Chapter 13

Problem Solving

INTRODUCTION

In this chapter you will see some typical problems in which you would be given a series of interlinked information and on the basis of those informations you would be expected to reach certain conclusions.

TYPES OF INFORMATIONS IN A GIVEN PROBLEM

1. Basic Informations

(Useful secondary informations): It is given in first couple of sentences of given data are such that they give you some basic information that is essential to give you general idea of the situation.

2. Actual Informations

Whatever remains after the basic informations are known as actual information.

While trying to solve a problem one should begin with actual information and useful secondary information should be solve by mind.

3. Negative Informations

Actual informations having negative sentences are called negative information. A negative information does not inform us anything exactly but it gives a chance to eliminate a possibility.

TYPES OF PROBLEMS

1. Simple problems (based on categorisation)
2. Problems based on arrangement (Linear, circular, rectangular/ square).
3. Problems based on comparison.
4. Problems based on blood relations.
5. Blood relations and profession based problems.
6. Problems based on conditional selection.

1. SIMPLE PROBLEMS BASED ON CATEGORISATION

Tips to Solve Problems

These type of problems can easily be solved by construction of table.

EXAMPLE **1 Directions : Read the following information carefully and answer the question that follows:**

1. There are six cities L, M, N, O, P and Q.
2. L is not a hill station.
3. M and P are not historical places.
4. O is not an industrial city.
5. L and O are not historical cities.
6. L and M are not alike.

Q. Which two cities are industrial centres ?

Sol. It can be solved by preparing a table in the manner given below:

	L	M	N	O	P	Q
Historical place						
Industrial city						
Hill station						

(2), (3), (4), (5) are negative informations. Therefore as per such informations. We put 'X' (not) mark wherever applicable. As a result the table looks like the one below.

	L	M	N	O	P	Q
Historical place	×	×		×	×	
Industrial city				×		
Hill station	×					

As above table gives definite informations about L, O. L is neither a historical place nor a hill station. So, it must be an industrial city. In the same manner O is neither a historical nor an industrial city. So, O must be a hill station. Hence, we put '✓' mark at the appropriate place which give the table following look:-

	L	M	N	O	P	Q
Historical place	×	×		×	×	
Industrial city	✓			×		
Hill station	×			✓		

Now, as per the condition (6) (L and M are not alike), M can not be an Industrial city. Also M is not a historical place either. Therefore, it is very obvious that M is a hill station.

Again, in the given problem there is no negative information about N. Hence, we can assume that N is a hill station as well as a historical place and an industrial city. Combining if these aspects, the following table will be prepared finally.

	L	M	N	O	P	Q
Historical place	×	×	✓	×	×	✓
Industrial city	✓	×	✓	×	✓	✓
Hill station	×	✓	✓	✓	✓	✓

Now, after analysing the given question we get the answer:-
So, P and Q are two industrial centres.

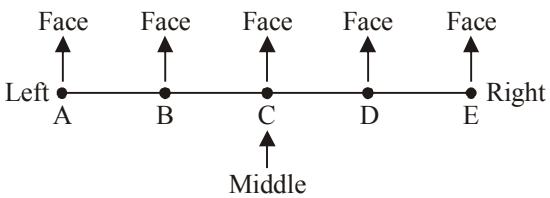
2. PROBLEMS BASED ON ARRANGEMENT

In such problems a group of people, objects, etc, may have to be is arranged in a row, or in a circle or any other way.

Linear Arrangement

one row sequence

(A) When direction of face is not clear, then we take ourself as base and then the diagram will be as follows

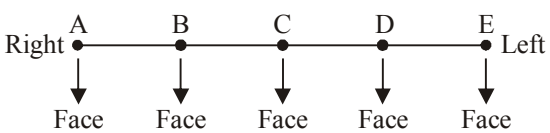


From the above diagram, it is clear that

(i) B, C, D, E are **right** of A but **only** B is the **immediate right** of A.

(ii) D, C, B, A are **left** of E but **only** D is the **immediate left** of E.

(B) When direction of face is towards you, then the diagram will be as follows



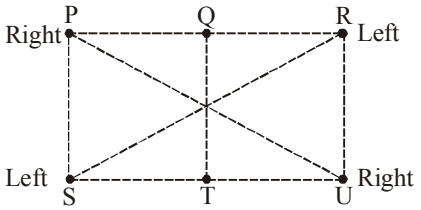
From the above diagram, it is clear that

(i) B is **immediate left** of A, C is **immediate left** of B; D is **immediate left** of C and E is **immediate left** of D.

(ii) D is **immediate right** of E; C is **immediate right** of D; B is **immediate right** of C; and A is **immediate right** of B.

two rows sequence

Let us see 6 persons seating in two rows



From the above diagram, it is clear that

(i) P is sitting **opposite** S.
(ii) Q is sitting **opposite** T.
(iii) R is sitting **opposite** U.
(iv) P and U are sitting at **diagonally opposite** positions.
(v) S and R are sitting **diagonally opposite** positions.

Note: Point to be noted that in arrangement problems, the actual information can be classified into 2 categories:-

(a) Definite information

A definite information is one when the place of object/man is definitely mentioned.

(b) Comparative information

In such information the place of object/man is not mentioned definitely but only a comparative position is given. In other words the positions of objects/men are given in comparision to another objects/men.

❑ Shortcut Approach

Step I. Sketch a diagram of empty places
Step II. Fill up as many empty places as possible using all the definite informations.
Step III. With the help of comparative information consider all possibilities and select the possibilities which does not violate any condition.

EXAMPLE 2. Directions : Just read the following information carefully to answer the questions given below it:

Five friends P, Q, R, S, and T are sitting on a bench.

(1) P is sitting next to Q.
(2) R is sitting next to S.
(3) S is not sitting with T.
(4) T is on the last end of the bench.
(5) R is on the 2nd position from the right.
(6) P is on the right of Q and T.
(7) P and R are sitting together.

Q. All what position is P sitting?

Sol.

Here, 4th and 5th sentences constitute definite information:
Comparative informations are: 1st, 2nd, 6th and 7th sentences while 3rd is a negative information.
Now, start with definite information, sketch the following arrangement:-

T __ __ R __

Now, this is the time to look for the comparative informations that tell about T and R. Such informations are 2nd, 6th and 7th sentences. Take the 7th and the 1st sentence. If P and R are together and also Q and P are together, then P must be between Q and R. Now the arrangement take the form as:-

T Q P R ____

By the virtue of the 2nd sentence:

T Q P R S

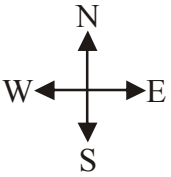
So, P is sitting between Q and R.

Circular Arrangement

Circle is the most important case from the exam point of view. Most of the times Circle kind of statements are there in exams.

From the exam point of view, in most cases they give 8 persons sitting in the circle. But before solving the important thing is their ' Sitting Position '.

Step 1. Knowing NEWS! N= North , E= East , W=West , S= South

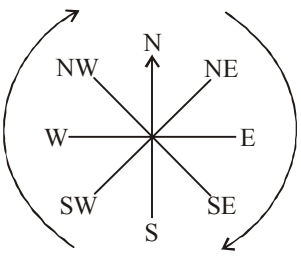


To remember this just remember combination ' North - South ' & ' West - East ' which comes together to each other respectively.

Step 2 : Picking Left & Right .

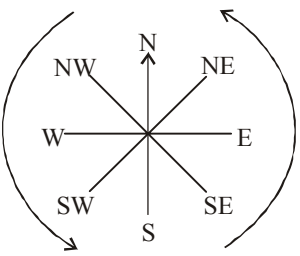
- Facing Center

Clock wise = Left



- Facing Outside

Anti - Clock wise = Right



If it is mention in the statement that all is facing outside then just do opposite of above like this:

Clock wise = Right & Anti-clock wise

= Left

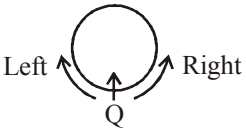
Step 3 : Solving step wise the statement or Following the statement.

❑ Shortcut Approach

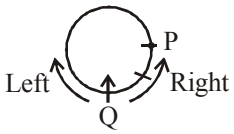
- Imagine yourself as one of the persons given in the question.
- Count how many people are mentioned in the question. Then draw a circle with those many lines.

- Imagine yourself at the position shown by the box.
- Now your left hand is the left side and right hand is the right side.
- Now, if in question it is given, P is second to the right of Q, approach as follows.

→ Imagine yourself as Q.



→ Now, P is second to right of Q. The right of Q is your right side. So, place P two places from Q towards its right.

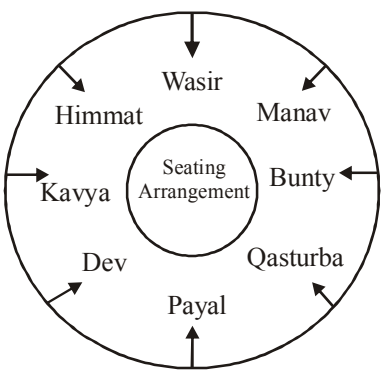


EXAMPLE **3. Directions Study the following information carefully and answer the question given below.**

Bunty, Dev, Manav, Kavya, Payal, Qasturba, Wasir and Himmat are sitting around a circle facing at the centre. Manav is to the immediate right of Bunty who is 4th to the right of Kavya. Payal is 2nd to the left of Bunty and is 4th to the right of Wasir. Qasturba is 2nd to the right of Dev who is 2nd to the right of Himmat.

Q. Who is 3rd to the right of Bunty?

Sol.



Now, look at the given question and check that you get the answer.

So, Himmat is 3rd to the right of Bunty.

3. PROBLEMS BASED ON COMPARISON

In such problems comparison of different objects or persons has to be made. Such comparisions are done on the basis of marks, ages heights, etc.

Method to Solve

If you give a serious look to the problem you will find that such problems are as same as the arrangement problems. Therefore, we have to go like arrangement problem while solving problems based on comparison.

EXAMPLE **4. Directions : Read the informations given below to answer the given question:**

(1) 7 students A, B, C, D, E, F and G take a series of tests.

(2) No two students obtain the same marks.

(3) G always scores more than A.

(4) A always scores more than B.

(5) Each time either C scores the highest and E gets the least, or alternatively D scores the highest and F or B scores the least.

Q. If D is ranked 6th and B is ranked 5th, which of the following can be true?

Sol.

In this case, we see there is no definite information. Sentence 5 gives a definite information but it is conditional. Still, we draw all the possibilities based on sentence 5.

(1) C __ __ __ __ __ __ E

or, (2) D __ __ __ __ __ __ F

or, (3) D __ __ __ __ __ __ B

We see that the two additional informations (3) and (4) are inadequate to reach a definite conclusion. Hence, keeping these in mind. We move on to the given questions.

D is ranked 6th and B is 5th. This does mean that possibilities (2) and (3) are violated. Hence, possibility (1) must be true. Thus, we have:

C _____ B D E

Also by virtue of (3) and (4) we can have only one arrangement for G, A and B which is GAB. Accordingly, there are two possibilities:

C G F A B D E

or, C G A F B D E

So, if D is ranked 6th and B is ranked 5th, then f is ranked 3rd or 4th.

4. PROBLEMS BASED ON BLOOD RELATION

Such problems involves analysis of certain blood relations.

❑ Shortcut Approach

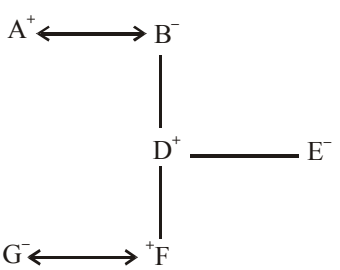
(i) Vertical/diagonal lines to represent parent-child relationships.

(ii) Single/double horizontal line like $(\leftrightarrow / \Leftrightarrow)$ to represent marriages.

(iii) A dashed line (—) for brother and sister relationship.

(iv) '+' sign for male and '–' sign for female

For example.



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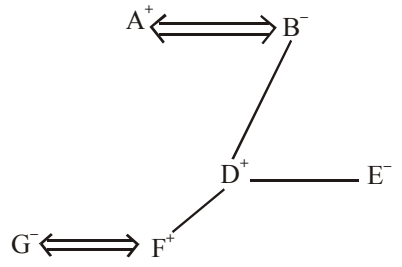

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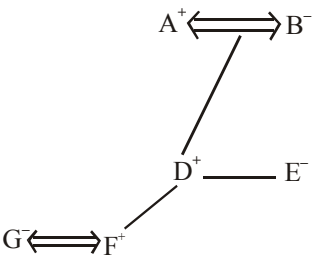


The above diagrams tells us:-

(a) A and B are couple; A is the husband while B is the wife.

(b) D is son of A and B while E is daughter of A and B.

(c) D is the brother of E and E is the sister of D.

(d) D has a son F

(e) F and G are couple; F is the husband and G is the wife.

(f) F is the grandson of A and B.

(g) G is the daughter in law of D.

(h) E is the aunt (Bua) of F

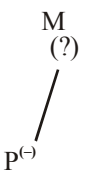
(i) There are 3 males (A, D and F) and 3 females (B, E, G)

EXAMPLE **5. Directions : Read the following information carefully and answer the question given below:**

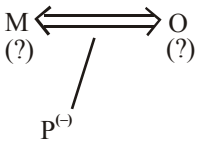
There are 6 members in a family. They are M, N, O, P, Q, R are travelling together. N is the son of O but O is not the mother of N. M and O are a married couple. Q is the brother O. P is the daughter of M. R is the brother of N.

Q. How many male members are there in the family?

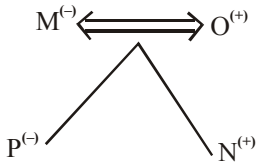
Sol. Here, all the sentences are actual information except the first out of these the 2nd and the fifth sentences give information on parent child relationship. We can begin with either of the two. Let us begin with the 6th sentence. Our diagram will be as



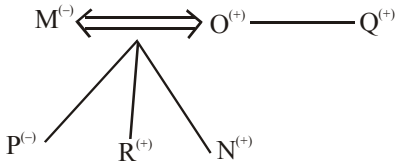
As, we do not want to make many diagrams and instead we would prefer to only add to the existing diagsams. Therefore, we should look for sentences that talk of M or P. The 3rd sentence talks about M. Hence, we add this information, that M and O are married couple in our diagram.



Now, the 2nd sentence talks about O. It says that N is the son of O but O is not the mother of N. Obviously, O must be the father of N. This means O is a male and hence M must be a female. Now our diagram takes the form as following:-



Now, we add the two sentences 'Q is the brother of O' and 'R is the brother of N' and we get the final diagram as below:-



So, there are 4 male members in the family.

5. PROBLEMS BASED ON BLOOD RELATIONS AND PROFESSION

Such problems are very much similar to the problems related to blood relation. What makes it different is the addition of new data:- the professions of family members. You will get the more clear idea about this type of problem.

EXAMPLE **6. Directions : Read the following information carefully and answer the question given below it:**

(1) A, B, C, D, E and P are members of a family.

(2) There are two married couples.

(3) B is an engineer and the father of E

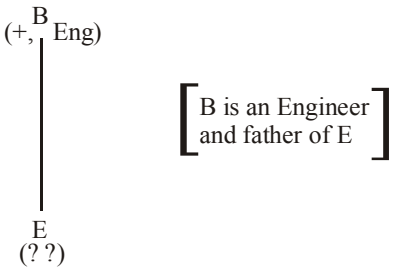
(4) P is the grandfather of C and is a lawyer.

(5) D is the grandmother of E and is a housewife.

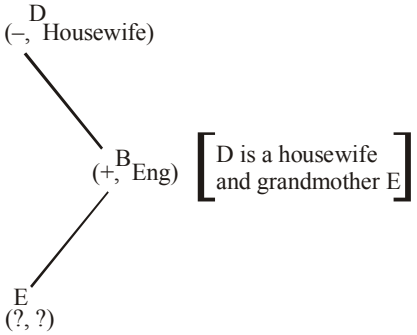
(6) There is one engineer, one lawyer, one teacher, one housewife and two students in the family.

Q. Who is the husband of A?

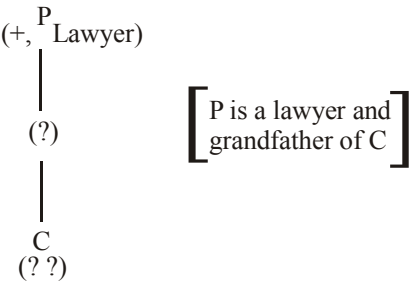
Sol. Here, (1), (2), and (6) are useful secondary informations. While (3), (4) and (5) are the actual informations. We start with the 3rd sentence because it mentions a parent. Child relationship its diagram can be made as the following:-



Now, we move on to another sentence that involves either B or E. You see that the 5th sentence gives some information about E. It says that D is the grandmother E. Point to be noted that if D is the grandmother of E, then the son of D must be father of E and hence B is the son of D. Now, the diagram takes the following form.

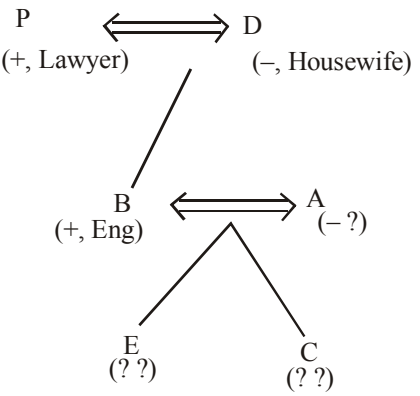


Now, the 4th sentence has the remaining information and diagram for it is given below:-



Now, we see that we have ended up with two different component. Then how to resolve this deadlock? The answer is simple: - to resolve it, we make use of the given useful secondary information (USI).

"There are two married couple in the family." Clearly, the two possible pairs are of grandfather, grandmother and father, mother. Therefore, we combine the two diagrams into the following way.



Point to be noted that the professions of A, E and C are yet unknown. However, with reasonable justification, we may assume that the mother (A) should be the teacher and the two children

E and C should be students. But this conclusion can be challenged and has no reason at all.

Apart from that the sexes of E and C can not be determined. So, B is husband of A.

6. PROBLEMS BASED ON CONDITIONAL SELECTION

In this type of problems, a group of objects/persons has to be selected from a given larger group, as per the given restrictions. You will get the better idea of such type of problem from the problem given below:-

EXAMPLE **7. Directions : Study the following information carefully and answer the question given below:-**

From, amongst 6 boys J, K, L, M, N, and O and 5 girls P, Q, R, S and T, a team of 6 is to be selected under the following conditions:-

(i) J and M have to be together.
(ii) L can not go with S.
(iii) S and T have to be together.
(iv) K can not be teamed with N.
(v) M cannot go with P.
(vi) K and R have to be together.
(vii) L and Q have to be together.

Q. If there be 5 boys in the team, then the lone girl member is ------

Sol. Make the group of all the pairs that have to be together on one side and the pairs that must not be together on the other side. Next, read each of the questions and treat that as an additional information. Finally, analyse the possibilities and choose the possibilities that satisfies all the conditions. Let us see the process below:-

Firstly, we can summarise the conditions in the following way:-

J, M	S, T
(+)(+)	(−)(−)
K, R	L, Q
(+)(−)	(+)(−)

→ Group 'must be together'.

L, S,	K, N,	M, P
(+)(−)	(+)(+)	(+)(−1)

→ Group never be together'

Here, number of boys are 5. We see than K and N can never be together. Therefore, there are only two ways of selecting 5 boys:- JKLMO and JNLMO. But the possiblity is not possible because if K would go then R should also go, and if L goes than Q should also go. Hence, JNLMO is the only possibility in which L's friend Q would be the lone girl member.

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