

## DATA ANALYSIS AND INTERPRETATION (TABLES AND GRAPHS)

Tables are one of the commonest and earliest way of storing and tabulating data. Tabulation is the systematic and scientific presentation of quantitative data in such a form that it is able to elucidate the problem under consideration. An aspirant is expected to be able to go through a table, quickly and effectively i.e. with understanding. Essentials of a table: There are six essential elements of a table—

(1) Title (2) Stub (section containing row heading) (3) Column caption (heading of each column) (4) Body (5) Footnotes (6) Source

### INTERPRETATION OF DATA

It is based on the careful assessment of the figures (number) given in the table. In this process we analyze the entries and subentries in the table and derive conclusions regarding:

- (1) maximum and minimum
- (2) maximum / minimum rate of increase or decrease
- (3) percent change in an entry from the previous entry
- (4) any eccentric behaviour of entries
- (5) nature of dependent variable etc.

### IMPORTANT POINTS FOR STATISTICAL ANALYSIS

**Ratio and proportion:** A ratio represents relation between part and part whereas proportion represents a relation between part and whole. These are very important in interpretation of data.

**Percentage:** The word percent means hundredth. We use the symbol "%" to express the word "percent". For example, "17 percent" means "17 hundredths", and can be written with a % symbol, as a fraction, or as a decimal. To provide a decimal to a percent, move the decimal point two places to the right, adding 0s if necessary, and add the % symbol.

To convert a fraction to a percent, first convert the fraction to a decimal, and then convert the decimal to a percent, as indicated above.

$$0.375 = 37.5\%, 0.3 = 30\%, 10 = 1000\%$$

Many questions involving percents can actually be answered more quickly in your head than by using paper and pencil. Since, take 10% of a number, just divide by 10 by moving the decimal point one place to the left; 10% of 60 is 6. Also, since 5% is half of 10%, then 5% of 60 is 3 (half of 6); and since 30% is 3 times 10%, then 30% of 60 is 18 ( $3 \times 6$ ).

**Rates:** A ratio between two magnitudes usually shown over a period of time is called rate or rate of change. This ratio helps us in finding the rate of change over a period of time. If one teacher is being paid at a rate Rs.500 per class and then his payment increases to Rs.600 per class, it is obvious that his payment increased by 20%.

**Types of ratio:** (1) Part to whole; (2) Part to part; (3) Whole to whole

There is not much theoretical background that can be given about tables; you are familiar with them and you have been using them since school days. However, some general hints can be supplied:

- (i) You should make sure that you look at the entire table or graph. Sometimes some trivial-looking portions may be overlooked by a non-careful examinee.
- (ii) Be conscious and aware of the units used in the table or graph. Make sure that you express your answer in correct units.
- (iii) A very common mistake in such types of questions arises due to confusion between decimals and percentages. Don't confuse decimals with percentages and vice versa. For example, if the units are percentages and an entry is given to be .3 then it is equal to .3% which equals .003.
- (iv) It would be advisable to look at answers before attempting a calculation. Since the test asks for only an approximate answer, even a mental scrutinizing may lead to an

answer of a reasonably correct degree; saving effort and time.

- (e) Again, since you are asked to furnish only an approximate answer, you may round off or approximate the various quantities

during calculation. For example if you are

$$\text{to calculate } \frac{192 \times 3.7}{7.89}$$

You may approximate 1.92 to 2 and  $2 \times 3.7$ , 7.89 to 8 and then find out  $\frac{2 \times 3.7}{8} = 0.92$

- (ii) You must base your answer to each question only on the information in the given charts and graphs. If your knowledge contradicts any of the data presented in the graphs, ignore what you

know. First of all, you may be mistaken; but more important, the data may refer to a different, unspecified location or year. In any case, always base your answer on the given data.

- (iii) Finally, you should check if the answer makes any sense. Before confirming your answer, take a second to be sure that it is reasonable. From the logic of situation you should realize that earning couldn't exceed sales. So by testing your answer for reasonableness, you will realize that you made a mistake. Remember that if you don't know how to solve problem, you must guess in order to move on. Before guessing, however, check to see if one or more of the choices are unreasonable. If so, eliminated them.

TABLE

Direction : Study the following table and answer the questions based on it.

PROJECTED AND ACTUAL PRODUCTION OF CARS OF 5 DIFFERENT COMPANIES  
(Number in '000)

YEAR	A		B		C		D		E	
	Projected	Actual	Projected	Actual	Projected	Actual	Projected	Actual	Projected	Actual
1987	22	20	16	12	21	20	22	16	22	20
1988	26	21	21	14	22	18	20	18	18	16
1989	24	15	15	14	26	20	22	21	20	18
1990	29	14	14	10	30	22	29	28	23	19
1991	28	18	18	16	34	28	26	24	21	17
1992	31	22	22	18	36	31	30	28	28	26

- Which company has the highest actual production of cars over these years?  
(a) A (b) B  
(c) C (d) D  
(e) E
- Which year has the lowest projected production of cars of all the 5 companies?  
(a) 1987 (b) 1989  
(c) 1990 (d) 1992  
(e) None of these
- What is the percentage of actual production of cars compared to the projected production of cars of company D in year 1988  
(a) 85 (b) 86  
(c) 90 (d) 92  
(e) None of these
- Which company has continuous increase in

actual production of cars over these years?

- (a) A (b) B  
(c) C (d) D  
(e) E
- What is the approximate % actual production of cars compared to the projected production of cars of B over these years (1987-1991)?  
(a) 80 (b) 78  
(c) 82 (d) 74  
(e) 77

**Solution:** 1. C We quickly go through the column of actual-production for different companies and note that D, A and C look like the top producers. How do we note this? We see that all the entries for A are over 20; for C, only entry is less than 20 but the later entries have

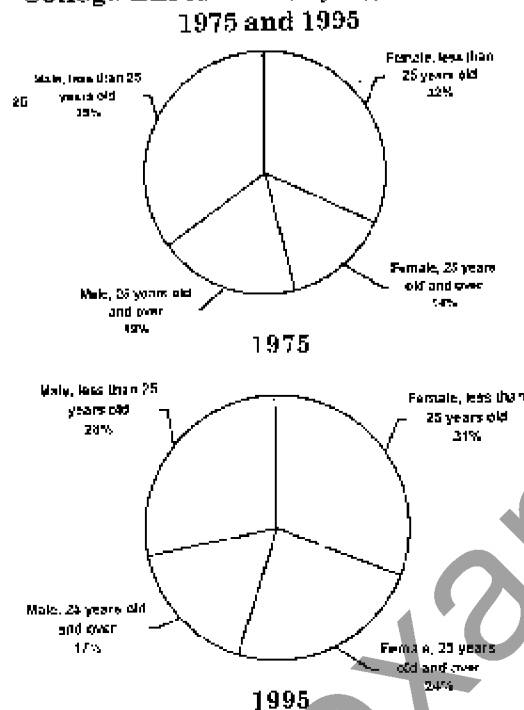
touched 30; and for D, only two entries are less than 20 but the entries are gradually rising, we quickly add up the entries of these 3 companies and find that C is the highest producer.  
 2. 1987 (by simple inspection): 3. 90% (18 is 90% of 20); 4. D; 5. 74%.

## GRAPHS

### 1. CIRCLE GRAPHS (PIE CHARTS)

Circular Graphs are used to show how various sectors share in the whole. Sometimes they are also referred to as pie charts. The percentage of each sector is usually denoted in a circle graph.

**Directions:** Refer to the following pie charts.  
**College Enrollment, by Age and Sex:**



**Source:** U.S. Bureau of the Census, Current Population Survey

- If there were 10,000,000 college students in 1975, how many more male students were there than female students?  
 (a) 800,000      (b) 1,600,000  
 (c) 2,400,000    (d) 5,400,000
- In 1975 what percent of female college students were at least 25 years old?  
 (a) 14%            (b) 30%  
 (c) 45%            (d) 69%

(c) 76%

- If the total number of students enrolled in college was 40% higher in 1995 than in 1975, what is the ratio of the number of male students in 1995 to the number of male students in 1975?  
 (a) 5:6              (b) 6:7  
 (c) 7:6              (d) 6:5  
 (e) 7:5

**Solutions :**

- (a) From the top graph, we see that in 1975, 54% (35% + 19%) of all college students were male, and the other 46% were female. So there were 5,400,000 males and 4,600,000 females - a difference of 800,000.

- (b) In 1975, of every 100 college students, 46 were female - 32 of whom were less than 25 years old, and 14 of whom were 25 years old and over. So, 14 of every 46 female students were at least 25 years

old. Finally,  $\frac{14}{46} \approx .3 = 30\%$

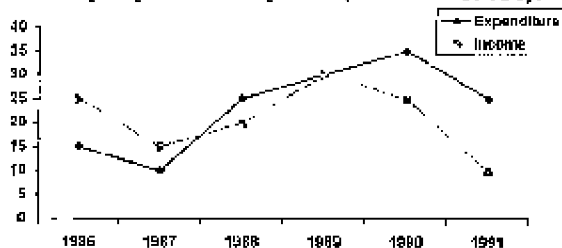
- (c) From the two graphs, we see that in 1975 54% (35% + 19%) of all college students were male, whereas in 1995 the corresponding figure was 45% (28% + 17%). For simplicity, assume that there were 100 college students in 1975, 54 of whom were male. Then in 1995, there were 140 college students, 63 of whom were male (45% of 140 = 63). So the ratio of the number of male students in 1995 to the number of male students in 1975 is 63:54 = 7:6.

## LINE GRAPHS

Line graphs denote how a quantity changes continuously. Very often the quantity is measured as time changes. If the line goes up, the quantity is increasing; if it goes down it is decreasing; if it is horizontal then the quantity is not changing. To measure the height of a point on the graph, your eyes should act as sufficient means.

**Example:** Study the following graph carefully and answer the questions given below it.

Income and expenditure of computer-based company over the years (Rs. .... in crore).



- What was the percentage increase in income from 1988 to 1989?
  - 100
  - 25
  - 50
  - 75
  - none of these
- In how many of the given years was the income more than expenditure?
  - one
  - two
  - three
  - four
  - none of these
- In how many of the given years was the difference between income and expenditure about Rs. 5 crores?
  - one
  - two
  - three
  - four
  - none of these
- Which years has the difference between income and expenditure about Rs. 10 crore?
  - 1987 & 1990
  - 1990 & 1991
  - 1986, 1990 & 1991
  - 1986 & 1990
  - 1988 & 1991
- If the difference between the income and expenditure was considered as profit in which of the following years was the rate of loss maximum?
  - 1988
  - 1990
  - 1991
  - 1987
  - none of these

**Solutions:**

- (d) 75% (Approximately, from 18 crores to 30 crores).
- (b) The income will be more than the expenditure if the line denoting income (bolder line) lies above the line denoting expenditure (dotted line). This is happening only in 1989, when both income and expenditure equal each other, in all the remaining years the gap between the

two lines appears greater than the gap of 5 units on the scale.

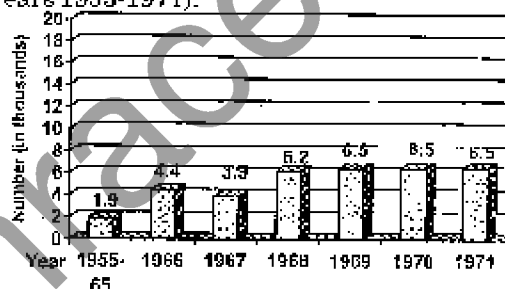
- (c) 1986, 1990, 1991
- (c) 1991. (when expenditure exceeds the income by the largest gap).

**BAR GRAPHS**

Quantities can be compared by the height or length of a bar in a bar graph. A bar graph can have either vertical or horizontal bars. You can compare different quantity or the same quantity at different times. Use your pencil or a piece of paper to compare bars which are not adjacent to each other.

**DISABILITY BENEFICIARIES REPORTED AS REHABILITATED**

(number, as percent of all rehabilitated clients of state vocational rehabilitation agencies, years 1955-1971).



- Between 1967 and 1971, the largest of disability beneficiaries were reported as rehabilitated in the year.
  - 1967
  - 1968
  - 1969
  - 1970
  - 1971
- Between 1955 and 1965, about how many clients were rehabilitated by state vocational rehabilitation agencies?
  - 90,000
  - 40,000
  - 1,000,000
  - 1,000,000
  - 10,000,000

**Solutions :**

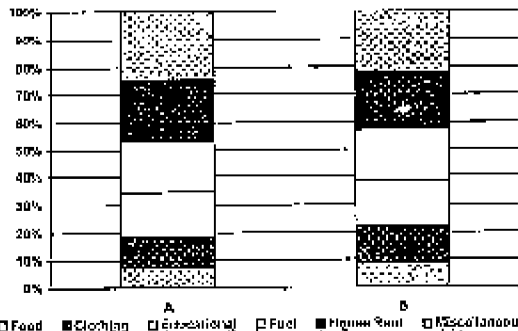
- (c) The answer is (c) since the highest bar is the bar for 1971. The percentage of disability beneficiaries out of all rehabilitated clients was higher in 1969, but the number was lower.
- (c) 1.9% of those rehabilitated were disability beneficiaries, and were about 19,000 disability beneficiaries rehabilitated. So if T is the total number rehabilitated, then 1.9% of T = 19,000 or

$.019T = 19,000$ . Thus  $T = 19,000 / .019 = 1,000,000$  and the answer is (c)

### CUMULATIVE GRAPHS

You can compare several categories by a graph of the cumulative type. These are usually bar or line graphs where the height of the bar or line is divided up proportionately among different quantities.

**Directions:** Following bar diagram shows the monthly expenditure of two families A & B on food, clothing, education, fuel, house rent and miscellaneous (in percentages).



- What fraction of the total expenditure is spent on education in family A?
  - $\frac{13}{20}$
  - $\frac{2}{3}$
  - $\frac{9}{13}$
  - none of these
- If the total expenditure on family B is Rs. 10000, then money spent on clothes by this family during the year is:
  - Rs. 200
  - Rs. 600
  - Rs. 2000
  - Rs. 6000
- If the total annual expenditure of family A is Rs. 30000, then money spent on food, clothes and house rent is:
  - Rs. 18500
  - Rs. 18000
  - Rs. 21000
  - Rs. 15000

- If both the families have same expenditure, which one spends more on education and miscellaneous together?
  - A
  - B
  - Both spend equal amounts
  - none of these

- What percentage is B's expenditure on food over A's expenditure on food, taking equal total expenditure?
  - 10%
  - 70%
  - 133.33%
  - 75%

**Solutions:**

- (d) Money spent on education by family A =  $(65 - 45)$  i.e. 20% of total expenditure =  $\frac{20}{100}$  of total expenditure =  $\frac{1}{5}$  of the total expenditure.
- (c) Money spent on clothes by family B =  $(60 - 40)$  % of total expenditure = Rs.  $\left[ \frac{20}{100} \times 10000 \right] = \text{Rs. } 2000$ .
- (b) Money spent by A on food, clothes and house rent =  $[30 + (15 - 30) + (90 - 75)]$  % of total expenditure =  $(60\% \text{ of Rs. } 30000) = \text{Rs. } \left[ \frac{60}{100} \times 30000 \right] = \text{Rs. } 18000$ .
- (a) Money spent by A on education and miscellaneous =  $[(65 - 45) + (100 - 90)]\% = 30\%$ .  
Money spent by B on education & miscellaneous =  $[(75 - 60) + (100 - 95)]\% = 20\%$ .
- (c) B's expenditure on food = 40%  
A's expenditure on food = 30%  
B's percentage over A's =  $\left[ \frac{40}{30} \times 100 \right] = 133.33\%$ .

### QUESTIONS

**Directions:** Study the table and answer the question regarding opinion polling :

	Voting for	Voting against	Indifferent	Total
Men	350	750	250	1350
Women	450	1250	50	1750
Total	800	2000	300	3100

- Which of the following conclusions drawn is most correct ?
  - 10% people did not take part in the polling
  - Women are less interested in polling as compared to men
  - Polling have become unpopular in India

- (d) 64.5% people voted not in favour of the party

**Directions:** Study the table and answer the question.

Year	Firm's outlay	Proceeds
1960	3400	4000
1970	3800	4500
1980	4600	5400
1990	7100	8000

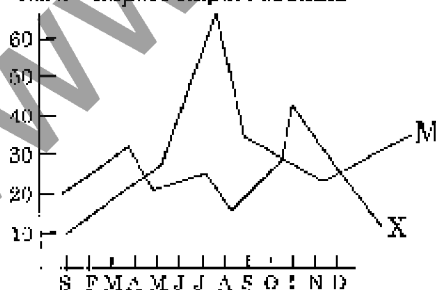
2. Which of the following conclusion is not true?
- There has been a steady growth in %age profit of the firm
  - Income of the firm becomes double in 30 years
  - Percentage profit in 1980 was 17.6%
  - There is 117.65% increase in the expenses of the firm from 1960 to 1990
3. For the purpose of preparing a pie-chart the Government's expenditures on different heads in angles are given below. Study them and answer Q. No. 4.
- |                        |     |
|------------------------|-----|
| Industries             | 90° |
| Transport              | 60° |
| Social Services        | 60° |
| Agriculture            | 45° |
| Power                  | 45° |
| Inventories            | 30° |
| Small scale industries | 15° |
| Irrigation             | 15° |

The statement which is not true is

- Expenditure on transport and social service combined is  $\frac{1}{3}$  of the total expenditure
- Expenditure on industries is triple that of agriculture
- Expenditure on irrigation is  $\frac{25}{6}\%$  of the total expenditure
- 25% of budget is spent on industries

**Directions:** Study The graph and attempt question No. 4.

No. 3 Export-Import of India



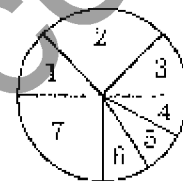
4. Which conclusions can not be drawn from the graph?

- Import and export both have favourable prospects
- Import was maximum in July but minimum in January
- In July export was minimum but import was maximum
- Export and import both were equal in April and December

5. Study the following pie chart and attempt the following questions:

**Expenses of a family:**

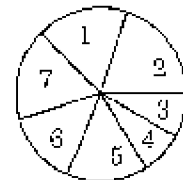
- Clothes
- Vegetables
- Meat
- Rent
- Petrol
- Others
- Foodgrains



Which conclusion based on the diagram is true here?

- Expenses on foodgrains is less than those on rent and petrol
  - Expenses on clothes and vegetables is greater than on rent, petrol and others
  - $\frac{2}{3}$  of the family's income is spent on all except foodgrains
  - Equal amount of money is spent on vegetables and meat
6. Income of a person from different sources is expressed through the following pie chart. Study them and answer the following question

- Service
- Rent
- Bank interest
- Company shares
- Commission on books
- Wife's salary
- Sale of wastes

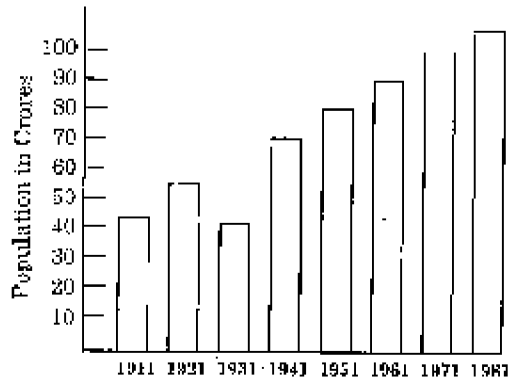


With the help of the above pie chart which of the conclusions cannot be drawn?

- Contribution of rent, interest, share and commission is more than  $\frac{1}{2}$  of the total income
- His salary is less than his wife salary

- (c) Income from service and rent put together makes an obtuse angle in a pie chart  
 (d) His wife's salary is less than the income obtained from rent.

**Directions:** Population growth in India is shown through a bar diagram. Study it and answer the question No. 7.

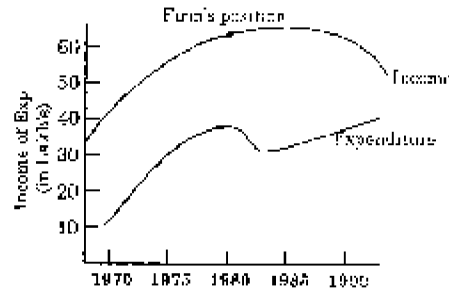


7. Which of the following conclusions is not true?  
 (a) Average annual increase of India's population is about one crore  
 (b) Population of India in 1990 is expected to rise by 10% or more  
 (c) Population in India in 1901 must have been less than 25 crores  
 (d) Growth rate of population from 1951 to 1961 is maximum
8. Runs scored by three players in 6 matches are given below, which player you would like to select as a captain of the team?

Players	I	II	III	IV	V	VI
A	20	15	85	80	5	35
B	40	50	50	45	55	30
C	10	130	20	10	100	30

- (a) C, because of his average  
 (b) B, because of his average and consistency  
 (c) C and B both  
 (d) A and B both

**Directions:** Study the graph and answer the question No. 9.



9. Which conclusion is not true?  
 (a) Profit of the firm was minimum in 1980 and maximum in 1985  
 (b) Rate of increase in income is less than that of increase in expenditure upto 1980  
 (c) There is a direct relation between income and expenditure after 1980  
 (d) All of the above

**Directions:** The following table shows the value of exports from India, study the table and answer the question.

Country	Export in Its crores		
	1960-61	1970-71	1980-81
U.K	13983	17040	51012
USA	11588	20734	54953
Russia	1038	20985	41039
Japan	1027	20348	54034
Germany	-	3231	23434
Malaysia	550	1173	2984
Pakistan	42	410	6066
Total including other countries	60061	152516	514332

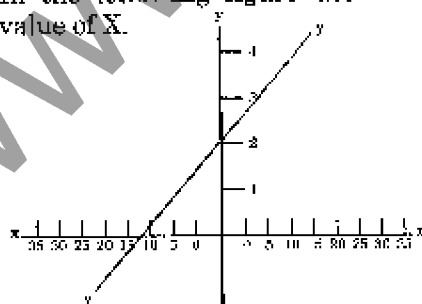
10. Which of the following conclusions is correct?  
 (a) Total export between 1970-80 increased by about 200%  
 (b) The relative share of the UK and USA went down considerably to the total export  
 (c) Japan became the major importing country from India in 1980  
 (d) The share of these seven countries was more than half to the total export during the whole period
11. Study the table and determine the state which has recorded maximum improvement in output from 1961 to 1991?

State	Export in Rs. crores			
	1961	1971	1981	1991
U.P.	261	271	381	360
Bihar	160	165	195	205
MP	350	270	260	370
AP	141	143	190	144
Punjab	470	490	530	690
Haryana	410	450	500	720
W. Bengal	150	240	290	170

- (a) U.P. (b) Punjab  
(c) Haryana (d) W. Bengal
12. On the basis of the above table which state does not record any improvement in its output?
- (a) U.P. (b) A.P.  
(c) Punjab (d) M.P.
13. Study the following table and determine whose overall performance is best among the three.

Subject	A's Marks	B's Marks	C's Marks
Maths	30	40	35
English	60	50	45
Science	20	40	40
Soc. Sc.	40	55	40
G.K.	60	35	39
Hindi	30	20	41

- (a) A  
(b) B  
(c) C  
(d) Cannot be determined
14. On the basis of the data given above which of the following conclusions is correct?
- (a) English is an easy subject for A  
(b) A has failed in 3 subjects but B in only one  
(c) Performance of A in English is twice that of Maths  
(d) None of the above
15. In the following figure determine the value of X.



- (a)  $X = Y$  (b)  $X + Y = -2$   
(c)  $X - 2 = Y$  (d)  $X = -Y + 2$
16. Which of the following figures does not represent a linear relationship between the variables X and Y?



- (a) A (b) B  
(c) C (d) D
17. Value of constant X and Y are 1 to 5 respectively in a linear relationship find the missing value of Y in the following table

X	Y
1	5
2	9
3	
4	21
5	27

- (a) 6 (b) 7  
(c) 13 (d) None of these
18. According to the survey of area A and B the following records were collected. Study the records and determine the conclusion which is not correct?

	Hindus	Muslims	Christians	Parsis	Sikhs	Jains	Total
Area A	28%	10%	12%	13%	26%	11%	38000
Area B	26%	18%	17%	8%	24%	7%	35000

- (a) There is a difference of 1540 Hindus between these two areas  
(b) Number of Parsis in area A is equal to that of Christians in area B  
(c) Hindus remained the largest community in both the areas  
(d) All of the above
19. According to the survey of 2000 educated unemployed persons in which 1200 were men and 800 were women, the following data were collected:

Qualification	Unemployed Men	Unemployed women
Doctors	12.5%	15%
Engineers	20%	7.5%
Trained Teachers	15%	22.5%
Postgraduates	22.5%	25%
Graduates	30%	30%



On the basis of the above table what is the difference in the number of unemployed men and women doctors?

- (a) 20 (b) 30  
(c) 40 (d) None of these

20. According to question No. 19 what is the total number of unemployed graduates?

- (a) 125 (b) 175  
(c) 550 (d) 600

### EXPLANATORY ANSWERS

1. (d):  $\frac{2000 \times 100}{3100} = 64.5\%$
2. (c): Firm's profit = Revenue - Expenses  
= 5400 - 4500 = 900.  
New percentage profit =  $\frac{900 \times 100}{5200} = 16.66\%$
3. (b): Expenses on industries = 90% and that of Agriculture = 45%.  
So it is only double. Here 360% = 100%, 180% = 50% and 90% = 25%.
4. (a): Import and export both are so fluctuating that nothing can be said about future prospect definitely.
5. (b): Area shown on the basis of the degree is taken into account here. The line that cut the circle into two halves means division of 50% and 50% while an arc of 90° means one-fourth.
6. (b): Since the angle is not given here so nothing can be said so accurately.
7. (b): Only estimation is possible and nothing can be definitely said about future.
8. (b): For better performance not only average is important but consistency is much more important. Consistency means difference between the highest score and the lowest score (range) should be minimum with least fluctuation in statistical language.
9. (c): Expenditure is highly fluctuating so relationship is not direct.
10. (b): The export to U.K. and USA from India is increasing undoubtedly but not so much as it is increasing in case of other five countries.
11. (d):

State	1961	1971	1981	1991
U.P.	4	3	4	5
Bihar	5	6	6	6
MP	3	4	5	4
AP	7	7	7	7
Punjab	1	1	2	2
Haryana	2	2	1	1
W. Bengal	6	5	4	3

The above table shows that the rank of W. Bengal was 6th in 1961 which becomes 3rd in 1991. The other states are not showing so much improvement in their performance.

12. (b): AP's rank was 7th in 1961 which is still 7th in 1991.
13. (c): A, B and C's mean marks are equal but A's range is 60 - 20 = 40  
B's range is 45 - 20 = 25  
C's range is 45 - 35 = 10  
Standard deviation will be maximum in case of A then comes B and least SD will be there in case of C.
14. (d): None of the conclusions is correct because  
(i) Pass mark in each subject has not been given.  
(ii) Each subject measures different types of abilities.  
(iii) Scores in a particular subject depend not only on the nature of the subject but other variables like, interest, aptitude, method of teaching etc. also affect scores.
15. (a): From O to the left is the minus sign of X and X is 2 point less than Y.
16. (d): In a linear relationship if one variable increases by a constant amount the corresponding increase in the other variable is also constant.
17. (c): Value of Y = 1 + 4X = 1 + 4 × 3 = 13  
Increase in X is one i.e., 1, 2, 3, 4, 5, and increase in Y is 4, i.e., 5, 9, 13, 17, 21

18. (b): (i)  $\frac{13 \times 38000}{100} = 4940$  Parsis

(ii)  $\frac{17 \times 35000}{100} = 6050$  Christians

Thus they are not equal.

19. (b):  $(12.5 \times 1200)/100 = 150$  men  
 $(15 \times 800)/100 = 120$  women  
Difference = 150 - 120 = 30
20. (d):  $(30 \times 1200)/100 = 360$ ,  $(30 \times 800)/100 = 240$   
360 + 240 = 600.