ANNUAL RATE OF INTEREST OFFERED BY TWO FINANCE COMPANIES OVER THE YEARS



19. If two different amounts in the ratio 8 : 9 are invested in Companies P and Q respectively in 2002, then the amounts received after one year as interests from Companies P and Q are respectively in the ratio :

(a) 2 : 3 (b) 3 : 4 (c) 6 : 7 (d) 4 : 3 (e) 9 : 8

20. In 2000, a part of Rs. 30 lakhs was invested in Company P and the rest was invested in Company Q for one year. The total interest received was Rs. 2.43 lakhs. What was the amount invested in Company P ?

(a) Rs. 9 lakhs (b) Rs. 11 lakhs (c) Rs. 12 lakhs
(d) Rs. 14 lakhs (e) Rs. 18 lakhs

21. A sum of Rs. 4.75 lakhs was invested in Company Q in 1999 for one year. How much more interest would have been earned if the sum was invested in Company P ?
(*a*) Rs. 19,000 (*b*) Rs. 14,250 (*c*) Rs. 11,750 (*d*) Rs. 9500 (*e*) Rs. 7500

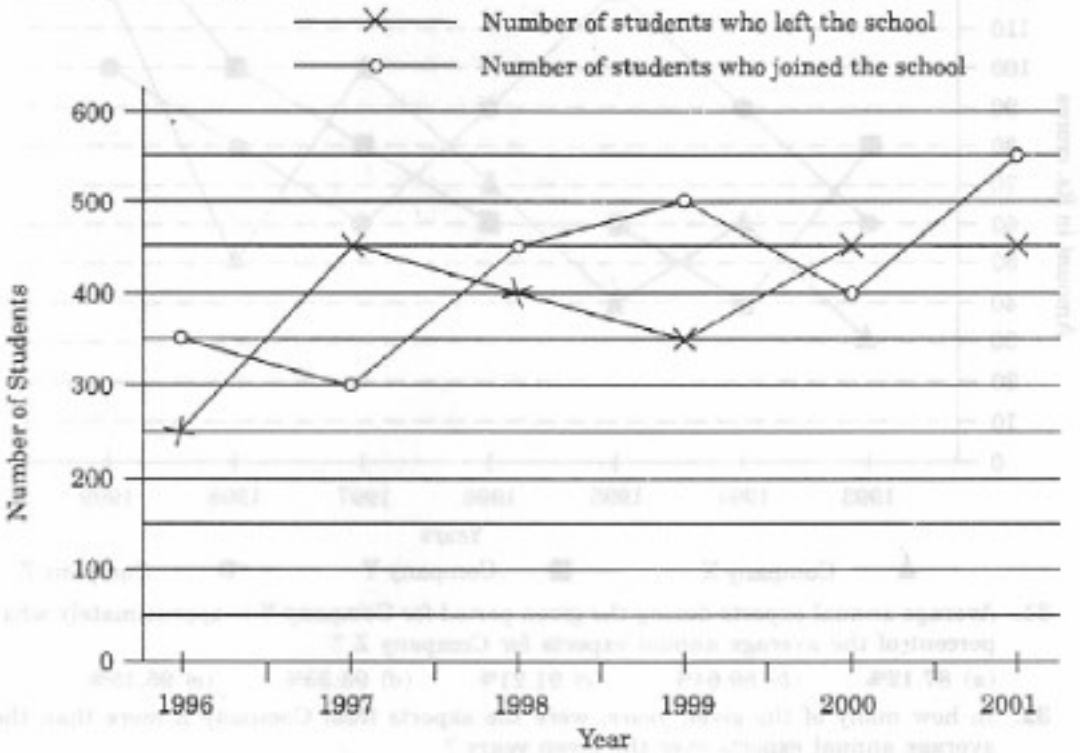
22. An investor invested a sum of Rs. 12 lakhs in Company P in 1998. The total amount received after one year was reinvested in the same Company for one more year. The total appreciation received by the investor on his investment was :
(*a*) Rs. 2,96,200 (*b*) Rs. 2,42,000 (*c*) Rs. 2,25,600
(*d*) Rs. 2,16,000 (*e*) Rs. 2,03,500

23. An investor invested Rs. 5 lakhs in Company Q in 1996. After one year, the entire amount along with the interest was transferred as investment to Company P in 1997 for one year. What amount will be received from Company P, by the investor ?
(*a*) Rs. 5,94,550 (*b*) Rs. 5,80,425 (*c*) Rs. 5,77,800
(*d*) Rs. 5,77,500 (*e*) Rs. 5,75,075

Directions (Questions 24 to 30) : ***Study the following line-graph which gives the number of students who joined and left the school in the beginning of year for six years, from 1996 to 2001.***

Initial strength of the school in 1995 = 3000.

The questions given below the graph are based on this line-graph. (S.B.I.P.O. 2001)



24. The strength of the school increased / decreased from 1997 to 1998 by approximately what percent ?
(*a*) 1.2% (*b*) 1.7% (*c*) 2.1% (*d*) 2.4% (*e*) 2.6%

25. The number of students studying in the school during 1999 was :
(*a*) 2950 (*b*) 3000 (*c*) 3100 (*d*) 3150 (*e*) 3200

26. During which of the following pairs of years, the strength of the school was same ?
(*a*) 1999 and 2001 (*b*) 1998 and 2000 (*c*) 1997 and 1998
(*d*) 1996 and 2000 (*e*) 1999 and 2000

27. The number of students studying in the school in 1998 was what percent of the number of students studying in the school in 2001 ?
(a) 92.13% (b) 93.75% (c) 96.88% (d) 97.25% (e) 99%

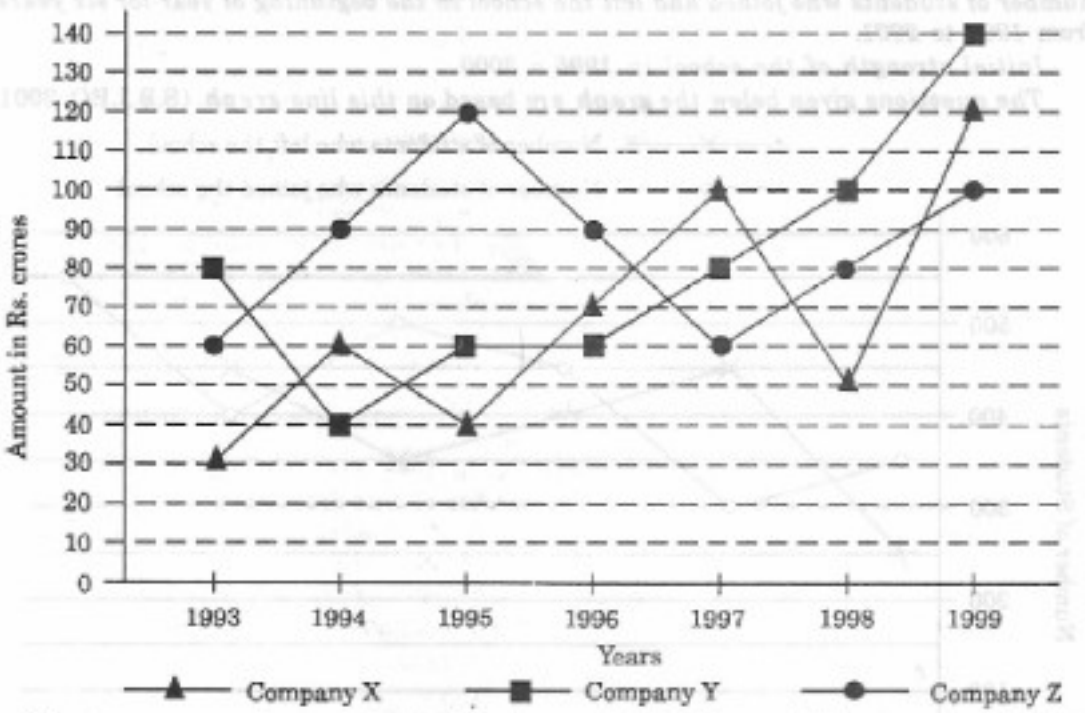
28. Among the given years, the largest number of students joined the school in the year :
(a) 1996 (b) 1998 (c) 1999 (d) 2000 (e) 2001

29. For which year, the percentage rise / fall in the number of students who left the school compared to the previous year is maximum ?
(a) 1997 (b) 1998 (c) 1999 (d) 2000 (e) 2001

30. The ratio of the least number of students who joined the school to the maximum number of students who left the school in any of the years during the given period is :
(a) 7 : 9 (b) 4 : 5 (c) 3 : 4 (d) 9 : 11 (e) 2 : 3

Directions (Questions 31 to 35) : ***Study the following graph and answer the questions based on it.*** **(S.B.I.P.O. 2000)**

Exports from Three Companies Over the Years (in Crore Rs.)



31. Average annual exports during the given period for Company Y is approximately what percent of the average annual exports for Company Z ?
(a) 87.12% (b) 89.64% (c) 91.21% (d) 93.33% (e) 95.15%

32. In how many of the given years, were the exports from Company Z more than the average annual exports over the given years ?
(a) 2 (b) 3 (c) 4 (d) 5 (e) 6

33. What was the difference between the average exports of the three Companies in 1993 and the average exports in 1998 ?
(a) Rs. 15.33 crores (b) Rs. 18.67 crores (c) Rs. 20 crores
(d) Rs. 22.17 crores (e) Rs. 25 crores

34. In which year was the difference between the exports from Companies X and Y the minimum ?
(a) 1994 (b) 1995 (c) 1996 (d) 1997 (e) None of these

35. For which of the following pairs of years the total exports from the three Companies together are equal ?
(*a*) 1995 and 1998 (*b*) 1996 and 1998 (*c*) 1997 and 1998
(*d*) 1995 and 1996 (*e*) 1993 and 1994

ANSWERS

1. (*b*)	**2.** (*e*)	**3.** (*c*)	**4.** (*e*)	**5.** (*c*)	**6.** (*c*)	**7.** (*b*)	**8.** (*b*)	**9.** (*b*)
10. (*a*)	**11.** (*c*)	**12.** (*d*)	**13.** (*d*)	**14.** (*b*)	**15.** (*d*)	**16.** (*d*)	**17.** (*b*)	**18.** (*b*)
19. (*d*)	**20.** (*e*)	**21.** (*d*)	**22.** (*c*)	**23.** (*b*)	**24.** (*b*)	**25.** (*d*)	**26.** (*d*)	**27.** (*b*)
28. (*e*)	**29.** (*a*)	**30.** (*e*)	**31.** (*d*)	**32.** (*c*)	**33.** (*c*)	**34.** (*c*)	**35.** (*d*)	

SOLUTIONS

1. The differences between the percentages of candidates qualified to appeared for the given pairs of years are :
For *1994 and 1995* = 50 – 30 = 20; For *1997 and 1998* = 80 – 50 = 30;
For *1998 and 1999* = 80 – 80 = 0; For *1999 and 2000* = 80 – 60 = 20;
For *1994 and 1997* = 50 – 30 = 20.
Thus, the maximum difference is between the years 1997 and 1998.

2. The graph gives the data for the percentage of candidates qualified to appeared and unless the absolute values of number of candidates qualified or candidates appeared is known we cannot compare the absolute values for any two years. Hence, the data is inadequate to solve this question.

3. Let the number of candidates appeared in 1998 be *x*.
Then, 80% of x = 21200 $\Rightarrow$ $x = \dfrac{21200 \times 100}{80}$ = 26500 (required number).

4. The total number of candidates qualified in 1996 and 1997 together, cannot be determined until we know at least, the number of candidates appeared in any one of the two years 1996 or 1997 or the percentage of candidates qualified to appeared in 1996 and 1997 together. Hence, the data is inadequate.

5. The number of candidates qualified in 1999 = 80% of 26500 = 21200.
$\therefore$ Number of candidates qualified in 2000 = 33500 – 21200 = 12300.
Let the number of candidates appeared in 2000 be *x*.
Then, 60% of x = 12300 $\Rightarrow$ $x = \dfrac{12300 \times 100}{60}$ = 20500.

6. Let the expenditure in 1998 be Rs. *x* crores.
Then, $65 = \dfrac{264 - x}{x} \times 100 \Rightarrow \dfrac{65}{100} = \dfrac{264}{x} - 1 \Rightarrow x = \dfrac{264 \times 100}{165} = 160.$
$\therefore$ Expenditure in 1998 = Rs. 160 crores.

7. It is given that : $\%\,\text{Profit} = \dfrac{\text{Income} - \text{Expenditure}}{\text{Expenditure}} \times 100$
$\Rightarrow \dfrac{\%\,\text{Profit}}{100} = \dfrac{\text{Income}}{\text{Expenditure}} - 1 \Rightarrow \dfrac{\text{Income}}{\text{Expenditure}} = \dfrac{\%\,\text{Profit}}{100} + 1.$
From this it is clear that the ratio of income to expenditure is minimum for the year in which the % profit has the minimum value. Since, out of the given years (*i.e.*, out of 1996, 1997, 1998, 1999 and 2000), the Company has the minimum % profit in the year 1997, so the minimum ratio of income to expenditure is in the year 1997.

8. Average percent profit earned for the given years

$$= \frac{1}{6} \times [40 + 55 + 45 + 65 + 70 + 60] = \frac{335}{6} = 55\frac{5}{6}.$$

9. The ratio of percentage profit earned to that in the previous year, for different years are :

For 1996 $= \frac{55}{40} = 1.38$; **For 1997** $= \frac{45}{55} = 0.82$; **For 1998** $= \frac{65}{45} = 1.44$;

For 1999 $= \frac{70}{65} = 1.08$; **For 2000** $= \frac{60}{70} = 0.86$.

Clearly, this ratio is minimum for 1997.

10. Let the expenditure in 1996 = expenditure in 1999 = x.

Also, let the incomes in 1996 and 1999 be I_1 and I_2 respectively.

Then, for the year 1996, we have :

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

And, for the year 1999, we have :

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

From (i) and (ii), we get :

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

11. Let the expenditure in 1997 be x.

Then, expenditure in 2000 $= x + (25\% \text{ of } x) = \frac{5}{4}x$.

Also, let the incomes in 1997 and 2000 be I_1 and I_2 respectively.

Then, for the year 1997, we have :

$$45 = \frac{I_1 - x}{x} \times 100 \Rightarrow \frac{45}{100} = \frac{I_1}{x} - 1 \Rightarrow I_1 = \frac{145x}{100} = 1.45x.$$

Also, for the year 2000, we have :

$$60 = \frac{\left(I_2 - \frac{5}{4}x\right)}{\left(\frac{5}{4}x\right)} \times 100 \Rightarrow \frac{60}{100} = \frac{4I_2}{5x} - 1 \Rightarrow I_2 = \frac{160}{100} \times \frac{5x}{4} = 2x.$$

Difference between the two incomes $= (2x - 1.45x) = 0.55x$.

$\therefore$ Percentage by which I_1 is less than $I_2 = \left(\frac{0.55x}{2x} \times 100\right)\% = 27.5\%$.

12. From the line-graph we obtain information about the percentage profit only. To find the profit in 2000 we must have the data for the income or expenditure in 2000. Therefore, the profit for 2000 cannot be determined.

13. The line-graph gives the comparison of percent profit for different years but the comparison of the expenditures is not possible without more data. Therefore, the year with minimum expenditure cannot be determined.

14. The exports are more than the imports in those years for which the exports to imports ratio is more than 1. For Company A, such years are 1995, 1996 and 1997. Thus, during these 3 years, the exports are more than the imports for Company A.

15. We shall try to find the difference between the imports and exports of Company B for various years one by one :

For 1995 : We have

$\frac{E}{I} = 0.75$ (where E = amount of exports and I = amount of imports in 1995)

$\Rightarrow$ $E = 0.75I$ $\therefore$ $I - E = I - 0.75I = 0.25I$.

Thus, the difference between the imports and exports of Company B in 1995 is dependent on the amount of imports of Company B in 1995.

Similarly, the difference for other years can be determined only if the amount of imports for these years are known. Since the imports or exports for various years are not known, the differences between imports and exports for various years cannot be determined.

16. Let the amount of imports of Company A in 1998 be Rs. x crores.

Then, $\frac{237}{x} = 0.75 \Rightarrow x = \frac{237}{0.75} = 316$.

$\therefore$ Amount of imports of Company A in 1998 = Rs. 316 crores.

17. In 1997 for Company A we have :

$\frac{E}{I} = 1.75$ *i.e.*, $E = 1.75I$ ...(*i*)

[where E = amount of exports and I = amount of imports of Company A in 1997]

Now, the required imports $I_1 = I + 40\%$ of $I = 1.4I$.

$\therefore$ Required ratio $= \frac{E}{I_1} = \frac{1.75I}{1.4I} = 1.25$.

18. In 1995 for Company A we have :

$\frac{E_A}{I_A} = 1.75$ ...(*i*) [where E_A = amount of exports and I_A = amount of imports of Company A in 1995]

In 1995 for Company B we have :

$\frac{E_B}{I_B} = 0.75$ ...(*ii*) [where E_B = amount of exports and I_B = amount of imports of Company B in 1995]

Also, we have $E_A = 2E_B$ ...(*iii*)

Substituting I_A = Rs. 180 crores (given) in (*i*), we get

E_A = Rs. (180 × 1.75) crores = Rs. 315 crores.

Using E_A = Rs. 315 crores in (*iii*), we get : $E_B = \frac{E_A}{2}$ = Rs. $\left(\frac{315}{2}\right)$ crores.

Substituting E_B = Rs. $\left(\frac{315}{2}\right)$ crores in (*ii*), we get :

$I_B = \frac{E_B}{0.75}$ = Rs. $\left(\frac{315}{2 \times 0.75}\right)$ crores = Rs. 210 crores.

i.e., amount of imports of Company B in 1995 = Rs. 210 crores.

19. Let the amounts invested in 2002 in Companies P and Q be Rs. $8x$ and Rs. $9x$ respectively.

Then, interest received after one year from Company P

= Rs. (6% of $8x$) = Rs. $\frac{48}{100}x$

and interest received after one year from Company Q

$$= \text{Rs. } (4\% \text{ of } 9x) = \text{Rs. } \frac{36}{100}x.$$

$$\therefore \quad \text{Required ratio} = \frac{\left(\frac{48}{100}x\right)}{\left(\frac{36}{100}x\right)} = \frac{4}{3}.$$

20. Let Rs. x lakhs be invested in Company P in 2000, then amount invested in Company Q in 2000 = Rs. $(30 - x)$ lakhs.

Total interest received from the two Companies after 1 year

$$= \text{Rs. } [(7.5\% \text{ of } x) + (9\% \text{ of } (30 - x))] \text{ lakhs} = \text{Rs. } \left[2.7 - \left(\frac{1.5x}{100}\right)\right] \text{ lakhs.}$$

$$\therefore \quad \left[2.7 - \left(\frac{1.5x}{100}\right)\right] = 2.43 \implies x = 18.$$

i.e., amount invested in Company P = Rs. 18 lakhs.

21. Difference = Rs. [(10% of 4.75) − (8% of 4.75)] lakhs

= Rs. (2% of 4.75) lakhs = Rs. 0.095 lakhs = Rs. 9500.

22. Amount received from Company P after one year (*i.e.*, in 1999) on investing Rs. 12 lakhs in it = Rs. [12 + (8% of 12)] lakhs = Rs. 12.96 lakhs.

Amount received from Company P after one year on investing Rs. 12.96 lakhs in the year 1999 = Rs. [12.96 + (10% of 12.96)] lakhs = Rs. 14.256 lakhs.

Appreciation received on investment during the period of two years

= Rs. (14.256 − 12) lakhs = Rs. 2.256 lakhs = Rs. 2,25,600.

23. Amount received from Company Q after one year on investment of Rs. 5 lakhs in the year 1996 = Rs. [5 + (6.5% of 5)] lakhs = Rs. 5.325 lakhs.

Amount received from Company P after one year on investment of Rs. 5.325 lakhs in the year 1997 = Rs. [5.325 + (9% of 5.325)] lakhs = Rs. 5.80425 lakhs = Rs. 5,80,425.

Questions 24 to 30 :

Before solving the questions, we shall analyse the graph :

From the graph it is clear that :

In 1996 : Number of students left = 250 and number of students joined = 350.

In 1997 : Number of students left = 450 and number of students joined = 300.

In 1998 : Number of students left = 400 and number of students joined = 450.

In 1999 : Number of students left = 350 and number of students joined = 500.

In 2000 : Number of students left = 450 and number of students joined = 400.

In 2001 : Number of students left = 450 and number of students joined = 550.

Therefore, the numbers of students studying in the school (*i.e.*, strength of the school) in various years :

In 1995 = 3000 (given); **In 1996** = 3000 − 250 + 350 = 3100;

In 1997 = 3100 − 450 + 300 = 2950; **In 1998** = 2950 − 400 + 450 = 3000;

In 1999 = 3000 − 350 + 500 = 3150; **In 2000** = 3150 − 450 + 400 = 3100;

In 2001 = 3100 − 450 + 550 = 3200.

Now, we shall solve the questions.

24. Percentage increase in the strength of the school from 1997 to 1998

$$= \left[\frac{(3000 - 2950)}{2950} \times 100\right]\% = 1.69\% = 1.7\%.$$

25. As calculated above, the number of students studying in the school during 1999 = 3150.

26. As calculated above, in the years 1996 and 2000 the strength of the school was same *i.e.*, 3100.

27. Using the calculations above we have :

$$\text{Required percentage} = \left(\frac{3000}{3200} \times 100\right)\% = 93.75\%.$$

28. As calculated above, the largest number of students (*i.e.*, 550) joined the school in the year 2001.

29. The percentage rise / fall in the number of students who left the school (compared to the previous year) during various years are :

$$\textbf{For 1997} = \left[\frac{(450-250)}{250} \times 100\right]\% = 80\% \text{ (rise)};$$

$$\textbf{For 1998} = \left[\frac{(450-400)}{450} \times 100\right]\% = 11.11\% \text{ (fall)};$$

$$\textbf{For 1999} = \left[\frac{(400-350)}{400} \times 100\right]\% = 12.5\% \text{ (fall)};$$

$$\textbf{For 2000} = \left[\frac{(450-350)}{350} \times 100\right]\% = 28.57\% \text{ (rise)};$$

$$\textbf{For 2001} = \left[\frac{(450-450)}{450} \times 100\right]\% = 0\%.$$

Clearly, the maximum percentage rise / fall is for 1997.

30. Using the calculations above we get :

$$\text{Required ratio} = \frac{300}{450} = \frac{2}{3}.$$

Questions 31 to 35 :

Analysis of the graph : From the graph it is clear that

(*i*) The amount of exports of Company X (in crore Rs.) in the years 1993, 1994, 1995, 1996, 1997, 1998 and 1999 are 30, 60, 40, 70, 100, 50 and 120 respectively.

(*ii*) The amount of exports of Company Y (in crore Rs.) in the years 1993, 1994, 1995, 1996, 1997, 1998 and 1999 are 80, 40, 60, 60, 80, 100 and 140 respectively.

(*iii*) The amount of exports of Company Z (in crore Rs.) in the years 1993, 1994, 1995, 1996, 1997, 1998 and 1999 are 60, 90, 120, 90, 60, 80 and 100 respectively.

31. Average annual exports (in Rs. crore) of Company Y during the given period

$$= \frac{1}{7} \times (80 + 40 + 60 + 60 + 80 + 100 + 140) = \frac{560}{7} = 80.$$

Average annual exports (in Rs. crore) of Company Z during the given period

$$= \frac{1}{7} \times (60 + 90 + 120 + 90 + 60 + 80 + 100) = \left(\frac{600}{7}\right).$$

$$\therefore \quad \text{Required percentage} = \left[\frac{80}{\left(\frac{600}{7}\right)} \times 100\right]\% = 93.33\%.$$

32. Average annual exports of Company Z during the given period

$$= \text{Rs.}\left[\frac{1}{7} \times (60 + 90 + 120 + 90 + 60 + 80 + 100)\right] \text{ crores} = \text{Rs.}\left(\frac{600}{7}\right) \text{ crores}$$

$$= \text{Rs. } 85.71 \text{ crores.}$$

From the analysis of graph the exports of Company Z are more than the average annual exports of Company Z (*i.e.*, Rs. 85.71 crores) during the years 1994, 1995, 1996 and 1999, *i.e.*, during 4 of the given years.

33. Average exports of the three Companies X, Y and Z in 1993

$$= \text{Rs.}\left[\frac{1}{3}\times(30+80+60)\right] \text{ crores} = \text{Rs.}\left(\frac{170}{3}\right) \text{ crores.}$$

Average exports of the three Companies X, Y and Z in 1998

$$= \text{Rs.}\left[\frac{1}{3}\times(50+100+80)\right] \text{ crores} = \text{Rs.}\left(\frac{230}{3}\right) \text{ crores.}$$

$$\text{Difference} = \text{Rs.}\left[\left(\frac{230}{3}\right)-\left(\frac{170}{3}\right)\right] \text{ crores} = \text{Rs.}\left(\frac{60}{3}\right) \text{ crores} = \text{Rs. } 20 \text{ crores.}$$

34. The differences between the exports from the Companies X and Y during various years are :

In 1993 = Rs. (80 – 30) crores = Rs. 50 crores;
In 1994 = Rs. (60 – 40) crores = Rs. 20 crores;
In 1995 = Rs. (60 – 40) crores = Rs. 20 crores;
In 1996 = Rs. (70 – 60) crores = Rs. 10 crores;
In 1997 = Rs. (100 – 80) crores = Rs. 20 crores;
In 1998 = Rs. (100 – 50) crores = Rs. 50 crores;
In 1999 = Rs. (140 – 120) crores = Rs. 20 crores.

Clearly, the difference is minimum in the year 1996.

35. Total exports of the three Companies X, Y and Z together, during various years are :

In 1993 = Rs. (30 + 80 + 60) crores = Rs. 170 crores.
In 1994 = Rs. (60 + 40 + 90) crores = Rs. 190 crores.
In 1995 = Rs. (40 + 60 + 120) crores = Rs. 220 crores.
In 1996 = Rs. (70 + 60 + 90) crores = Rs. 220 crores.
In 1997 = Rs. (100 + 80 + 60) crores = Rs. 240 crores.
In 1998 = Rs. (50 + 100 + 80) crores = Rs. 230 crores.
In 1999 = Rs. (120 + 140 + 100) crores = Rs. 360 crores.

Clearly, the total exports of the three Companies X, Y and Z together are same during the years 1995 and 1996.