Introduction:

Reasoning plays an important role in a candidate's performance in the aptitude tests including campus placement and therefore needs to be practiced and perfected. Reasoning, in the exams can be primarily divided into 2 broad categories Verbal and Non Verbal. It has been observed that in the exams, the Verbal questions have a higher weightage in the overall composition. This book will primarily focus on all the categories under the Verbal part and some categories under Non Verbal Reasoning.

The broad topics covered include Arrangement problems which can be Deterministic and Non Deterministic, Blood Relations, Grouping or Condition based problems, Coding-Decoding, Direction Sense, Series Completion, Mathematical Reasoning , Miscellaneous problems and puzzles.

Our effort through this book will be to understand each of these types of problems, their variety, and practice them in order to improve our performance in the Reasoning Section. The main concepts in every topic have been discussed alongwith relevant examples. At the end of every topic, a basic level practice exercise has been provided . Additionally, advanced level practice exercises (2 exercises for each topic) have been provided towards the end.

Students are advised and encouraged to do as many varied types of problems in practice in order to extend the range of problems that can be handled by them effectively.

Unit 1:

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Arrangement Based Problems

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Concepts: There are few aspects to be learnt before we can start doing the reasoning problems on Arrangement. Let us try to understand them.

1. An arrangement problem can be Linear, Circular, Horizontal or any other (across a Rectangular Table etc).

2. In a Linear Arrangement problem, the items can be arranged either facing you or away from you. One can take either of the 2 cases but one must try to always follow a particular case for all problems depending on the convenience. Also, since we have to always face an arrangement while looking at the arrangement, it is better if one can consider the items in the arrangement facing you.

3. The Left and Right of an arrangement and an item within the arrangement is Opposite. Let us take an example to illustrate point no. 2 and 3.

4 boys Anil, Bipin, Chandra and Deepak are standing in a straight line facing you, the Reader of the text. If each one is represented by their names, the arrangement will look as under:

Anil   Bipin   Chandra   Deepak

Let us now try to answer 2 questions.

Q1: Which person is 3rd from the left of the arrangement?

When we are answering a question like the one above, we will always face the arrangement starting with Anil and therefore Chandra will be the 3rd person counting from the left end of the arrangement.

Q2: Which person is to the immediate right of Chandra?

Does Chandra's right mean your right? Absolutely not because you are facing the arrangement and therefore, Chandra's right will be the exact opposite of your right. The person to the immediate right of Chandra is hence Bipin.

1.   A is 2 places to the right of B means if we are facing the arrangement, it would be like   A X B. This can also be written as A is 2nd to the right of B.

2.   There are 2 people between A and B will be shown as A X X B or as

B X X A because in this case right or left is not specified.

3.   In an arrangement, A is placed after B. This means A can have any position that is placed after B starting from the left. Many students by default take the statement as immediately after which is not true.

4.   Another word used for 'before' is preceed while another word used for 'after' is follows.

5.   A, B and C are Doctor, Engineer and Lawyer not necessarily in the same order. We would come across such statements very frequently in Reasoning problems. What it indicates is that we are not sure about which person has which profession. It needs to be logically concluded and arrived at.

But there are questions or part of questions in which we come across statements like A, B and C are Doctor, Engineer and Lawyer respectively which indicates that their professions are in the same order.

Few points to remember before we start looking at the question sets.

1. Comprehension is an important part of all reasoning problems. Many a times, students are not able to do a problem because of their inability to comprehend whatever is being said.

2. While attempting a Reasoning problem, please try to do your work neatly and in an organized manner. It will help you to get to the solution easily.

3. Information complied must be at a one place and not scattered.

Example Set 1: 5 Cars a Santro, a Zen, an Alto, an Indica and a Ritz were on display in a straight line facing you. Further information is as follows:

1. Ritz is 3rd to the right of Alto but not at a extreme position.
2. Zen is to the immediate left of Ritz.

Let us look at the following example where only 2 statements have been provided as a part of the information. Let us mark the positions as 1 to 5.

1	2	3	4	5

From statement 1, it is clear that Alto can be either at Position 4 or position 5 because of the reason that Ritz is 3rd to the right of Alto. Now if Alto is at position 4, then Ritz will be at Position 1 which in turn violates the first condition. Therefore, Alto is at position 5 and Ritz will be at position 2.

From Statement 2, Zen will be at position 3. We are not sure about the exact positions of Santro and Indica.

The final arrangement will be as follows:

Santro/Indica	Ritz	Zen	Santro/Indica	Alto

Now, what if the question asks about the exact position of Santro or Indica? We will not be able to answer the question uniquely. Such a problem set where all values or information is not definitely determined is called as a Non-Deterministic Set.

The answer to the above question will be cannot be determined which is a popular answer choice in reasoning.

Important Note: This is a difference between answer choices "None of These" and "Cannot be Determined". Answer choice "None of These" means there is a unique answer but it not amongst the choices provided while "Cannot be Determined" means the answer to the question asked cannot be uniquely determined.

What if we add a 3rd statement which says Indica is between the Zen and the Alto. Now using the additional data provided, we can definitely say that there will be a unique arrangement
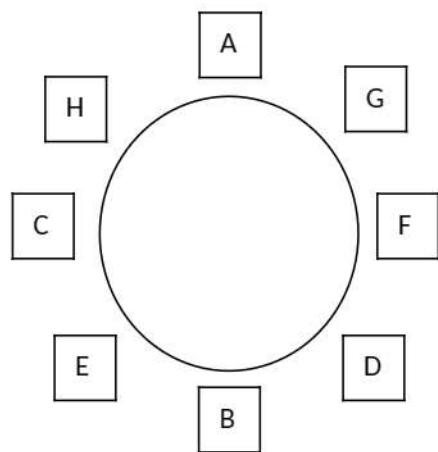
Santro	Ritz	Zen	Indica	Alto

Such a set where all values are uniquely determined is called a Deterministic Set.

Important Note: Sometimes, additional data is provided in the questions in certain sets like the one above. Students make the mistake of taking up the additional data to solve the entire set. Please remember, data provided in a question cannot be used for other questions until and unless it is clearly mentioned in the problem.

Circular Arrangement: Unlike Linear arrangement wherein every position in unique by itself, in Circular arrangement questions all the positions are identical. Therefore, in Circular arrangement questions, the position of an individual depends on the neighbours to the left and right.

Usually in such questions 6 or 8 people are arranged in a circle. Unless mentioned otherwise, we must try to take positions that are diagonally opposite so that the problem can be easily solved. Also, conditions given in Circular arrangement questions can be with reference to the right or left of people or with reference to Clockwise and Anti-Clockwise movement. There are few additional aspects that must be taken care in a Circular Question.

If the Question says, how many people are seated between A and D then the correct answer is either 2 or 4 or the correct answer is Cannot be Determined because the question does not specify the direction in which the counting has to be done.

What if the Question asks about the number of people seated between H and D. In this case, we will not have 2 answers because the number of people seated between D and H is 3 when counted from either direction. From this we can definitely conclude that the number of positions between 2 diagonally opposite positions will be the same on either side. Let us see how an information like this can be utilized.

Example: There are a number of people seated in a circular arrangement such that the person at position number 9 is diagonally opposite the person at position number 21. Then how many people are seated in the arrangement?

If we use the learning above, the number of people on either side of these 2 positions will be the same. There are 11 positions on either side and so the total number of people will be 11+11+2 = 24

Linear Arrangement

Practice Exercise: Level 1

Set 1: A teacher had arranged for extra classes for his students in a particular week. 5 topics were to be taught on 5 different days of the week starting from Monday to Saturday with a Rest day in between. The topics were Logarithms, Set Theory, Percentages, Clocks and Calendar not in any particular order.
Additional Information is as follows:

1.   The Rest day will be either on Wednesday or Thursday.
2.   Percentages will be the 1st topic taught and will not be immediately followed by Set Theory.
3.   Clocks and Calendar will have to be taught on consecutive days.
4.   Logarithms will be taught on Saturday.

Q1: When is the class on Set Theory scheduled?

a.Wednesday   b. Friday   c. Tuesday   d. cannot be determined

Q2: Which topic is scheduled on Wednesday?

a. Clocks   b. Set Theory   c. Calendar   d. cannot be determined

Q3: If there is gap of exactly 1 day between the Rest day and the day Clocks topic is scheduled, then how many days gap is there between Calendar and Logarithms?

a. 2   b. 3   c. 1   d. cannot be determined

Q4: Which among the following cannot be true about the rest day?

a.   Immediately after the Clocks class.
b.   2 days before the last class.
c.   1 day after the % class.
d.   None of These.

Q5: Taking all the conditions into consideration, how many different ways can the classes be scheduled?

a. 1   b. 2   c. 3   d. 4

Set 2: 5 friends P,Q,R,S and T are to be seated in a straight line for a photograph. They are wearing T-Shirts of Maroon, Green, Yellow, Grey and Black not in any order. Further information is as under :
1. The person wearing the Grey T-shirt is to the immediate left of the person who is 2nd from the right end of the arrangement.
2. Neither R nor S are at the extreme positions.
3. T wears a Yellow T-shirt and does not have anyone sitting to his right.
4. Q is wearing a Maroon T-Shirt.
5. R sits in the middle and is not wearing a Black T-Shirt.

Q6: What is the colour of the T-Shirt worn by R?
a. Yellow   b. Grey   c. Green   d. Maroon

Q7: Counting from the left end of the arrangement, which person is at the 2ⁿᵈ position?

a. Q   b. S   c. P   d. cannot be determined

Q8: If the person wearing Maroon is adjacent to the person wearing Yellow, what is the colour worn by the person sitting at the 4ᵗʰ position from the left?

a.Yellow   b. Black   c. Green   d. cannot be determined

Q9: How many people are sitting between P and T?

a.1   b. 2   c. 3   d. cannot be determined

Q10: Who is wearing the Grey coloured T-Shirt?

a. Q   b. P   c. S   d. R

Set 3: 5 people A,B,C,D and E participated in a race and got the top 5 positions not in any order. They were wearing Jersey numbers 3, 7, 12, 15 and 19 not in any order. Following additional information is available:

1. The person wearing Jersey number 12 finished at one of the top 2 positions.
2. E came first and was not immediately followed by either B or C.
3. D wearing the number 3 finished at the 5ᵗʰ position.
4. C finished before B who was wearing Jersey number 15.
5. Person wearing Jersey number 7 finished later than at least 1 person

Q11: At which position did B finish the race?

a. 2ⁿᵈ   b. 3ʳᵈ   c. 4ᵗʰ   d. 5ᵗʰ

Q12: Who was wearing Jersey number 7?

a. A   b. C   c. E   d. cannot be determined

Q13: If C is wearing Jersey number 7, what is the Jersey number worn by E?

a. 12   b. 19   c. 15   d. cannot be determined

Q14: If A is wearing Jersey number 12, then who is wearing Jersey number 19?

a. E   b. C   c. D   d. cannot be Determined

Q15: If all conditions are fulfilled, how many different arrangements are possible?

a. 2   b. 4   c. 3   d. 1

Vertical, Circular and Others

Practice Exercise: Level 1

Set 1: 5 people A,B,C,D and E are working in 3 departments in company ABC Ltd. Each person works in exactly 1 department out of Marketing, Finance or Operations. While 2 of them work in Marketing, 2 work in Finance and 1 person in Operations. Each person belongs to a different grade of Seniority from 1 to 5 with 1 being the highest and 5, the lowest.

Further information is as follows:
1. Any 2 people with consecutive seniority levels cannot work in the same department.
2. D is 4 levels of Seniority below A.
3. B is one level of Seniority above C.
4. It is possible but not true for C and D to work in the same department.
5. While D works in Marketing, C does not work in operations.

Q1: In which Department does E work?
a. Marketing   b. Operations   c. Finance   d. cannot be determined

Q2: Which is the pair of employees that work in the same department?
a. A,D   b. C,E   c. B,E   d. B,D

Q3: What is the Seniority Rank of E?
a. 3   b. 4   c. 5   d. 2

Q4: In which department does the person with Seniority Rank 2 work?
a. Marketing   b. Finance   c. Operation   d. cannot be determined

Q5: If another person was to be transferred from Finance or Marketing to Operations, in how many different ways can the person be selected?
a. 1   b. 2   c. 3   d. 4

Set 2: 8 people of the BCCI governing council were seated around a circular table for their annual meeting. The members of the governing council were the President, the Vice President, Secretary, Treasurer, Member, Captain, Vice Captain and Coach of the team. Further information is as under :
1. The Member was diagonally opposite the Vice Captain and 2nd to the left of the President.
2. The Secretary was seated to the immediate left of the Member.
3. Neither the Captain nor the Coach was seated adjacent to the Vice Captain.
4. The Vice President was diagonally opposite the Coach.

Q6: Who was sitting diagonally opposite the President?
a. Vice Captain   b. Treasurer   c. Captain   d. Coach

Q7: Taking into consideration all the conditions, how many different arrangements are possible?
a. 1   b. 2   c. 3   d. 4

Q8: Counting in the anticlockwise direction, how many people are seated between the Secretary and the Vice Captain?
a. 2   b. 3   c. 4   d. cannot be determined

Q9: Which pair is not seated diagonally opposite each other?
a. Member, Vice Captain b. Secretary, Treasurer   c. Coach, Vice President
d. President, Treasurer.

Q10: Who is seated 3rd to the right of the Captain?
a. Coach   b. President   c. Member   d. Treasurer

Set 3: 4 couples the Anands, the Dhagarras, the Chaterjees and the Bishts were participating in an event where individual skills would be put to test to decide the winner. Arrangements had been made for each one to stay alone in rooms arranged equally along both sides of a corridor. Further information is as follows:
1. The rooms were marked 1 to 8 with Room numbers 1,3,5 and 7 on one side and Room numbers 2,4,6 and 8 on the other side.
2. No person will stay in a room directly opposite to one's spouse. Also, no one will stay on the same side as the spouse.
3. While Mr.Chaterjee was in Room number 1, Mrs. Anand was in Room Number 6.
4. While Mr.Dhagarra is in Room Number 4, Mrs Bisht is in Room Number 3.

Q11: Who is the person in Room number 7?
a. Mrs. Dhagarra   b. Mr. Bisht   c. Mr.Anand   d. Mrs. Chaterjee

Q12: Who is sitting directly opposite Mrs. Dhagarra?
a. Mrs. Anand   b. Mrs. Chaterjee   c. Mr.Bisht   d. cannot be determined

Q13: How many pairs exist in which 2 people of the opposite gender are sitting opposite each other?
a. 1   b. 2   c. 3   d. 0

Q14: Which is the room number occupied by Mr.Bisht?
a. Room No. 8   b. Room No. 5   c. Room No. 2   d.cannot be determined

Q15: Which of the following is definitely false regarding the position of Mrs. Chaterjee?
a. To the immediate right of Mrs. Anand
b. Directly opposite Mr.Anand
c. 2nd to the right of Mr.Bisht
d. 2nd to the right of Mr.Dhagarra.

Practice Exercise: Level 1

Set 1: 6 new players L,M,N,O,P and Q were selected to represent the Indian Cricket Team. Their skills were Fast Bowler, Opening Batsman, Wicket Keeper, Spinner, Middle Order Batsman and Medium Pace bowler. Each one belonged to one of the states UP, MP, Gujarat, Delhi, Maharashtra and Bihar not necessarily in the same order. While the category bowlers includes all the 3 types, the category Batsman includes both the Batsmen.
Further conditions are as follows:
1. Each State is represented by exactly 1 person
2. P belongs to Maharashtra and is not a bowler.
3. The Wicket Keeper is either O or M and belongs to either Delhi or Bihar.
4. Q is the Fast Bowler from MP.
5. The Opening Batsman and the Spinner are from Bihar and UP respectively.
6. M does not belong to Delhi.
7. While N belongs to Gujarat, L belongs to the category "bowlers".

Q1: Who is the Opening Batsman?
a. M   b. L   c. N   d. cannot be determined

Q2: The Medium Pace Bowler belongs to which State?
a. Bihar   b. Gujarat   c. MP   d. none of these

Q3: Which among the following States does not represent a Bowler?
a. MP   b. UP   c. Gujarat   d. Delhi

Q4: Who is the Spinner among all the 6 players?
a. M   b. N   c. L   d. cannot be determined

Q5: Which among the following combinations is not correct?
a. P-Mah-Middle Order Batsman
b. L-UP-Spinner
c. M-Gujarat-Medium Pace Bowler
d. O-Delhi-Wicket keeper

Set 2: 6 new ministers were being sworn in as a part of the government. The six ministers were PC, PM, MB, AKA, KS, and SBC and were being sworn in as The Ministers of Finance, Defence, Home, Civil Aviation, Telecom and Railways not in any order.
Further conditions are as under:
1. The First person to be sworn in was the Defence Minister.
2. AKA and KS were sworn immediately after one another though not necessarily in the same order.
3. There were exactly 2 people sworn in between MB and SBC.
4. PC was sworn in last and got civil aviation.

5. The Minister for Finance was sworn in 3ʳᵈ and was immediately followed by the Railway Minister.
6. Neither SBC nor MB got the Defence Ministry.
7. AKA was sworn in as the Railway Minister and took oath after the Telecom Minister.

Q6: Who was the person to take oath as the Home Minister?
a. MB   b. PM   c. SBC   d. cannot be determined

Q7: At which position did the Telecom Minister take oath?
a. 2ⁿᵈ   b. 3ʳᵈ   c. 4ᵗʰ   d. 1ˢᵗ

Q8: Which person took oath as the Finance Minister?
a. AKA   b. MB   c. KS   d. cannot be determined

Q9: If there was a gap of exactly one between the Finance Minister and MB, then who among the following took oath as the Telecom Minister?
a. PM   b. SBC   c. AKA   d. none of these

Q10: If all the conditions are satisfied, how many different solutions are possible?
a. 1   b. 2   c. 3   d. 4

Set 3: 5 children Jasmine, Krati, Leena, Mishtu and Nupur treated each other at different Outlets in the city to celebrate their results. The treats were at CCD, Mishtaan Bhandar, Guptaji, Bisht Snacks and Goverdhan not in any order. Each place specializes in exactly one of the items, Coffee, Lassi, Lime Juice, Shakes and Cold Drinks not in any order and is located at Balliwala, Chowk, Bus Stand, Sabzi Mandi and Nashvilla Road not in any order. Further conditions are as under:
1. Leena treated with Lassi but neither at Guptaji nor Goverdhan.
2. Bisht Snacks specializes in Shakes and is located at Balliwala.
3. Nupur treated with Coffee at Nashvilla Road.
4. Neither Krati nor Mishtu treated with Lime Juice.
5. The Outlet at Chowk is known for it's Lassi.
6. CCD is located at Sabzi Mandi and is famous for Lime Juice.
7. Mishtu gave the treat at Guptaji.

Q11: Which outlet is located at Nashvilla Road?
a. Guptaji   b. Goverdhan   c. Bisht Snacks   d. cannot be determined

Q12: Which drink is Bus Stand famous for?
a. Cold Drinks   b. Lime Juice   c. Coffee   d. Shakes

Q13: Where is CCD located?
a. Nashvilla Road b. Sabzi Mandi   c. Chowk   d. Balliwala

Q14: Which friend treated with Lime Juice?
a. Krati   b. Mishtu   c. Leena   d. Jasmine

Q15: Which is the outlet known for Lassi?
a. Bisht Snacks   b. CCD   c. Mishtaan Bhandar   d. Guptaji