

LOGICAL GAMES

LOGICAL GAMES involve puzzles in which the relationships among the groups of objects, people, cities, activities etc. are given. These puzzles may deal with such things as making a group, seating arrangement, scheduling the activities etc. After reading and analyzing the statement, you'll be asked to answer three to seven questions about the relationships given, which require you to accurately interpret the information given as well as draw logical inferences about relationships.

The analytical games can be categorized as follows:

1. Sequencing games
2. Grouping games
3. Matching games
4. Hybrid games
5. Mapping games

SEQUENCING GAMES

In these types of games you have to put the entities (persons, teaching, schedules etc.) in order. In a sequencing game, you may be asked to arrange/schedule the entities from north to south, left to right, top to bottom, or Monday through Friday etc.

GROUPING GAMES

In grouping games, you may be asked to organize the entities into groups or teams etc. It can be a selection or distribution problem e.g. selecting players or dividing the people into groups. In selection games you start with a large pool of entities and you have to select a smaller group from these.

Tips for Sequencing and Grouping games

Use short hand language to write the rules

A and B both cannot be there

A is done before B

Two things are done between A and B

B is done two days/hours after A

~~AB~~

A < B

A _ _ B or B _ _ A

A_B

"Picturizing a problem is more important than making the diagram of the problem. Short handing and diagram forming are only the tools to enhance your thinking and solve the question."

TCY's 5-step approach that can help you:

1. **Get the overview of the problem**
 - Establish the entities.
 - Note the action
2. **Picturize the problem mentally (understanding).**
 - Assemble the entities
 - Use a simple diagram

3. Consider individual rules.

- Take time to understand the rules.
- Short hand the rules (brief and clear)

4. Combine rules

- Try deducing from the given set of rules

5. Answer:

- Read the question carefully and try to pre-phrase the answer.
- Use the elimination with the help of deductions you have made.

Note:

- Don't write the full name of cities, peoples etc., and the items should be designated simply by their first letter. It's unnecessary wastage of time.
- Try to start the diagram with definite or concrete relationship/condition
- Pay close attention to words like "could be", "must be", "may", "not", "except", "necessarily". Because answer to question like "Which must be true" or "Which of the following may be true" will be different.
- Don't get confused with the one-way relationship. For example if A attends the seminar, then B also attends it. This means if A is present, B should also be present. Do not interpret it as if B is present A should also be present.

Grouping games require us to answer the same basic questions: Who's in and who's out? Which group can include X, and who else can or cannot reside in a group with X?

Tips to solve grouping game problems:

1. See what entities can, must or cannot be in what groups.
2. See what entities can, must or cannot be in the same group as other entities.
3. Notice whether the game asks you to put **ALL** of the entities into groups or asks you to select **SOME** of the entities for a smaller group.
4. Pay close attention to numbers: the number of entities in each group, the total number of entities available, the number of entities already chosen.
5. For ambiguous entity names or to differentiate group names from entity names, use upper case and lower case letters.

MATCHING GAMES

In this type of problem some persons with some pet names or professions or states or cities or names of their wives etc. are given but not in same order. You have to match the correct ones.

Method to solve these types of problems:

1. Draw a table with name of the person vertically and quality or other parameter horizontally
2. Read the statement. Put the cross mark (×) if quality or parameter is not applicable.
3. Put the tick mark (√) if some quality or parameter is applicable.
4. If in a row or column, a tick mark (√) appears, then put cross marks (×) in all the remaining boxes in that row or column.
5. If in a row or column, all the boxes except one have cross marks (×), then put tick mark (√) in that box.

HYBRID GAMES

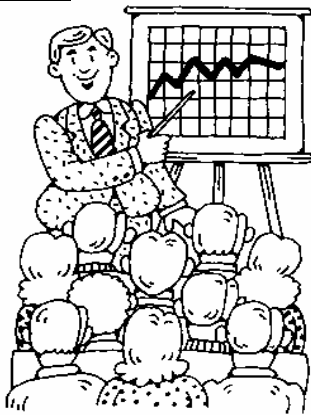
It is a mixture of sequencing and grouping games. Mostly, these are considered to be the most difficult types of games. But not every game is a hybrid, and not all hybrid games are difficult.

1. Don't panic. Organization is the key to hybrid games.
2. As in other games there is no one 'correct diagram' for hybrid games.
3. Try making as many deductions as possible.

PROBLEMS

SEQUENCING GAMES

GAME 1



A professor plans his teaching schedule to deliver eight topics B, C, H, P, Q, R, V, and W, of his subject. The topic must be taught one at a time in accordance with the following guidelines:

- H must be the fourth topic and W must be the sixth topic.
- Topic Q must be taught before topic H.
- Topic B and topic V cannot be taught consecutively.
- Topic C must immediately precede topic Q.
- Exactly two topics must be taught between topic P and topic Q.

1. Topic P must come immediately between which of the following pairs of topics?
 (1) Q and H (2) C and W (3) R and B (4) H and W
2. What is the maximum number of topics that can be taught between the topics C and R?
 (1) two (2) three (3) four (4) six
3. If Topic B is taught seventh, which of the following must be true?
 (1) Topic C is taught second. (2) Topic V is taught third.
 (3) Topic P is taught eighth. (4) Topic R is taught third.
4. Which of the following pairs of courses cannot be taught consecutively?
 (1) Q and V (2) W and V (3) R and H (4) B and R

Solutions:

Since you're asked to arrange eight topics in order, it makes sense to visualize the game by drawing eight slashes, and also number the slashes like this:-

— — — — — — — —
 1 2 3 4 5 6 7 8

Rule I is concrete rule .H is fourth and W is sixth. Build this right into your diagram

Rule II : $Q < H$ (As H is at 4th position, Q must be first, second or third)

Rule III : ~~BV~~ or ~~VB~~ (not together)

Rule IV : **CQ** (C is immediately before Q. Rule I & II tell us Q must be first, second or third, so C must be first or second and Q can't be at first position)

Rule V : Exactly two topic between P and Q (Sequence can be P _ C Q or C Q _ _ P Now first not possible because Q must be second or third, so only C Q _ _ P Sequence is possible.)

Q can only be taught second or third. If Q is taught second, C must be first and P must be fifth which is possible. But if Q is taught third, C must be second and P must be sixth which is not possible as W must be taught sixth. But that's not all, **Rule III** said that B and V can't taught consecutively .The only slot left are 3rd, 7th, and 8th. Since B and V must be separated ,they can't taught 7th, and 8th. Therefore ,either B or V must be taught third. By combining all the rules and deductions now the problem can be visualized as follow:

<u>C</u>	<u>Q</u>	<u>B/V</u>	<u>H</u>	<u>P</u>	<u>W</u>	<u>B/V/R</u>	
1	2	3	4	5	6	7	8

Answer to the problems:

1. **Answer: (4)**

2. **Answer: (4)**

C is definitely taught first and R can either be taught seventh or eighth.

Since you are looking for most topics between two, so R will be taught eighth

(C QB/V H P W V/B R)

3. If B is taught seventh then V must be taught third. **Answer: (2)**

4. All are possible except choice (3) i.e. R and H. **Answer: (3)**

GAME 2



Hardy's world ride is composed of six dragon bogies, numbered 1 to 6. Six children must be put into the six bogies, one child per bogie. The six children are Kailash, Mohit, Namarita, Onkar, Puneet, and Raman.

Mohit must be in bogie 1 or 6.

Onkar and Puneet must be in adjacent bogies.

Kailash must be closer than Raman to the front of the dragon bogies.

1. Kailash CANNOT be in which one of the following bogies?

- (1) bogie 1 (2) bogie 2 (3) bogie 3 (4) bogie 6

2. If Onkar and Namarita are in adjacent bogies, and if Puneet is in bogie 6, Raman must be in which one of the following bogies?

- (1) bogie 1 (2) bogie 2 (3) bogie 3 (4) bogie 4

3. If Puneet is in bogie 1, which one of the following CANNOT be true?

- (1) Mohit is in bogie 6 (2) Namarita is in bogie 3
(3) Onkar is in bogie 2 (4) Kailash is in bogie 5

4. Mohit must be in bogie 6 if which of the following children is in bogie 2?
 (1) Namarita (2) Onkar (3) Puneet (4) Raman

Solutions:

Step –1: Establish the entities

There are Kailash, Mohit, Namarita, Onkar, Puneet, and Raman. These can be casted as K, M, N, O, P, R.

Step –2: Visualise the problem

This is a sequencing game which can be visualized with six slots:

1 2 3 4 5 6
 - - - - -

Step –3: Consider the individual rules

Abbreviate wherever possible, express simple rules in visually direct shorthand.

Rule- I: Mohit must be in bogie 1 or 6 can be abbreviated as

1 2 3 4 5 6
 M - - - - -
 or
 - - - - - M

Rule – II : Onkar and Puneet must be in adjacent bogies.

OP or PO

Rule – III: Kailash must be closer than Raman to the front of the dragon bogies $K < R$

Step – 4: Answers to the questions

1. Kailash CANNOT be in which one of the following bogies?

Sol. As $K < R$. R follows K. So K cannot occur last i.e. bogie no – 6. **Answer: (4)**

2. If Onkar and Namarita are in adjacent bogies, and if Puneet is in bogie 6, Raman must be in which one of the following bogies?

Sol. As P is on 6 no. So O must be at 5 (**Rule no – II**) and N must be at 4 (ON or NO given in the question)

1 2 3 4 5 6
 M - - N O P

Also $K < R$ so K must be in bogie no. 2 and R in bogie No. 3. **Answer: (3)**

3. If Puneet is in bogie 1, which one of the following CANNOT be true?

1 2 3 4 5 6
 P O - - - M

Possible arrangements are P O K R N M or P O K N R M and P O N K R M

Let's check the options

- (1) Mohit is in bogie 6 ---- true
 (2) Namarita is in bogie 3 ---- may be possible
 (3) Onkar is in bogie 2 ---- true
 (4) Kailash is in bogie 5 ---- not possible (As $K < R$)
 (5) Raman is in bogie 4 ---- may be possible **Answer: (4)**

4. Mohit must be in bogie 6 if which of the following children is in bogie 2 ?

If R will be in bogie no 2 then K must be in bogie no 1 (**Rule – III : $K < R$**)

1 2 3 4 5 6
 K R - - - M

Therefore M must be in bogie no 6 (**Rule – I**) **Answer: (4)**

GROUPING GAME

GAME 3

The coach of the Sports Club must choose two two-person Badminton teams for an upcoming tournament. The players available are Chahail, Daman and Eshaan, who are experienced players; and Rajiv, Sahil, Tej, and Uday, who are novices.

At least one experienced player must be in each team in the tournament.

Daman and Sahil will be chosen only if the two are in different teams.

If either Chahail or Tej is chosen, the other must also be chosen.

Tej will not be chosen if Uday is chosen.

Eshaan will not be chosen if Rajiv is chosen.

1. Which one of the following must be true?

(1) Chahail and Rajiv cannot both be chosen.	(2) Daman and Tej cannot both be chosen.
(3) Uday and Chahail cannot both be chosen	(4) If Eshaan is chosen, Sahil cannot be chosen.

2. Which of the following is NOT an acceptable selection for the teams?

(1) Team 1: Daman and Rajiv;	Team 2: Chahail and Tej
(2) Team 1: Chahail and Eshaan;	Team 2: Tej and Rajiv
(3) Team 1: Daman and Chahail;	Team 2: Eshaan and Tej
(4) Team 1: Eshaan and Sahil;	Team 2: Daman and Uday

3. If Sahil is chosen and Tej is rejected for the tournament, which ones of the following must be the members of one of the teams?

(1) Sahil and Daman	(2) Sahil and Chahail
(3) Daman and Rajiv	(4) Daman and Uday

4. If Uday is not chosen for the expedition, and Rajiv is chosen for team 1, which one of the following must be in team 2?

(1) Eshaan	(2) Chahail	(3) Sahil	(4) Tej
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Solutions:

Step –1: Establish the entities

Experienced players are Chahail, Daman, and Eshaan can be abbreviated as **C, D & E**

Novices are Rajiv, Sahil, Tej, and Uday i.e. **R, S, T, U**

Step –2: Visualise the problem

This is a grouping game which can be visualized with two two person teams :

T1 / T2

— — — —

Step –3: Consider the individual rule

Abbreviate where possible, express simple rules in visually direct shorthand

Rule – I: At least one experienced players must be in each team in the tournament.

Rule – II: Both Daman and Sahil will be chosen only if they are in different teams.

Rule – III: If either Chahail or Tej is chosen, the other must also be chosen.

Rule – IV: Tej will not be chosen if Uday is chosen.

Rule – V: Eshaan will not be chosen if Rajiv is chosen.

D | S
CT or TC
~~UT & TU~~
~~RE & ER~~

Step – 4 Answers to the questions

1. Check the options:

(1) Chahail and Rajiv cannot both be chosen.

- This is not true because we can choose C & R together. If we choose C then T will also be there. Fourth person will be D (**Rule no – I & Rule no – V**)

T1 / T2
CT DR

(2) Daman and Tej cannot both be chosen.

- This is also possible .SEE group made in option (1)

(3) Uday and Chahail cannot both be chosen.

- This is not possible because if C is chosen, T should also be chosen (**Rule-III**). But U and T cannot be together (**Rule IV**). This option must be true

(4) If Eshaan is chosen, Sahil cannot be chosen.

- This is not true if we can make

T1 / T2 & T1 / T2
ES DU ES CT &....

(5) If Uday is chosen, Tej must also be chosen.

- Not possible (**Rule no IV**)

Answer: (3)

2. Which of the following is NOT an acceptable selection for the teams?

All options except option (2) are possible (**Rule V:**

~~RE & ER~~

3. If Sahil is chosen and Tej is rejected for the tournament, which one of the following must be the members of one of the teaming teams?

- If T is rejected then C can't be chosen (**Rule V**). But at least one-experienced players must be in each team in the tournament. So D & E must be chosen. If E is chosen then R can't be chosen so the fourth person left is U. Possible teams are

T1 / T2
SU DR

Answer: (4)

4. If Uday is not chosen for the tournament, and Rajiv is chosen for team 1, which one of the following must be in team 2?

- If R is chosen, then experienced player with R will be C and D (E can't Rule V)As C and T are always together. So T must be chosen. Possible teams are

T1 / T2 & T1 / T2
RC DT RD CT

So T must be in team 2. **Answer: (4)**

MAPPING GAMES

Mapping games revolve around things like roads, messages relay thing with TO/FROM relationships

GAME 4

A telecommunication company has six satellite towers in cities: New Delhi, Orissa, Panipat, Quilon, Rajkot and Shimla

Because of an antiquated technology, signals can be directly sent only from:

New Delhi to Panipat
Panipat to New Delhi
New Delhi to Quilon
Quilon to Panipat
New Delhi to Shimla
Rajkot to New Delhi
Orissa to Rajkot
Shimla to New Delhi

A "relay" occurs when a tower receives a signal from another tower and sends it on to a third. A tower can relay a signal from one tower to another in any combination allowed by the above conditions.

1. Which tower cannot receive signals from any other tower?
(1) New Delhi (2) Orissa (3) Panipat (4) Quilon
2. Which of the following would require exactly one relay?
(1) a signal sent from New Delhi to Shimla (2) a signal sent from Orissa to Quilon
(3) a signal sent from Quilon to Orissa (4) a signal sent from Rajkot to Quilon
3. A signal cannot possibly be sent from
(1) Shimla to Quilon (2) Rajkot to Panipat
(3) Panipat to Rajkot (4) Shimla to Panipat
4. If the telecommunication system at Panipat fails, so that Panipat may send but not receive signals, which of the following would be IMPOSSIBLE?
(1) Sending a signal from Orissa to New Delhi (2) Sending a signal from Quilon to New Delhi
(3) Sending a signal from Orissa to Quilon (4) Sending a signal from Shimla to Quilon
5. Quilon would be able to send signals to all other cities either directly or by relay if which of the following capabilities were added to the original list?
(1) Sending signals from Orissa to Quilon (2) Sending signals from Rajkot to Orissa
(3) Sending signals from Quilon to Shimla (4) Sending signals from Panipat to Orissa

Solutions:

Step – 1: Establish the entities

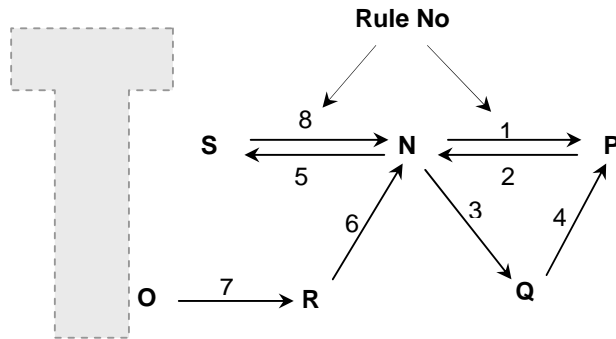
There are six cities, which can be abbreviated as N, O, P, Q, R and S

Step – 2: Visualise the problem

This is a mapping game which can be visualized with a diagram.

Step – 3: Consider the individual rule

1. New Delhi to Panipat
2. Panipat to New Delhi
3. New Delhi to Quilon
4. Quilon to Panipat
5. New Delhi to Shimla
6. Rajkot to New Delhi
7. Orissa to Rajkot
8. Shimla to New Delhi



Solutions:

Step – 4 Answers to the questions

1. Which tower cannot receive signals from any other tower?

(2) Orissa (see the diagram)

2. Which of the following would require exactly one relay?

- | | |
|--|--------------------------------|
| (1) a signal sent from New Delhi to Shimla | ----- No relay |
| (2) a signal sent from Orissa to Quilon | ----- 2 relays (O – R – N – Q) |
| (3) a signal sent from Quilon to Orissa | ----- Not possible |
| (4) a signal sent from Rajkot to Quilon | ----- 1 relay (R – N – Q) |

Answer: (4)

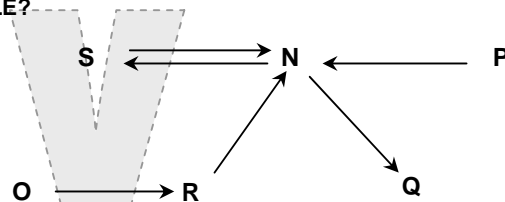
3. A signal cannot possibly be sent from

- | | |
|-----------------------|--------------------------------|
| (1) Shimla to Quilon | ----- Possible (S – N – Q) |
| (2) Rajkot to Panipat | ----- Possible (R – N – P) |
| (3) Panipat to Rajkot | ----- Not possible (S – N – Q) |
| (4) Shimla to Panipat | ----- Possible (S – N – P) |

Answer: (3)

4. If the telecommunication system at Panipat fails, so that Panipat may send but not receive signals, which of the following would be IMPOSSIBLE?

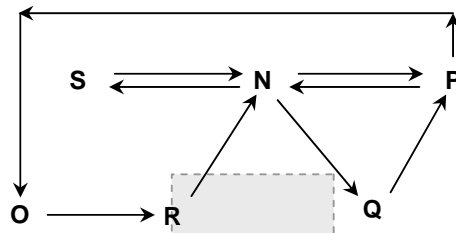
Now diagram reduces to



- | | | |
|---|-----|--------------------------|
| (1) Sending a signal from Orissa to New Delhi | --- | possible (O – R – N) |
| (2) Sending a signal from Quilon to New Delhi | --- | not possible |
| (3) Sending a signal from Orissa to Quilon | --- | possible (O – R – N – Q) |
| (4) Sending a signal from Shimla to Quilon | --- | possible (S – N – Q) |

Answer: (2)

5. Quilon would be able to send signals to all other cities either directly or by relay if which of the following capabilities were added to the original list?



Q can send signals to P, N, S but not to R and O. So Q would be able to send signals to all other cities only when O would be able to receive signals. (that is only in option (2) & option (4)) But sending signals from R to O does not link O & Q.

So Answer is (4).

Another example of Mapping Game

Five villages linked by roads. The roads run directly between:

Village A and Village B

Village B and Village C

Village B and Village D

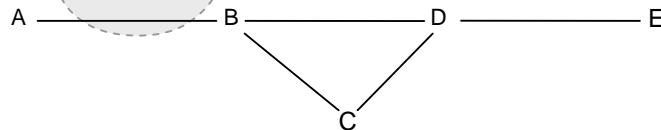
Village D and Village C

Village D and Village E

There are no other roads that provide access to any of the villages.

1. How many different ways are there to travel by road from village A to village E without going through any village twice?
 (1) 1 (2) 2 (3) 3 (4) 4

Sol.



We can see from the diagram that there are only two possible ways to travel from village A to village E that are:

A – B – D – E and **A – B – C – D – E**

Remember to:

- Start your map with an entity frequently mentioned in the rules. This will form a hub at the center of your map.
- Keep track of connections, not locations.
- Now --- draw a map!
- After drawing your map, think about its structure.
- Which entities are centrally positioned, forming nodes or hubs?
- Which are relatively cut off, forming dead ends?

GAME 5



Exactly four persons stand in a queue on the wait for their turn for collecting entrance ticket at ticket counter at a cinema theater, numbered 1 through 4 from first to last. Two of the persons are males and other two are females. Two out of four are doctors, one is lawyer and one is engineer. Exactly one of four is wearing a cap. The persons in a queue are standing according to the following conditions.

The person wearing a cap is either at No. 1 or No. 4.

Doctor is at No. 2 position.

At least one male stands in line between the two females.

One of the doctors is wearing a cap.

1. Which one of the following must be true for a person at No. 3 position?
 - (1) She is a female.
 - (2) He is a male.
 - (3) Person is a lawyer.
 - (4) Person does not wear a cap.
2. If person at No. 4 position is a male who wears a cap, then all of the following must be true EXCEPT.
 - (1) No. 1 is a female.
 - (2) No. 2 is a male.
 - (3) Engineer is at No. 3 position.
 - (4) Doctor is at No. 4 position.
3. If the two males stand in line immediately adjacent to each other, then which one of the following must be false?
 - (1) A female wears a cap.
 - (2) Engineer is a female.
 - (3) Person at No. 3 is a male.
 - (4) Both doctors are male.
4. If the two doctors stand in line immediately adjacent to each other, and if person at No 2 is a male, then which one of the following correctly describes person at No. 1?
 - (1) A female doctor wearing a cap.
 - (2) A male doctor wearing a cap.
 - (3) A female engineer without cap.
 - (4) A male engineer without cap.

Solutions:

Step –1: Establish the entities

M Stands for Male
F Stands for Female
D Stands for Doctor
L Stands for Lawyer
E Stands for Engineer

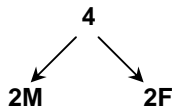
Step – 2: Visualise the problem

This is a hybrid game which can be visualized with a diagram

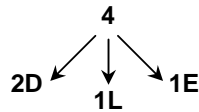
1 2 3 4
 - - - -

Step – 3: Consider the individual rule

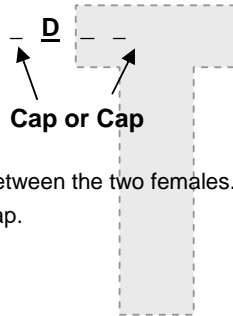
Two of the persons are males and other two are females.



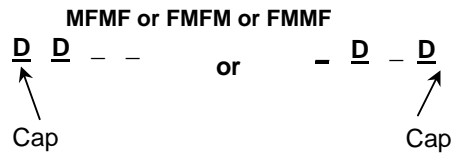
Two out of four are doctors, one is lawyer, and one is engineer..



The person wearing a cap is either at No .1 or No. 4. Doctor is at No. 2 position.



At least one male stands in line between the two females.
One of the doctors is wearing a cap.



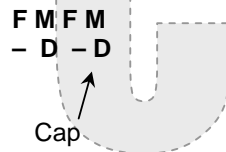
Step – 4 Answers to the questions

1. Which one of the following must be true for a person at No.3 position?

- (1) She is a female. ---- May be true
- (2) He is a male. ---- May be true
- (3) Person is a lawyer. ---- May be true
- (4) Person does not wear a cap. ---- Must be true
- (5) Person wears a cap. ---- False

Answer: (4)

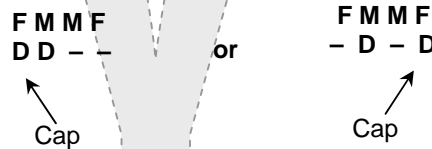
2. If person at No.4 position is a male who wears a cap, then all of the following must be true EXCEPT.



- (1) No. 1 is a female. ----- true
- (2) No. 2 is a male. ----- true
- (3) Engineer is at No. 3 position. ----- may be possible
- (4) Doctor is at No.4 position. ----- true
- (5) Exactly one person stands in the between the two doctors ----- true

Answer: (3)

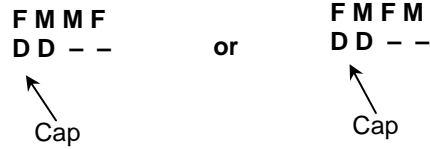
3. If the two male stand in line immediately adjacent to each other, then which one of the following must be false.



- (1) A female wears a cap. ---- May be true
- (2) Engineer is a female.. ---- May be true
- (3) Person at No.3 is a male. ---- Definite true
- (4) Both doctors are male. ---- False
- (5) Lawyer is a female. ---- May be true

Answer: (4)

4. If the two doctors stand in line immediately adjacent to each other, and if person at No 2 is a male, then which one of the following correctly describes person at No.1?



Answer: (1) A female doctor wearing a cap

IF – THEN (Conditional Statement)

Here's an **If-Then RULE**. This is going to be very helpful for the Grouping and Hybrid Games section.

“If A then B” : It means if given A , then B must be true. It also means that if we have not given B then **A** must **not** be true. So this conditional statement is equivalent to **“If not B, then Not A”** but we can't tell **“if not A then”** and **“if B then”**. Be careful while applying this approach.

For example: “If Amit attends the seminar then Ajay must attend it”. We can deduce from it that if Ajay does not attend the seminar, then Amit must not attend it. But if Ajay attends the seminar then Amit may or may not attend it or if Amit does not attend the seminar, then whether Ajit attends the seminar or not that we can't tell.

C

Y