DATA ANALYSIS & INTERPRETATION

Data Analysis and Interpretation is a tool to measure the analytical ability of a candidate earned over a period of time. It is integral to SBI PO Exams and other Bank PO Exams. It is not merely finding average, percentage increase or decrease or ratio. It tests the degree of analysis a candidate has. Unless you analyse a given data eloquently, you can't interpret it, explain it. Under this section, questions based on tables, bar diagrams, line graphs, pie chart and more importantly paragraph analysis (Venn Diagram). We shall present here a detailed information on each one of topics with examples and their analytical solutions.

An analytical study of questions asked in recently held exam and other exams, we reach at the conclusion that questions also relate to Data Sufficiency, and Probability. Problems on Permutation and Combination may also get their share. This topic is very important for the candidates preparing for various competitive exams. It is a significant part of almost all competitive exam. Let's elaborate our view in detail.

DATA

Facts or information related to any event or events especially as basis for inference are termed as Data. Data may be collected by an investigator fhimself or may be obtained from sources like published reports, official statistics collected by the government or data collected by other investigators. The former is said to be Primary Data and the latter is said to be Secondary Data. After the data have been collected they are arranged according to their characteristics. This step is called classification of data. The objectives of classification are :

(a) simplifying the raw data
(d) facilitating comparison
(c) depicting the salient features of the data
(d) making the data more intelligible
(e) facilitating interpretation

Although classified data is a step towards simplification of data, it is not able to explain the data fully. In order to present the data in an under standable form so that it may be quickly grasped, the following common forms of presentation are used :

(a) Tabular Form
(b) Bar Diagram
(c) Line Graph
(d) Pie Diagram

Actually data related to any event are collected, classified and presented so that they can be analysed in order to draw inferences from them. After that nterpretation is done. We try to get meaningful information from the data. Let's discuss every form of presentation in detail —

MEANING OF TABULATION

Tabulation is one of the most important devices for the presentation of the data in a condensed and comprehensive form. It attempts to furnish the maximum information contained in the data in a minimum possible space without minimising the quality and usefulness of the data.

A statistical table is the logical listing of related quantitative data in vertical columns and horizontal rows of numbers with sufficient explanatory and qualifying words, phrases and statements in the form of titles, headings and notes to make clear the full meaning of data and their origin. Thus, a table is a systematic presentation of statistical data in horizontal rows and vertical columns according to some salient features.

MERITS OF TABULATION

(i) Tabulation is the final stage in collection and compilation of the data.

(ii) It simplifies the data.

(iii) It depicts trend and pattern within the data

(vi) It provides a gateway for further statistical analysis and interpretation.

(v) In tabulation comparable data are kept close, so that a comparable study of these data becomes easy.

(vi) It makes the data suitable for further Diagrammatic and Graphic representation.

(vii) It saves time and space, as maximum information is expressed in a small space without repetition.

PARTS OF A TABLE

Though the various parts of a table depend on the nature of the data and purpose of the investigation, the following features generally, form the parts of a statistical table :

(i) Table Number : Usually placed at the top of the table either in the centre above the title or in the side of the title, it serves to identify the table for future reference.

(ii) Heading or Title : Every table is provided with a suitable title, which usually appears at the top of the table. It is brief, simple, unambiguous, complete and self-explanatory, so that a first hand idea of the problem can be had from it.

A title describes the nature of the data, the place of relation, the time period and the source of the data.

(iii) Head Note : It is a sort of a supplement to the title. If required, it is given just below the title to provide additional information regarding the contents of the table. The head note is usually enclosed in brackets. For example, the units of measurement are usually expressed as head note as '*in kilometres*', '*in crores*', '*in Rupees*'; etc.

(iv) Columns and Rows : Columns are vertical arrangements, whereas rows are horizontal arrangements. The number of rows and columns is suitably taken in view of the data under consideration.

(v) Captions : Captions are the designations for vertical columns. They are placed in the middle of the columns. They briefly express the contents of the columns.

(vi) Stubs : Stubs are the designations for horizontal rows. They are placed to the left of the rows. They briefly express the contents of the rows.

(vii) Body : The data when arranged according to the designations given in the rows and columns, form the body of the table. It contains the numerical data to be presented to the readers. In view of increasing the utility of the table, totals are genrally given for each separate category either against the rows or below the columns.

(viii) Foot Note : If some additional information regarding the data is required for their complete description, foot notes are used for this purpose. As the name suggests, they are placed at the bottom of the table.

(ix) Source Note : The source of collection of data is mentioned below the foot note so that it must be known from where these have been taken. The source note is used if the data are of secondary nature.

Thus, we have discussed the various components of an attractive and useful table. In all the competitive examinations, questions based on tables generally possess the above mentioned parts. Hence, they should be understood clearly. For conveniene, format of a blank table has been given below :

FORMAT OF A TABLE

TABLE NO.

TITLE

(HEAD NOTE)

Stub Heading	Caption				Total
	Sub-Heading		Sub-Heading		
	Column Heading	Column Heading	Column Heading	Column Heading	
		BODY	OF		
			THE	TABLE	
Total					

BAR DIAGRAM

A question arises that when we can present data in classified and tabular forms, then what is the need to present data in other forms? It is human nature to invent a comparatively better method than the existing ones. A better method will naturally have some advantages over the existing ones. Hence, some of the advantages are enumerated below :

(i) Diagrams present the data in simple and easily understood form. They, being visual aids, give a bird's eye view of the given statistical data.

(ii) Diagrams, being more attractive and impressive, appeal to the eye and leave a long lasting impression on the mind. This easy presentation makes even a layman understand it easily.

(iii) A reader needs a very little effort to grasp the diagrams and draw meaningful conclusions from them. In this way a lot of time is saved.

(iv) A human mind has natural craving and affection for beautiful and attractive pictures. This human psyche of the human is widely exploited by the advertising bodies today to attract the consumers. Consequently they have global applicability.

(v) Diagrams highlight the salient features of the collected data and facilitate comparisons.

Bar Diagrams are one of the simplest and the most common devices used for the presentation of statistical data. They consist of a number of equidistant rectangles. One for each category of the data in which the magnitudes are represented by the length or height of the rectangles, where as width of rectangles are arbitrary and immaterial. The following points should be kept into consideration while drawing bar diagrams:

(i) All the bars drawn in a diagram are generally of uniform width which depends on the number of bars to be constructed and the availability of space.

(ii) To make the bar diagram attractive and graceful, uniform space is given between different bars.

(iii) As the height of the rectangles are taken proportional to the magnitude of observations the scale is selected keeping in view the magnitude of the greatest observation.

(iv) All the bars are constructed on the same base line.

(v) Bars drawn may be vertical or horizontal.

(vi) Vertical bars are generally arranged from left to right.

(vii) Horizontal bars are generally arranged from top to bottom.

(viii) Generally, the figures represented by the bars are written at the top of the bars. It facilitates a reader to draw a precise idea of the value.

(ix) A suitable title is given at the top of the diagram which indicates the subject matter and various other facts depicted in the bar diagram.

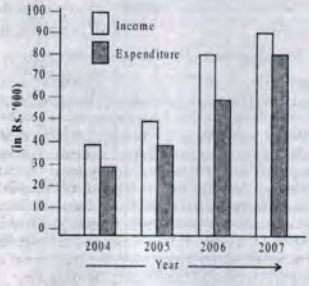
(x) Sometimes footnotes are given at the left hand bottom of bar diagram to explain certain facts, not mentioned in the title.

(xi) A brief index is also given at the right hand top of bar diagram which explains the various types of shades. Colours or designs used while constructing bar diagrams.

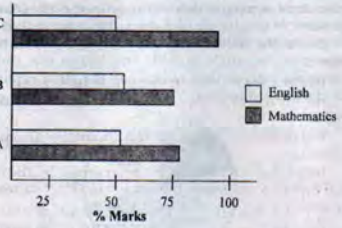
A simple bar diagram can be used to describe only a single characteristic. When a combination of inter-related variables are to be presented graphically, multiple bar diagrams are used. These are extended forms of simple bar diagrams. Here, many aspects of

the given data are presented simultaneously and as such are very useful for direct comparison between two or more phenomena by representing them with separate bars of various shades or colours. Here an index is given to explain the shades and colours used. Proper and euqal spacing is given between different sets of the bars.

Example : Income & Expenditure of a Family



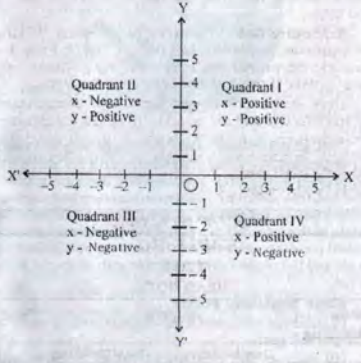
Example : % Marks of 3 students in a class in Mathematics and English.



GRAPHIC REPRESENTATION OF DATA

Line Graphs are more obvious, precise and accurate than the diagrams and can be effectively used for further statistical analysis, viz., to study slopes, rates of change and for future inference. They can be used to study the relationship between the variates under study. Line Graphs are drawn on 'graph-paper'.

Construction of Line Graphs : Line Graphs are drawn on a special paper called 'graph paper' which has a net work of horizontal and vertical lines. In the graph paper two straight lines are drawn at right angles, intersecting each other at point O (say) known as origin. The horizontal line is known as X-axis and is usually denoted by XOX. The vertical line is known as the Y-axis and is usually denoted by YOY^1. In this way the graph is divided into four parts called quadrants. In practice only the first quadrant is used unless negative quantities are to be displayed. The distances measured to the right of origin along X-axis are taken as positve where as the distances measured to the left of origin along X-axis are taken as negative. Along the Y-axis, the distances measured above the origin are taken as positive where as the distances measured below the origin are taken as negative. Any pair of the values of variables is represented by an order pair (x, y) where x generally represents the value of independent variable and y represents the value of dependent variable.



Line graphs are used to show how a quantity changes. Very often the quantity is measured as time changes. If the line goes up, the quantity is increasing; if the line is horizontal, the quantity is not changing.

ADVANTAGES OF GRAPHS

1. Graphs are visual aids that give a bird's eye view of numerical data.

2. Graphs, being attractive, leave a much lasting impression on mind.

3. In the construction of graph, generally graph paper is used which helps us to learn the mathematical relationship between the two variables.

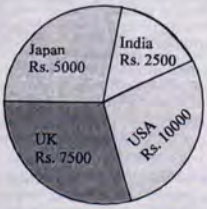
4. Graphs are clear, precise and accurate and help statisticians for the study of slopes, rates of change and estimation.

5. Graphs reveal the trends and also exhibit the way in which the trends change.

PIE DIAGRAMS

A pie-diagram is a pictorial representation of the numerical data by non-intersecting adjacent sectors of the circle such that area of each sector is proportional to the magnitude of the data represented by the sector.

The following figure shows a pie-diagram of per capita income of four countries. In this figure a circle is sliced into four sectors such that size of a sector is proportional to the per capita income of the country represented by the sector.



Just as sub-divided and percentage bars are used to represent the total magnitude and its different components, the circle representing the total may be divided into different segments representing certain proportion or percentage of the different components parts to the total. Such a sub-divided circle diagram is called pie-diagram because the entire graph looks like a pie and the components resemble with slices cut from a pie.

Some Important Points

(i) Different sectors of a pie-chart represent various component parts.

(ii) Each of the component values is expressed either as a percentage of the respective total or as sectorial angle of the respective total.

(iii) Since the angle at the centre of the circle is 360°, the total magnitude of the various components is taken to be equal to 360°.

(iv) Since 1 per cent of the total value is equal to $\frac{360}{100} = 3.6°$, the percentage of the component parts can be converted to degrees by multiplying each of the them by 3.6.

(v) The degrees represented by the various components parts of a given magnitude can be obtained without computing their percentage to the total value as follows :

$$\text{Degree of the any component part} = \frac{\text{Component value}}{\text{Total value}} \times 100$$

We give below some illustrations of Pie-diagram.

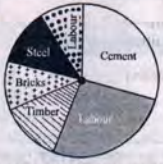
Example : The following data relate to the cost of construction of a house in Delhi.

Items	Cement	Steel	Bricks	Timber	Labour	Miscellaneous
Expenditure	30%	10%	10%	15%	25%	10%

Solution : Computation of Central Angles :

Items	Expenditure (in Rs.)	Central Angle
Cement	30	$\left(\frac{30}{100} \times 360\right)^{\circ} = 108°$
Steel	10	$\left(\frac{10}{100} \times 360\right)^{\circ} = 36°$
Bricks	10	$\left(\frac{10}{100} \times 360\right)^{\circ} = 36°$
Timber	15	$\left(\frac{15}{100} \times 360\right)^{\circ} = 54°$
Labour	25	$\left(\frac{25}{100} \times 360\right)^{\circ} = 90°$
Miscellaneous	10	$\left(\frac{10}{100} \times 360\right)^{\circ} = 36°$
Total	**100**	**360°**

Now, draw a circle of an appropriate radius and also draw a radius coinciding with the 12 O'Clock position of two hands of a clock. We observe that the largest sector angle is 108°. So we construct a sector whose sector angle is 108° and whose one radius coinsides with vertical radius and the other radius is in clockwise direction.



Draw other sectors in succession in descending order of manitude of sector angles in clock wise direction.

The pie-diagram so obtained is shown in Figure.

IMPORTANT POINTS TO REMEMBER

From the point of view of competitive examinations one must remember the following points before attempting to solve the problems on Data Interpretation :

(i) Learn basic arithmetic well (i.e. ratios, percentages etc.)

(ii) Read the data/graph and the questions carefully. Read the headings and footnotes especially. Be aware of the units used. If there is more than one graph, understand their relationship.

(iii) As far as possible try to do multiplication and division mentally. Approximate the numbers judiciously to make big calculations simpler. Arrive at approximate answers rather than finding out exact answers.

(iv) Look at the alternatives given. If possible, try to eliminate some alternatives on first reading or looing at the data provided.

(v) The last but not the least, acquire speed through knowledge and practise.

PARAGRAPH ANALYSIS (VENN DIAGRAM)

It is a type of analytical ability test too. In such problems, a paragraph is given with information on a subject. then some questions are given on the information contained in the passage. A candidate is required to study the information carefully and make relevant calculation. The questions can be answered accordingly.

IMPORTANT ARITHMETIC TOOLS

Percentage : It is a fraction whose denominator is 100 and the numerator of such a fraction is termed as rate per cent. Thus the term per cent means for every hundred. It should be noted that in common parlance, per cent and percentage are used interchangeably.

Percentage as an Operator

1. Let us discuss x% of y.

This operation can be broken into two parts :

(i) $x\% = \frac{x}{100}$

(ii) 'of' means multiplication and hence can be replaced by multiplication sign 'x'.

$\therefore x\%$ of y means $\frac{x}{100} \times y = \frac{xy}{100}$

Let $x\%$ of $y = z$

$\frac{xy}{100} = z$

This equality involves 3 variables x, y, and z. If the value of any two variables out of the three are known, the value of the third variable can be easily determined.

2. Per cent change (Increase or Decrease)

$$\text{Per cent change} = \frac{\text{Final value - Initial value}}{\text{Initial value}} \times 100$$

or,

$$\text{Per cent change} = \left(\frac{\text{Final value}}{\text{Initial value}} - 1\right) \times 100$$

It is to be remembered that change per cent is always calculated with respect to the initial value. Hence, it is the initial value which is taken as reference value for finding % change.

$$\therefore \%\ \text{change} = \frac{\text{Difference between two quantities}}{\text{Reference Value}} \times 100$$

Further, change involves both increase as well as decrease. Therefore, we should follow the sign convention given below :

Sign convention : + for increase and – for decrease

Example : Biscuit exports of a country in 2001 and 2002 were 300 and 450 lakh tins respectively. What is the percentage increase in exports in 2002 ?

Solution : Here, our reference year is 2001 as the data of two years 2001 and 2002 are available and we have to calculate change in 2002.

$$\therefore \%\ \text{change} = \frac{450 - 300}{300} \times 100$$

$$= \frac{150}{300} \times 100 = 50$$

Ratio : A ratio is a comparison of two quantities by division. In other words, ratio of two quantities represents the number of times one quantity contains another quantity of the same kind. Since ratio is an abstract number, the two quantities that are being compared must be expressed in the same unit. Thus, production of rice in tonnes can be compared with consumption of rice in tonnes. We cannot compare the production of rice in tonnes and production of cotton in bales.

Example : Biscuit export of country in 2001 and 2002 were 300 and 450 lakh tins respectively. The ratio of the exports in these two years is given by 300 : 450

or, 1 : 1.5 or 2 : 3.

Averages : The inherent inability of the human mind to grasp in its entirety a large body of numerical data compel us to seek relatively few constants that will adequately describe the data. Averages are one of such few constants. These are the typical values around which other items of the distribution congregate. They give us the gist of huge numerical data. Here, we will describe arithmetic mean only.

The average or arithmetic mean of a number of quantities of the same kind is their sum divided by the number of those quantities.

Let $x_1, x_2, x_3, \ldots\ldots, x_n$ be the n values of x. Their average is denoted by $\bar{x}$ and given by

$$\bar{x} = \frac{\text{Sum of observations}}{\text{Total number of observations}}$$

$$\text{or, } \bar{x} = \frac{x_1 + x_2 + x_3 + \ldots\ldots + x_n}{x_n}$$

Directions (1-5) : Study the table carefully to answer the questions that follow.

Monthly Bill (in rupees) of paid by three landline phone, electricity, laundry and mobile phone paid by three different people in five different months

Month	Monthly Bills											
	Landline Phone			Electricity			Laundry			Mobile Phones		
	Ravi	Dev	Manu	Ravi	Dev	Manu	Ravi	Dev	Manu	Ravi	Dev	Manu
March	234	190	113	145	245	315	93	323	65	144	234	345
April	124	234	321	270	220	135	151	134	35	164	221	325
May	156	432	211	86	150	98	232	442	132	143	532	332
June	87	123	124	124	150	116	213	324	184	245	134	125
July	221	104	156	235	103	131	143	532	143	324	432	543

1. What is the total amount of bill paid by Dev in the month of June for all the four commodities ?
(1) ₹ 608 (2) ₹ 763
(3) ₹ 731 (4) ₹ 683
(5) ₹ 674

2. What is the average electricity bill paid by Manu over all the five months together ?
(1) ₹ 183 (2) ₹ 149
(3) ₹ 159 (4) ₹ 178
(5) ₹ 164

3. What is the difference between the mobile phone bill paid by Ravi in the month of May and laundry bill paid by Dev in the month of March ?
(1) ₹ 180 (2) ₹ 176
(3) ₹ 190 (4) ₹ 167
(5) ₹ 196

4. In which months respectively did Manu pay the second highest mobile phone bill and the lowest electricity bill ?
(1) April and June
(2) April and May
(3) March and June
(4) March and May
(5) July and May

5. What is the respective ratio between the elctricity bill paid by Manu in the month of April and the mobile phone bill paid by Ravi in the month of June ?
(1) 27 : 49 (2) 27 : 65
(3) 34 : 49 (4) 135 : 184
(5) 13 : 24

[1 to 5 : SBI PO Exam, 28.04.2013]

Directions (6–10) : In the following table the production of different kinds of toys by a company in different years has been given. Read the table carefully and answer the questions.

Production of 5-different Toys and Percentage of Defective Toys in Various Years

Toys / Years	Type-A		Type-B		Type-C		Type-D		Type-E	
	Produ-ction	% defective toys	Production	% defective toys	Production	% defective toys	Production	% defective toys	Production	% defective toys
2006	18000	06	20000	06	12000	04	22000	07	23000	08
2007	21000	05	15000	05	15000	08	20000	08	18000	06
2008	16000	08	18000	04	17000	05	18000	05	17000	05
2009	22000	09	19000	06	20000	07	24000	06	20000	04
2010	24000	04	21000	09	24000	09	27000	08	24000	08
2011	28000	05	20000	05	28000	05	28000	05	27000	09
2012	26000	07	28000	08	31000	02	30000	05	30000	05

6. Find the approximate average number of defect free A,C and E types of toys manufactured in 2007.
(1) 16890 (2) 16980
(3) 16880 (4) 17890
(5) None of these

7. How many defect free C-type of toys were manufactured in 2008 ?
(1) 16250 (2) 16150
(3) 16350 (4) 16450
(5) None of these

8. Find the difference between the number of E-type of toys manufactured in 2008 and the total number of A-type and B-type of toys manufactured in 2009.
(1) 26000 (2) 23000

(3) 24000 (4) 18000
(5) None of these

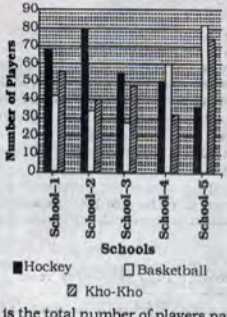
9. In which year was the maximum number of defective toys of type-A manufactured ?
(1) 2010 (2) 2008
(3) 2012 (4) 2009
(5) None of these

10. Find the ratio between the number of defective toys of type-A in 2006 and that of defective toys of type-E in 2007?
(1) 3 : 2 (2) 2 : 3
(3) 1 : 2 (4) 2 : 1
(5) 1 : 1

[6 to 10 : SBI Management Executive Exam, 22.02.2014]

Directions (11-15) : Study the graph carefully to answer the questions that follow.

Number of players participating in three different games in five different schools



11. What is the total number of players participating in hockey from all the five schools together ?
(1) 324 (2) 288
(3) 342 (4) 284
(5) 248

12. What is the respective ratio between number of players participating in basketball from school-1 and the number of players participating in Kho-Kho from school-3 ?
(1) 5 : 7 (2) 7 : 9
(3) 7 : 8 (4) 9 : 7
(5) 5 : 8

13. In which school is the number of players participating in hockey and basketball together second highest ?
(1) School-1 (2) School-2
(3) School-3 (4) School-4
(5) School-5

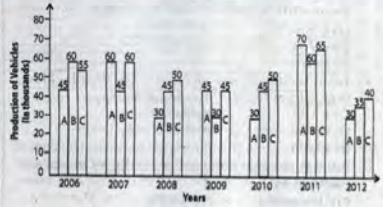
14. Number of players participating in Kho-Kho from school-4 is what percent of number of players participating in hockey from school-2 ?
(1) 42 (2) 48
(3) 36 (4) 40
(5) 60

15. 25% of the number of the players participating in hockey from School-5 are females. What is the number of the hockey players who are males in school-5 ?
(1) 15 (2) 18
(3) 30 (4) 21
(5) 27

[11 to 15 : SBI PO Exam, 28.04.2013]

Directions (16–20) : In the following bar diagram, production of three kinds of vehicles by a company in different years has been given. Read the bar diagram carefully and answer the questions.

Production of Three Type of Vehicles A, B and C (In Thousands).



16. Find the ratio between the number of vehicles of type C produced in 2012 and that of vehicles A produced in 2006.
(1) 8 : 9 (2) 7 : 9
(3) 7 : 6 (4) 7 : 8
(5) None of these

17. The number of vehicles of type B produced is 2009 is what per cent of the total production of vehicles in 2009 ?
(1) 20% (2) 25%
(3) 18% (4) 21%
(5) None of these

18. What is the ratio between the total number of vehicles produced in 2012 and total production of A-type of vehicles in the years 2007 and 2008?
(1) 7 : 9 (2) 7 : 8
(3) 7 : 6 (4) 8 : 7
(5) None of these

19. In which year is the percentage increase in production of type-A vehicles from the previous year is maximum ?
(1) 2009 (2) 2007
(3) 2010 (4) 2011
(5) None of these

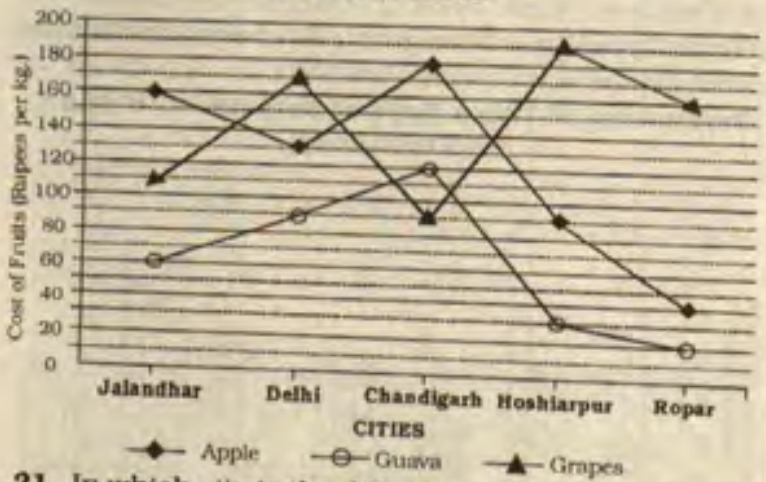
20. The number of type-C vehicles produced in 2010 is approximately what per cent of total number of vehicles produced in 2011 ?

(1) 30% (2) 20%
(3) 32% (4) 28%
(5) 26%

[16 to 20 : SBI Management Executive Exam, 22.02.2014]

Directions (21-25) : Study the following graph carefully to answer the questions that follow :

Cost of three different fruits (in rupees per kg.) in five different cities.



21. In which city is the difference between the cost of one kg. of apple and cost of one kg. of guava second lowest ?

(1) Jalandhar (2) Delhi
(3) Chandigarh (4) Hoshiarpur
(5) Ropar

22. Cost of one kg. of guava in Jalandhar is **approximately** what percent of the cost of two kgs. of grapes in Chandigarh ?

(1) 66 (2) 24
(3) 28 (4) 34
(5) 58

23. What total amount will Ram pay to the shopkeeper for purchasing 3 kgs. of apples and 2 kgs. of guavas in Delhi ?

(1) ₹ 530 (2) ₹ 450
(3) ₹ 570 (4) ₹ 620
(5) ₹ 490

24. Ravinder had to purchase 45 kgs. of grapes from Hoshiarpur. Shopkeeper gave him discount of 4% per kg. What amount did he pay to the shopkeeper after the discount ?

(1) ₹ 8,208 (2) ₹ 8,104
(3) ₹ 8,340 (4) ₹ 8,550
(5) ₹ 8,410

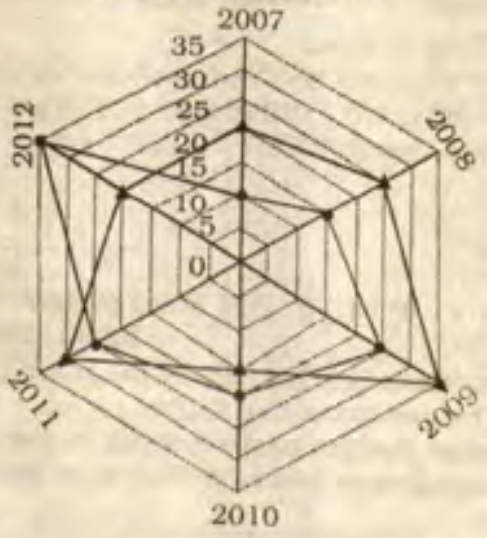
25. What is the respective ratio between the cost of one kg. of apples from Ropar and the cost of one kg. of grapes from Chandigarh ?

(1) 3 : 2 (2) 2 : 3
(3) $2^2 : 3^2$ (4) $4^2 : 9^2$
(5) $9^2 : 4^2$

Directions (26-30) : Study the radar graph carefully and answer the questions that follow :

Number of students (in thousands) in two different universities in six different years

Number of Students



26. What was the difference between the number of students in university-1 in the year 2010 and the number of students in university-2 in the year 2012?

(1) Zero (2) 5,000
(3) 15,000 (4) 10,000
(5) 1,000

27. What is the sum of the number of students in university-1 in the year 2007 and the number of students in university-2 in the year 2011 together ?

(1) 50000 (2) 55000
(3) 45000 (4) 57000
(5) 40000

28. If 25% of the students in university-2 in the year 2010 were females, what was the number of male students in the university-2 in the same year ?

(1) 11250 (2) 12350
(3) 12500 (4) 11500
(5) 11750

29. What was the percent increase in the number of students in university-1 in the year 2011 as compared to the previous year ?

(1) 135 (2) 15
(3) 115 (4) 25
(5) 35

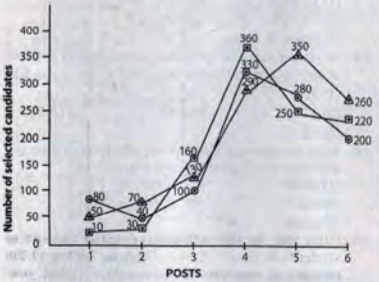
30. In which year was the difference between the number of students in university-1 and the number of students in university-2 highest ?

(1) 2008 (2) 2009
(3) 2010 (4) 2011
(5) 2012

Directions (31–35) : In the following multiple graphs, the number of selected candidates for 6 different posts by three different companies A, B and C has been shown. Read the graph carefully and answer the questions.

Company A —⊙—; Company B —⊡—; Company C —△—

Number of Selected Candidates in three companies



POST 1 : HR Officer
POST 2 : IT Officer
POST 3 : Assistant Manager
POST 4 : Advertisement Office Assistant
POST 5 : Office Assistant Operations
POST 6 : Junior Office Administrator

31. What is the ratio between the number of all candidates selected for company A and that selected for the posts of assistant managers and junior office administrators in all three companies?
(1) 103 : 107 (2) 102 : 107
(3) 103 : 106 (4) 113 : 117
(5) None of these

32. The number of candidates recruited for the post of office assistant operations in company B is approximately what percent of total candidates recruited in that company ?
(1) 28% (2) 24%
(3) 30% (4) 31%
(5) None of these

33. The number of candidates recruited for the posts of assistant manager and advertisement office assistant is what per cent of the candidates recruited for the post of junior office administrator and HR officer by the company C ?
(1) 115% (2) 120%
(3) 135% (4) 141%
(5) None of these

34. The total number of candidates recruited for the post of HR officers in all the companies is what per cent of the total candidates recruited by the company A for all posts ?
(1) 16% (2) 11%
(3) 12% (4) 14%
(5) None of these

35. What is the respective ratio between the average number of candidates selected for all the posts by company A and company C ?
(1) 113 : 115 (2) 115 : 113
(3) 113 : 117 (4) 117 : 113
(5) 103 : 105

[31 to 35 : SBI Management Executive Exam, 22.02.2014]

Directions (36-40) : Study pie-chart and table carefully to answer the questions that follow:

Pie-chart showing Percentage wise distribution of cars in four different states
Total cars = 700
Distribution of Cars

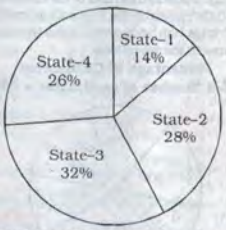


Table showing ratio between diesel and petrol engine cars which are distributed among four different states

State	Diesel Engine Cars	Petrol Engine Cars
State-1	3	4
State-2	5	9
State-3	5	3
State-4	1	1

36. What is the difference between the number of diesel engine cars in state-2 and the number of petrol engine cars in state-4 ?
(1) 159 (2) 21
(3) 28 (4) 34
(5) 161

37. Number of petrol engine cars in state-3 is what percent more than the number of diesel engine cars in state-1 ?
(1) 100 (2) 200
(3) 300 (4) 125
(5) 225

38. If 25% of diesel engine cars in state-3 are AC and remaining cars are non-AC, what is the number of diesel engine cars in state-3 which are non-AC?

(1) 75 (2) 45
(3) 95 (4) 105
(5) 35

39. What is the difference between the total number of cars in state-3 and the number of petrol engine cars in state-2 ?

(1) 96 (2) 106
(3) 112 (4) 102
(5) 98

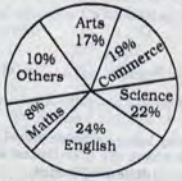
40. What is the average number of petrol engine cars in all the states together ?

(1) 86.75 (2) 89.25
(3) 89.75 (4) 86.25
(5) 88.75

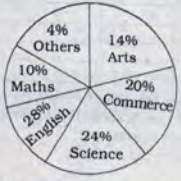
[36 to 40 : SBI PO Exam, 28.04.2013]

Directions (41–45) : In the following pie-charts, the percentage wise distribution of candidates who have applied for different subjects in a college and that of selected candidates has been given. Read the following pie-charts to answer the questions.

Percentage of Candidates
Applied Number of candidates = 88000



Percentage of Candidates Qualified
Number of candidates = 14400



41. What is the difference between the total number of candidates who got selected in Science and the number of candidates who applied for the same ?

(1) 15904 (2) 14904
(3) 15940 (4) 16940
(5) None of these

42. What is the sum of the total number of candidates who applied for Arts and the number of candidates who got selected in Maths and English both ?

(1) 19432 (2) 20432
(3) 20342 (4) 19432
(5) None of these

43. What is the ratio between the number of candidates who qualified in Arts and commerce together and the number of candidates who qualified in English and Science ?

(1) 17 : 25 (2) 17 : 29
(3) 17 : 26 (4) 29 : 17
(5) None of these

44. What per cent of candidates qualified in English of the total candidates applied for the same ?

(1) 15 (2) 16
(3) 17 (4) 19
(5) 22

45. Find the average number of candidates who got selected for English, Science and Arts.

(1) 3618 (2) 3682
(3) 3628 (4) 3268
(5) 3168

[41 to 45 : SBI Management Executive Exam, 22.02.2014]

Directions (46–48) : Study the information carefully to answer these questions.

In a team there are 240 members (males and females). Two-third of them are males. Fifteen percent of males are graduates. Remaining males are non-graduates. Three-fourth of the females are graduates. Remaining females are non-graduates.

46. What is the difference between the number of females who are non-graduates and the number of males who are graduates ?

(1) 2 (2) 24
(3) 4 (4) 116
(5) 36

47. What is the sum of the number of females who are graduates and the number of males who are non-graduates ?

(1) 184 (2) 96
(3) 156 (4) 84
(5) 196

48. What is the ratio between the total number of males and the number of females who are non-graduates ?

(1) 6 : 1 (2) 8 : 1
(3) 8 : 3 (4) 5 : 2
(5) 7 : 2

[46 to 48 : SBI PO Exam, 28.04.2013]

Directions (49–53) : Read the following information carefully to answer the questions.

In a store, there are 600 women. The store is a collection of precious stones namely diamond, ruby

and emerald. It is found that 40% of women like diamond, 20% of women like ruby and 10% of women like emerald. 5% of women like diamond and ruby; 3% of women like ruby and emerald and 4% like emerald and diamond. 2% of women like all three stones.

49. Find the number of women who like both ruby and diamond.
(1) 30 (2) 32
(3) 12 (4) 6
(5) 18

50. Find the number of women who like emerald only.
(1) 32 (2) 30
(3) 28 (4) 198
(5) 40

51. Find the number of women who like both diamond and emerald ?
(1) 32 (2) 30
(3) 24 (4) 28
(5) 27

52. Find the number of women who like diamond only.
(1) 60 (2) 240
(3) 120 (4) 198
(5) 84

53. Find the number of women who like only ruby.
(1) 60 (2) 240
(3) 120 (4) 198
(5) 30

[49 to 53 : SBI Management Executive Exam, 22.02.2014]

ANSWERS WITH EXPLANATIONS

1. (3) Total amount of bill paid by Dev
= 123 + 150 + 324 + 134 = Rs. 731

2. (3) Average electricity bill paid by Manu

$$= \frac{315+135+98+116+131}{5} = \frac{795}{5} = \text{Rs. } 159$$

3. (1) Required difference
= 323 – 143 = Rs. 180

4. (4) Second highest mobile phone bill = Rs. 345 (March) of Manu
Lowest electricity bill of Manu = Rs. 98 (May)

5. (1) Required ratio = 135 : 245 = 27 : 49

6. (1) Required number of defect free toys

$$= \frac{21000\times 95}{100} + \frac{15000\times 92}{100} + \frac{18000\times 94}{100}$$

= 19950 + 13800 + 16920 = 50670

$$\text{Required average} = \frac{50670}{3} = 16890$$

7. (2) Required answer $= \frac{17000\times 95}{100} = 16150$

8. (3) Required difference = 22000 + 19000 – 17000
= 24000

9. (4) Number of defective toys of type-A :

$$\text{Year 2006} \Rightarrow \frac{18000\times 6}{100} = 1080$$

$$\text{Year 2008} \Rightarrow \frac{16000\times 8}{100} = 1280$$

$$\text{Year 2009} \Rightarrow \frac{22000\times 9}{100} = 1980$$

$$\text{Year 2012} \Rightarrow \frac{26000\times 7}{100} = 1820$$

10. (5) Required ratio $= \frac{18000\times 6}{100} : \frac{18000\times 6}{100}$
= 1 : 1

11. (2) Total number of hockey-players
= 68 + 80 + 54 + 50 + 36 = 288

12. (3) Required ratio = 42 : 48 = 7 : 8

13. (2) Hockey and basketball players :
School-1 ⇒ 68 + 42 = 110
School-2 ⇒ 80 + 34 = 114
School-3 ⇒ 54 + 28 = 82
School-4 ⇒ 50 + 60 = 110
School-5 ⇒ 36 + 82 = 118

14. (4) Required percentage $= \frac{32}{80}\times 100 = 40$

15. (5) Required number of male Hockey players

$$= \frac{36\times 75}{100} = 27$$

16. (1) Required ratio = 40 : 45 = 8 : 9

17. (2) Required percentage

$$= \frac{30}{45+30+45}\times 100 = \frac{30}{120}\times 100 = 25\%$$

18. (3) Required ratio
= (30 + 35 + 40) : (60 + 30) = 105 : 90 = 7 : 6

19. (4) For vehicles of type-A :
Year. 2007 ⇒ From 45 thousand to 60 thousand
Year. 2011 ⇒ From 30 thousand to 70 thousand

20. (5) Required percentage $= \frac{50}{195}\times 100 = 26$

21. (2) It is obvious from the graph.
Ropar ⇒ difference
= 40 – 20 = Rs. 20/kg
Hoshiarpur ⇒ difference
= 90 – 30 = Rs. 60/kg
Chandigarh ⇒ difference
= 180 – 120 = Rs. 60/kg

Delhi ⇒ difference
= 130 – 90 = Rs. 40/kg
Jalandhar ⇒ difference
= 160 – 60 = Rs. 100/kg

22. (4) Required percentage

$$= \frac{60}{180} \times 100 = \frac{100}{3} = 33\frac{1}{3}\%$$

23. (3) Amount paid by Ram
= Rs. (3 × 130 + 2 × 90)
= Rs. (390 + 180) = Rs. 570

24. (1) Cost of 45 kg of grapes
= 45 × 190 = Rs. 8550
Cost price after discount of 4%

$$= 8550 - \frac{8550 \times 4}{100}$$

= 8550 – 342 = Rs. 8208

25. (3) Required ratio = 40 : 90
= 4 : 9 = $2^2 : 3^2$

26. (1) Required difference
= 20000 – 20000 = 0

27. (5) Required sum
= 10000 + 30000 = 40000

28. (1) Required number of students

$$= \frac{15000 \times 75}{100} = 11250$$

29. (4) Total students :
University–1 (2011) ⇒ 25000
University–1 (2010) ⇒ 20000

$$\text{Percentage increase} = \frac{5000}{20000} \times 100 = 25$$

30. (5) **Difference**
Year 2008 ⇒ 10 thousand
Year 2009 ⇒ 10 thousand
Year 2010 ⇒ 5 thousand
Year 2011 ⇒ 5 thousand
Year 2012 ⇒ 15 thousand

31. (1) Total number of candidates selected for company A = 80 + 40 + 100 + 330 + 280 + 200
= 1030
Assistant Managers + Junior Office Administrators
= (100 + 130 + 160) + (200 + 220 + 260) = 390 + 680 = 1070
Required ratio : 1030 : 1070
= 103 : 107

32. (2) Total candidates selected in company B
= 10 + 30 + 160 + 360 + 250 + 220 = 1030
∴ Required percentage

$$= \frac{250}{1030} \times 100 \approx 24\%$$

33. (3) Company C
Assistant Manager + Advertisement Office Assistant
= 130 + 290 = 420
Junior Office Administrator + HR Officer
= 260 + 50 = 310
Required percentage

$$= \frac{420}{310} \times 100 \approx 135\%$$

34. (4) Total number of HR Officers selected
= 80 + 10 + 50 = 140
∴ Required percentage

$$= \frac{140}{1030} \times 100 \approx 14\%$$

35. (5) Total candidates selected :
Company A ⇒ 1030
Company C ⇒ 1050
Required ratio = 1030 : 1050
= 103 : 105

36. (2) Diesel engine cars in state-2

$$= \frac{5}{14}\left(\frac{700 \times 28}{100}\right)$$

Petrolenginc cars in state-4

$$= \frac{1}{2}\left(\frac{700 \times 26}{100}\right) = \frac{5}{14} \times 196 = 70$$

$$= \frac{1}{2} \times 182 = 91$$

Difference = 91 – 70 = 21

37. (2) Petrol engine cars in state-3

$$= \frac{3}{8}\left(\frac{700 \times 32}{100}\right)$$

$$= \frac{3}{8} \times 7 \times 32 = 84$$

Diesel engine cars in state-1

$$= \frac{3}{7}\left(700 \times \frac{14}{100}\right) = 42$$

∴ Required percentage

$$= \frac{84}{42} \times 100 = 200$$

38. (4) Diesel engine cars in state-3

$$= \frac{5}{8} \times 700 \times \frac{32}{100} = 140$$

∴ Non-Ac diesel engine cars

$$= \frac{140 \times 3}{4} = 105$$

39. (5) Total cars in state-3 = $\frac{700 \times 32}{100} = 224$

Petrol engine cars in state-2

$= \frac{9}{14} \times 700 \times \frac{28}{100} = 126$

Difference = 224 – 126 = 98

40. (2) Petrol engine cars in state-1

$= \frac{4}{7} \times 700 \times \frac{14}{100} = 56$

$\therefore$ Required average = $\frac{56 + 126 + 84 + 91}{4}$

$= \frac{357}{4} = 89.25$

41. (1) Number of candidates who applied for Science

$= 88000 \times \frac{22}{100} = 19360$

Number of candidates selected for Science

$= 14400 \times \frac{24}{100} = 3456$

Required difference
= 19360 – 3456 = 15904

42. (2) Number of candidates who applied for Arts

$= 88000 \times \frac{17}{100} = 14960$

Number of selected candidates in Maths and English

$= 14400 \times \frac{38}{100} = 5472$

Required sum = 14960 + 5472 = 20432

43. (3) Required ratio
= (14 + 20) : (28 + 24)
= 34 : 52 = 17 : 26

44. (4) Number of applicants for English

$= 88000 \times \frac{24}{100} = 21120$

Number of selected candidates

$= \frac{14400 \times 28}{100} = 4032$

Required percentage = $\frac{4032}{21120} \times 100 \approx 19$

45. (5) Required average = $\frac{1}{3} \times \frac{14400 \times 66}{100} = 3168$

Calculations (46 – 48) :

Males = $\frac{2}{3} \times 240 = 160$,

Females = 80

Graduate Males = $\frac{15 \times 160}{100} = 24$

Non-graduate males = 160 – 24 = 136

Graduate females = $\frac{80 \times 3}{4} = 60$

Non-graduate females = 20

46. (3) Required difference = 24 – 20 = 4

47. (5) Required answer = 60 + 136 = 196

48. (2) Required ratio = 160 : 20 = 8 : 1

Calculations (49–53) :

Diamond $\Rightarrow \frac{600 \times 40}{100} = 240$

Ruby $\Rightarrow \frac{600 \times 20}{100} = 120$

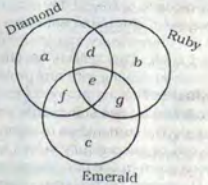
Emerald $\Rightarrow \frac{600 \times 10}{100} = 60$

Diamond + Ruby $\Rightarrow \frac{600 \times 5}{100} = 30$

Ruby + Emerald $\Rightarrow \frac{600 \times 3}{100} = 18$

Emerald + Diamond $\Rightarrow \frac{600 \times 4}{100} = 24$

Diamond + Emerald + Ruby $\Rightarrow \frac{600 \times 2}{100} = 12$



$a + d + e + f = 240$
$b + d + e + g = 120$
$c + f + e + g = 60$
$d + e = 30$
$e + g = 18$
$e + f = 24$
$e = 12$
$\therefore f = 24 - 12 = 12$
$g = 18 - 12 = 6$
$d = 30 - 12 = 18$
$c = 60 - 12 - 12 - 6 = 30$
$b = 120 - 30 - 6 = 84$
$a = 240 - 30 - 12 = 198$

49. (1) **50.** (2) **51.** (3) **52.** (4) **53.** (5)

DATA SUFFICIENCY

It is necessary to state at the first instance that unlike Percentage, Interest, Profit & Loss etc., the section *Data Sufficiency* is not an independent topic in itself. Rather, it makes use of the several topics discussed earlier. Questions under this section may be based on any topic, mathematical as well as non-mathematical. Although it is not an independent mathematical topic, it is certainly an important analytical concept. And hence, it requires to be discussed separately. These questions, in most cases, do not require exact solutions for arriving at the required answer. As the name suggests, we merely have to test whether the information or data given in the question are sufficient to find its solution. If yes, what part of the information is just enough to answer the question. There may be cases where all the details/data given in the problem together are not sufficient to arrive at the correct answer and require some additional information for finding the solution. Once again it is stressed that the question does not require finding complete solution of the problem or its exact answer rather it requires merely testing of whether the data furnished are sufficient for finding the solution and if yes, what parts of the data/information are just sufficient. It has become an important part in all competitive examinations as it tests one's analytical ability, capability to grasp the problem and visualise the inputs that may be essentially required to solve it (i.e; minimum inputs/data required), see if alternative solutions are possible and discard the unnecessary and irrelevant details to save time and effort. This reflects on one's efficiency and effectiveness in dealing with any problem.

A typical Data Sufficiency problem usually contains a question followed by two statements providing certain information. The student has to ascertain whether the example can be successfully solved with the help of informations given in the first statement and/or in the second statement. Sometimes, either of the two statements are sufficient to obtain a solution. At other times, even the information given in the both the statements together may not be sufficient to find the solution. Data Sufficiency examples test students' knowledge to determine the information requirements necessary to solve a given problem rather than actually solving it. Thus, it becomes a test of knowledge of one's mathematical formulae, skills and application of these to tackle the "real life" situations. Further, the student must be able to determine the "minimum" information required to solve the problem in order to arrive at the most appropriate choice. The point to be noted is, "except the information provided in the question and the statements, nothing should be assumed and taken for granted."

The questions in the Data Sufficiency section carry following directions on the basis of which answers have to be marked in the answer sheet.

Directions : The question consists of a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements are sufficient to answer the question. Read the question and both the statements and—

Given answer (1) if the data in statement I alone are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question.

Give answer (2) if the data in statement II alone are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question.

Give answer (3) if the data either in statement I alone or in statement II alone are sufficient to answer the question.

Give answer (4) if the data even in both the statements I and II together are not sufficient to answer the question.

Give answer (5) if the data in both the statements I and II together are necessary to answer the question.

As we can see the questions on "Data Sufficiency" and their solutions are going to be on different patterns as compared to conventional mathematical problems. The question here is presented in parts and not in a consolidated form. Further, the answer has to be selected by making the right choice from amongst the five options detailed in the "Directions" above rather than actually solving the problem to arrive at the correct answer. This scheme of presentation of question and choice of interrelated answers often lead the student into a confusing state of mind. Therefore, while attempting to solve questions in this section, one should proceed in a systematic way and with clarity. Eliminate the choices which you are sure is wrong or not possible.

By looking at the format of the question, it is prudent first to try statement I. See whether the data provided in this statement are sufficient.

There are two possibilities :

(i) the data provided in the statement I alone would be sufficient to answer the question, or

(ii) the data provided in the statement I alone would not be sufficient to answer the question.

If the answer to (i) is 'YES' then either Option (1) or Option (3) is the answer.

If the answer to (i) is 'NO' then either Option (2), Option (4) or Option (5) is the answer.

In both the cases we can eliminate two or three answer choices easily.

It is clear that the question has to be answered on the basis of two given statements, besides using other common information furnished in the example itself. There can be 3 positive possible combinations of two given statements namely,

(i) Statement (I) alone
(ii) Statement (II) alone and
(iii) Statements (I) and (II) taken together.

Therefore, the question needs to be examined successively in context of these three options. While examining or solving the question at each of the above three stages, either dicard the impossible wrong choices or select the possible right choices of answers.

The above suggested step-by-step approach is illustrated diagramatically for eaiser understanding and avoiding confusion in selecting the right answer choice.

Step-by-Step Approach

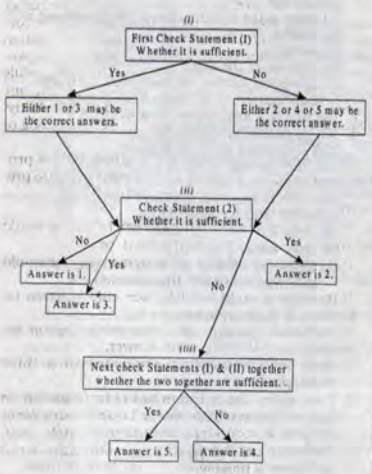
Step I : First, check whether the question can be answered with statement (I) alone.

Step II : Next check whether the question can be answered with statement (II) alone.

These two are the minimum checks that have be performed in each question to reach at or near the appropriate choice. If answer to either Step I or Step II is "YES" there is no need to proceed to the next Step III.

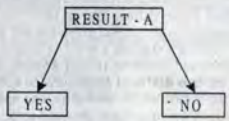
Step III : If answers to both Steps I and II are "No", check whether answer can be found with the help of both the statements (I) and (II) taken together.

If answer to Step (III) is also "No", the process ends here and there is no need to proceed further and try any other permutation & combination. This gives the conclusion that even statements (I) and (II) together are not sufficient to answer the question.



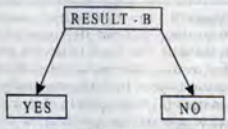
The above chart can be simplified into various steps:

Step I : Examine whether statement I alone is sufficient to answer the question.



In both the cases move to Step II.

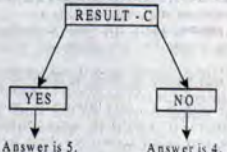
Step II : Examine whether statement II alone is sufficient to answer the question.



Step III : Try to arrive at the answer with the help of results obtained in Step I and Step II.

RESULT - A	RESULT - B	Inference
YES	YES	Answer is 3.
YES	NO	Answer is 1.
NO	YES	Answer is 2.
NO	NO	Move to Step IV

Step IV : Examine whether both the statements I and II together are sufficient to answer the question.



Points to Remember

(a) Don't waste your precious time in actually solving the problem because you are required only to test the sufficiency of given information for finding the solution and not to find the exact numerical answer.

(b) When the example contains geometrical figures, don't take the value of its dimensions by measuring with scale where dimensions are not given. Also, don't make unwarranted assumption on the basis of appearance of the figure. These derivations and assumptions may be misleading as these figures may not have been drawn to scale. Answers should always be based on the information, provided in the example/ statements.

(c) If the question is of the form, "What is the value of, say, quantity x", the solution has to be unique. The information given in the example should be checked for finding the unique solution/answer. Solutions lead-

ing to more than one answer, in such cases should not be accepted as correct. For example, a quadratic equation in x on solving gives two values for x, a cubic equation gives three values and so on.

For example, $x^2 - 4 = 0$ gives $x = +2$ and -2.

$x^3 - x^2 - 4x + 4 = 0$ gives $x = +1, +2$ and -2.

(d) If a question involves two unknown quantities, there must be **two distinct** equations to solve it. Otherwise, either it cannot be solved or the solution will not be unique. Two equations are said to be distinct if they are independent of each other i.e., one can't be deduced from the other.

ILLUSTRATIVE EXAMPLES BASED ON MEMORY

Directions (1 – 5) : Each of the questions below consists of a question and two statements numbered I and II given below it. You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and—

Give answer (1) if the data in statement **I alone** are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question.

Give answer (2) if the data in statement **II alone** are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question.

Give answer (3) if the data **either** in statement I alone or in statement II alone are sufficient to answer the question.

Give answer (4) if the data given in both the statements I and II together are **not** sufficient to answer the question, and

Give answer (5) if the data in both the statements I and II together are necessary to answer the question.

1. What will be the amount at the end of 2 years, if the interest is compounded yearly.

I. The simple interest on the same sum for a period of 2 years is Rs. 400 at the same rate of 5% per annum.

II. The difference between the simple interest and the compound interest for 2 years at the rate of 5% per annum is Rs. 100.

2. Find the average of five consecutive odd numbers.

I. The difference of fifth number and the first number is 7.

II. The sum of the first two numbers is 5 more than the fifth number.

3. Find the ratio of the area of the bigger circle and smaller circle.

I. The radius of the smaller circle is 24 cm.

II. The difference between the radii of bigger and the smaller circles is 3 cm.

4. What is the length of the train ?

I. The train crosses a signal post in 9 seconds.

II. If the train with speed x kmph crosses another train 100m long coming from the opposite direction at 60 kmph in 15 seconds.

5. Find the radius of the semi-circle.

I. The area of semi-circle is equal to the area of the rectangle.

II. The breadth of rectangle is 5 cm less than its length and its perimeter is 50 cm.

[1 to 5: SBI Management Executive Exam, 22.02.2014]

Directions (6–10) : In these questions, a question is given followed by information in three statements. You have to consider the information in all the three statements and decide the information in which of the Statement(s) is not necessarily required to answer the question and therefore can be dispensed with. Indicate your answer accordingly.

6. How many students from Institute 'A' got placement ?

I. Number of students studying in Institutes A and B are in the ratio of 3:4 respectively.

II. Number of students who got placement from Institute B is 120% of the number of students who got placement from Institute A.

III. 80% of the students studying in Institute B got placement.

(1) None of the statements can be dispensed with
(2) Only I
(3) Only II
(4) Anyone of the three
(5) Question cannot be answered even with the information in all three statements

7. What is the monthly income of Mr. X ?

I. Mr. X spends 85% of his income on various items and remaining amount is saved.

II. Monthly savings of Mr. X are Rs.4,500

III. Out of the total money spent by Mr. X in a month, one-fifth is spent on food and remaining amount of Rs.20, 400 on other items.

(1) Only II (2) Only III
(3) Only either II or III
(4) Question cannot be answered even with the information in all three statements
(5) None of these

8. What is Suchitra's present age ?

I. Suchitra's present age is double the age of her son.

II. Ratio between present ages of Suchitra and her mother is 2 : 3 respectively.

III. Four years hence the ratio between Suchitra's age and her son's age will be 13 : 24 respectively.

(1) Only II (2) Only III
(3) Either I or II only
(4) Either II or III only (5) None of these

9. What is Neeta's share in the profit earned at the end of 2 years in a joint business run by Neeta, Seeta and Geeta ?

I. Neeta invested Rs. 85,000 to start the business.

II. Seeta and Geeta joined Neeta's business after six months investing amounts in the ratio of 3 : 5 respectively.

III. Totat amount invested by Seeta and Geeta is Rs.2.3 lakhs.

(1) Only II (2) Only III

(3) Only either II or III

(4) Information in all the three statements is required for answering the question.

(5) Question cannot be answered even with the information in all three statements.

10. What is the labelled price of the article ?

I. Cost price of the article is Rs.500.

II. Selling price after offering 5% discount on the labelled price is Rs. 608.

III. Profit earned would have been 28% if no discount was offered.

(1) Only I (2) Only III

(3) Only II and III (4) Only I and III

(5) Only I and II

ANSWERS WITH EXPLANATIONS

1. (3) From statement I,

$$P = \frac{S.I. \times 100}{R \times T} = \frac{400 \times 100}{5 \times 2} = \text{Rs. } 4000$$

Using,

$A = P\left(1 + \frac{R}{100}\right)^T$, amount can be determined.

From statement II,

$$\text{Difference} = \frac{PR^2}{(100)^2}$$

We can find principal and hence amount.

2. (4) From both the statements, we get no result.

3. (5) From both statements,

$r_1 = 24$ cm

$r_2 - r_1 = 3$ cm

$\Rightarrow r_2 = r_1 + 3 = 24 + 3 = 27$ cm

$$\therefore \text{Required ratio} = \frac{\pi r_2^2}{\pi r_1^2} = \frac{r_2^2}{r_1^2} = \frac{27^2}{24^2} = \frac{81}{64}$$

4. (5) From both the statements,

If the length of the train be y metre,

$$\text{Speed of train} = \frac{y}{9}\text{ m/sec} = \frac{5y}{9 \times 18}\text{ kmph}$$

$$\text{Again, } \left(\frac{5y}{9 \times 18} + 60\right) \times \frac{15}{60 \times 60} = \frac{y + 100}{1000}$$

$$\Rightarrow \left(\frac{5y}{162} + 60\right) \times \frac{15}{36} = \frac{y + 100}{10} \quad \ldots(i)$$

It is to be noted that when a train crosses a pole, the distance covered = length of the train. When it crosses another train,

Relative speed × time = sum of lengths of both trains.

Hence, from equation (i), we can determine length of train.

5. (5) From statement II,

length = x cm, breadth = $(x - 5)$ cm

$\therefore 2(x + x - 5) = 50$

$\Rightarrow 2x - 5 = 25$

$\Rightarrow 2x = 25 + 5 = 30$

$\Rightarrow x = 15$ cm = length

$\therefore$ Breadth = $15 - 5 = 10$ cm

From statement I,

$$\frac{\pi r^2}{2} = 15 \times 10 \Rightarrow \pi r^2 = 300 \Rightarrow r = \sqrt{\frac{300}{\pi}}$$

This gives us value of radius.

6. (5) From statement I,

Let the number of students in the institutes A and B be $3x$ and $4x$ respectively. However we get no conclusive answer by using data given in all the statements.

7. (3) From statements I and II,

Let Mr. X's monthly income = Rs. x. Then,

$$\frac{15 \times x}{100} = 4500 \Rightarrow x = \frac{4500 \times 100}{15} = \text{Rs. } 30000$$

From statements I and III,

$$x \times \frac{4}{5} \times \frac{85}{100} = 20400$$

$$\Rightarrow x = \frac{20400 \times 5 \times 100}{4 \times 85} = \text{Rs. } 30000$$

8. (1) From statements I and III,

Let Suchitra's son's present age be x years.

$\therefore$ Suchitra's present age = $2x$ years

After 4 years,

$$\frac{2x + 4}{x + 4} = \frac{13}{24}$$

We can get the required answer by this relation.

9. (4) From all three statements,

Seeta's investment

$$= \text{Rs. } \left(\frac{3}{8} \times 2.5\right) \text{lakh} = \text{Rs. } 93750$$

Geeta's investment = Rs. 156250

Ratio of Neeta's, Seeta's and Geeta's profit

$= 85000 \times 24 : 93750 \times 18 : 156250 \times 18$

We can get the share of Neeta if total profit is given.

10. (4) Let the marked price of the article be Rs. x.

From statement II,

$$\frac{95 \times x}{100} = 608 \Rightarrow x = \frac{608 \times 100}{95} = \text{Rs. } 640$$

From statements I and III,

$$\text{Marked price} = \frac{128 \times 500}{100} = \text{Rs. } 640$$

PROBABILITY

Human life is full of uncertaintities. In our day to day life we very often make guess and give statements like : "Possibility of a particular party to win this election is more", "Most probably it will be sunny day today"; "It is almost certain that Ramesh will compete in Bank P.O. Exam." Whenever we use such statements we have intuition which enables us to claim that one event is more likely to happen than the other. In probability theory, the degree of certainty and uncertainty is measured in terms of numbers lying between 0 and 1.

SOME BASIC CONCEPTS

1. Experiment : An operation which results in some well defined outcomes is called an experiment.

2. Random Experiment : An experiment whose outcome cannot be predicted with certainty is called a random experiment. In other words if an experiment is performed many times under similar conditions and the outcome each time is not the same, then this experiment is known as a random experiment.

Remark : An experiment whose **outcome** cannot be predicted before hand is not a random experiment. For example, when we throw an apple upward, it is certain that it will come to the earth falling downward. So, throwing an apple upward is not a random experiment

Examples : (i) "Tossing of a fair coin" is a random experiment because if we toss a coin either a head or a tail will come up. But if we toss a coin again and again, the outcome in each case will not be the same.

(ii) "Drawing a card from a well shuffled pack of 52 playing cards" is a random experiment.

(iii) "Throwing an unbiased dice" is a random experiment since when we throw a dice, we cannot say with certainty that a particular number ranging from 1 to 6 will come up.

3. Trial and Elementary Events : When an experiment is repeated under similar conditions and it does not give the same result each time but may result in any one of the several possible outcomes, the experiment is called a trial and the outcomes are called cases. The number of times the experiment is repeated is called the number of trials.

For example,

(i) Tossing of a coin is a trial and getting a head or a tail is case or elementary event.

(ii) Throwing of a dice is trial and getting 3 on its upper face is an elementary event or case.

(iii) One toss of a coin is a trial when the coin is tossed 5 times.

(iv) Drawing a card from a pack of a well shuffled cards is a trial and getting a king of diamond is an elementary event.

4. Exhaustive Number of Cases : The total number of possible outcomes of a random experiment in a trial is known as the exhaustive number of cases. In other words the total number of elementary events of a random experiment is called the exhaustive number of cases. It is generally denoted by n (S).

For example,

(i) In throwing of a dice the exhaustive number of cases is 6, since any one of the six faces marked with 1, 2, 3, 4, 5, 6 may come uppermost.

(ii) In drawing 2 cards from a well-shuffled pack of 52 cards, the exhuastive number of cases is $^{52}C_2$ since 2 cards can be drawn out of 52 cards in $^{52}C_2$ ways.

(iii) In drawing three balls from a bag containing 3 white, 5 black and 3 red balls, the exhaustive number of cases is $^{11}C_3$ since 3 balls can be drawn out of (3 + 5 + 3) = 11 balls in $^{11}C_3$ ways.

5. Equally Likely Events : Events are equally likely if there is no reason for an event to occur in preference to any other event.

Thus when an unbiased dice is thrown all the six faces 1, 2, 3, 4, 5 and 6 are equally likely to come up.

Similarly when an unbiased coin is tossed occurrences of head and tail are equally likely cases.

6. Favourable Number of Cases : The number of cases favourable to an event in a trial is the number of elementary events such that if any one of them occurs, we say that the event happens.

In other words, the number of cases favourable to an event in a trial is the total number of elementary events such that the occurrence of any one of them ensures the happening of the event. It is generally denoted by n (E).

For examples,

(i) In tossing of a dice, the number of cases favourable to the appearance of a multiple of 2 is 3 viz 2, 4, 6.

(ii) In drawing two cards from a pack of 52 cards, the number of cases favourable to drawing 2 kings is $^4C_2$.

Mathematical Definition of Probability : If there are n elementary events associated with a random experiment and m of them are favourable to an event E, then the probability of happening of E is denoted by P (E) and is defined as the ratio m/n.

$$\text{or, } P(E) = \frac{\text{Number of cases favourable to event A}}{\text{Total no. of cases}}$$

$$\text{or, } P(E) = \frac{\text{No. of desired events}}{\text{Total no. of events}} = \frac{n(E)}{n(S)}$$

$$= \frac{\text{Favourable number of cases}}{\text{Exhaustive number of cases}}$$

Note : 1. Probability of occurrence of an event is a number lying between 0 and 1.

2. Probability of a certain event = 1.

3. Probability of happening an event + of not happening an event = 1

Some information about playing cards :

1. A pack of 52 playing cards has 4 suits.

(a) Spades (b) Hearts
(c) Diamonds (d) Clubs.

2. Spades and clubs are black faced cards.

Spades  Club 

3. Hearts and diamonds are red faced cards.

Hearts  Diamonds 

4. Each suit consists of 13 cards.

5. The aces, kings, queens, jacks are called face cards or honours cards.

Sample Space : The set of all possible outcomes of a random experiment is called the sample space and is denoted by S. No. of events in S = n (S).

Let us consider the folowing questions asked in previous exams.

1. An urn contains 9 red, 7 white and 4 black balls. If two balls are drawn at random, find the probability that both the balls are red.

(1) $\frac{17}{95}$ (2) $\frac{18}{95}$

(3) $\frac{1}{12}$ (4) $\frac{91}{190}$

(5) None of these

Directions (2-3) : Answer the following questions based on the information given below.

A bowl contains 4 red, 3 green, 2 blue and 5 black marbles.

2. If two marbles are drawn at random, what is the probability that they are green ?

(1) $\frac{4}{91}$ (2) $\frac{51}{91}$

(3) $\frac{4}{13}$ (4) $\frac{1}{13}$

(5) None of these

3. If four marbles are drawn at random, what is the probability that two are red and two are blue ?

(1) $\frac{6}{1001}$ (2) $\frac{1}{143}$

(3) $\frac{1}{13}$ (4) $\frac{6}{91}$

(5) None of these

4. A bag contains 7 blue balls and 5 yellow balls. If two balls are selected at random, what is the probability that none is yellow ?

(1) $\frac{5}{33}$ (2) $\frac{5}{22}$

(3) $\frac{7}{22}$ (4) $\frac{7}{33}$

(5) $\frac{7}{66}$

5. A die is thrown twice. What is the probability of getting a sum 7 from both the throws ?

(1) $\frac{5}{18}$ (2) $\frac{1}{18}$

(3) $\frac{1}{9}$ (4) $\frac{1}{6}$

(5) $\frac{5}{36}$

[4 to 5 : SBI PO Exam, 28.04.2013]

ANSWERS WITH EXPLANATIONS

1. (2) There are 20 balls in the urn out of which 2 balls can be drawn in $^{20}C_2$ ways.

$\therefore$ Total number of elementary events = $^{20}C_2 = 190$

There are 9 red balls out of which 2 balls can be drawn in $^9C_2$ ways.

$\therefore$ Favourable number of elementary events = $^9C_2 = \frac{9\times8}{1\times2} = 36$

$\therefore$ Required probability = $\frac{36}{190} = \frac{18}{95}$

2. (5) There are 14 marbles in the bowl out of which 2 marbles can be drawn in $^{14}C_2$ ways.

So, exhaustive number of cases

$= {}^{14}C_2 = \frac{14\times13}{1\times2} = 91$

There are 3 green marbles in the bowl.

$\therefore$ Favourable number of cases

$= {}^3C_2 = 3$

$\therefore$ Required probability = $\frac{3}{91}$

3. (1) Exhaustive number of cases

$= {}^{14}C_4 = \frac{14\times13\times12\times11}{1\times2\times3\times4} = 1001$

Favourable number of cases

$= {}^4C_2 \times {}^2C_2 = 6 \times 1 = 6$

$\therefore$ Required probability = $\frac{6}{1001}$

4. (3) Total possible outcomes

= selection of 2 balls out of 12 balls

$= {}^{12}C_2 = \frac{12\times11}{1\times2} = 66$

Favourable outcomes = selection of 2 balls out of 7 blue balls = $^7C_2 = \frac{7\times6}{1\times2} = 21$

$\therefore$ Required probability = $\frac{21}{66} = \frac{7}{22}$

5. (4) Total possible outcomes = 6 × 6 = 36

Favourable outcomes = (1, 6) (6, 1) (2, 5), (5, 2), (3, 4), (4, 3) = 6

$\therefore$ Required probability = $\frac{6}{36} = \frac{1}{6}$