LEARNING OBJECTIVES

- This Section deals with questions in which series or letters in some order, Coding and decoding
- This terms of the series or letters are follows certain pattern throughout

9.1 SERIES

Series Classified into Three Types, Namely

A. Number Series
B. Alphabet Series
C. Letter Series

A. NUMBER SERIES

Case 1: Missing terms of the series

In this type the questions we have to identify the missing term of the series real according to a specific pattern of the series rule to form its code. The students are required to detect the missing number of the series and answer the questions accordingly.

Example 1: Find the missing term of the series 2, 7, 16, ______ , 46, 67, 92

Explanation: Here the terms of the series are +5, +9, +13, +17, +21 , +25…
Thus, 2 + 5 = 6; and 7 + 9 = 16 …
So missing term = 16 + 13 = 29

Example 2: Find the wrong terms of the series 9, 29, 65, 126, 217, 344

Explanation: $2^3+1, 3^3+1, 4^3+1,…….$
Here 29 is wrong term of series

Example 3: Find the missing term of the series 1,9, 25, 49, 81, 121, ............

Solution: The given terms of the series are consists square of consecutive odd number $1^2, 3^2, 5^2, 7^2, ...$
So missing value = $13^2 = 169$
B. ALPHABET SERIES

Alphabet series consists of letters of the alphabet placed in a specific pattern. For example, the series are in the following order of the numbers.

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<tr>
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<th>1</th>
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<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
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<td>E</td>
<td>F</td>
<td>G</td>
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<td>I</td>
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<td>K</td>
<td>L</td>
<td>M</td>
<td>N</td>
<td>O</td>
<td>P</td>
<td>Q</td>
<td>R</td>
<td>S</td>
<td>T</td>
<td>U</td>
<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td></td>
</tr>
</tbody>
</table>

Example 4: Find the next term of the series BKS, DJT, FIU, HHV?

**Explanation:** In each term, the first letter is moved two steps forward, the second letter one step backward and third letter one step forward to obtain the corresponding letter of the next term. So the missing term is JGW.

C. LETTER SERIES:

This type of question usually consist of a series of small letters which follow a certain pattern. However some letters are missing from the series. These missing letters are then given in a proper sequence as one of the alternatives.

Example 5: aab, ____ , aaa, bba, ____

(a) baa (b) abb (c) bab (d) aab

1) The first blank space should be filled in by ‘b’ so that we have two a’s by two b’s.
2) The second blank place should be either ‘a’, so that we have three a’s followed by three b’s.
3) The last space must be filled in by ‘a’.
4) Thus we have two possible answers – ‘baa’ and ‘bba’.
5) But only ‘baa’ appers in the alternatives.

So the answer (a) is correct.

9.2 CODING AND DECODING

Before transmitting, the data is encoded and at receiver side encode data is decoded in order to obtain original data by determining common key in encoded data.

The Coding and Decoding is classified into, they are type.

Type 1: Letter Coding

Type 2: Number Coding

Type 1: Letter Coding

In this type the real alphabets in a word are replaced by certain other alphabets according to a specific rule to form its code. The candidate is required to detect the common rule and answer the questions accordingly.
Case 1: To form the code for another word

Example 6: If in a certain language MYSTIFY is coded as NZTUJGZ, how is MENESIS coded in that language?

Explanation: Clearly, each letter in the word MYSTIFY is moved one step forward to obtain the corresponding letter of the code.

\[
\begin{array}{c}
\text{M Y S T I F Y} \\
\text{+1} \\
\text{N Z T U J G Z}
\end{array}
\]

So, in MENESIS, N will be coded as O, E as F, M as N and so on. Thus, the code becomes NFOFTJT.

Example 7: If TAP is coded as SZO, then how is FRIEND coded?

Explanation: Clearly each letter in the word TAP is moved one step backward to obtain the corresponding letter of the code.

\[
\begin{array}{c}
\text{S Z O} \\
\text{-1} \\
\text{T A P}
\end{array}
\]

Thus, in FRIEND, F will be coded as E, R as Q, I as G, E as D, N as M and D as C. So, the code becomes EQGDMC.

Example 8: In a certain code, MENTION is written as LNEITNO. How is PRESENT written in that code?

Explanation: Clearly, to obtain the code, the first letter of the word MENTION is moved one step backward and the remaining letters are reversed in order, taking two at a time. So, in PRESENT, P will be coded as O, and the sequence of the remaining letter in the code would be ERESTN. Thus the code becomes OERESTN. Hence, The answer is OERESTN.

Case 2: To find the word by analysing the given code (DECODING)

Example 9: If in a certain language CARROM is coded as BZQQNL, which word will be coded as HORSE?

Explanation: each letter of the word is one step ahead of the corresponding letter of the code

\[
\begin{array}{c|c}
\text{B Z Q Q N L} & \text{H O R S E} \\
\hline
\text{C A R R O M} & \text{I P S T F}
\end{array}
\]

So, H is coded as I, O as P, R as S, S as T and E as F. HORSE is coded a IPSTF.

Type 2: Number Coding

In these questions, either numerical code values are assigned to a word or alphabetical code letters are assigned to the numbers. The candidate is required to analyse the code as per the directions.
9.4 LOGICAL REASONING

Case 1: When a numerical code values are assigned to words.

Example 10: If in a certain language A is coded as 1, B is coded as 2, and so on, how is AICCI is coded in that code?

Explanation: As given the letters are coded as

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

So in AICCI, A is coded as 1, I as 9, and C as 3. Thus, AICCI is coded as 19339.

Example 11: If PAINT is coded as 74128 and EXCEL is coded as 93596, then how would you encode ANCIENT?

Explanation: Clearly, in the given code, the alphabets are coded as follows:

<table>
<thead>
<tr>
<th>P</th>
<th>A</th>
<th>I</th>
<th>N</th>
<th>T</th>
<th>E</th>
<th>X</th>
<th>C</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>8</td>
<td>9</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

So, in ANCIENT, A is coded as 4, N is coded as 2, C as 5, I is coded as 3, E as 9, and T as 8. Hence, the correct code is 4251928.

Case 2: Number to letter coding.

Example 12: In a certain code, 2 is coded as P, 3 as N, 9 as Q, 5 as R, 4 as A and 6 as B. How is 423599 coded in that code?

Explanation: Clearly as given, 4 as A, 2 as P, 3 as N and 5 is coded as R, 9 as Q. So, 423599 is coded as APNRQQ.

9.3 ODD MAN OUT

Classification means ‘to assort the items’ of a given group on the basis of a certain common quality they possess and then spot the stranger or ‘odd one out’.

These questions are based on words, letters and numerals. In these types of problems, we consider the defining quality of particular things. In these questions, four or five elements are given, out of which one does not belong to the group. You are required to find the ‘odd one’.

Example 13: January, May, July, November

(a) January (b) May (c) July (d) November

Explanation: All the months above are 31 days, whereas, November 30 days

Answer: (d)

Example 14: 10, 14, 16, 18, 23, 24 and 26

(a) 26 (b) 17 (c) 23 (d) 9

Explanation: Each of the above series are even number, except 23.

Answer: (c)

Example 15: 6, 9, 15, 21, 24, 26, 30

(a) 9 (b) 26 (c) 24 (d) 30
EXERCISE 9(A)
(Note: Questions are taken from previous exam questions papers of Competitive exams like SSC, RRB, MAT, UPSC etc.)
Choose the most appropriate (a) or (b) or (c) or (d).

1) 6, 11, 21, 36, 56 ?
   (a) 42   (b) 51   (c) 81   (d) 91

2) 10, 100, 200, 310 ?
   (a) 400   (b) 410   (c) 420   (d) 430

3) 11, 13, 17, 19, 23, 25, 29
   (a) 33   (b) 27   (c) 31   (d) 49

4) 6, 12, 21, 33 ?
   (a) 33   (b) 38   (c) 40   (d) 48

5) 2, 5, 9, 14, ?, 27
   (a) 20   (b) 16   (c) 18   (d) 24

6) 6, 11, 21, ?, 56, 81
   (a) 42   (b) 36   (c) 91   (d) 51

7) 10, 18, 28, 40, 54, ?, 88
   (a) 70   (b) 86   (c) 87   (d) 98

8) 120, 99, ?, 63, 48, 35
   (a) 80   (b) 36   (c) 45   (d) 40

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9) 22, 24, 28, 36, ?, 84
   (a) 44   (b) 52   (c) 38   (d) 54
10) 4832, 5840, 6848, 7856 ?
    (a) 8864  (b) 8815  (c) 8846  (d) 8887
11) 10, 100, 200, 310, 430 ?
    (a) 560   (b) 540   (c) 550   (d) 590
12) 28, 33, 31, 36, 34 ?
    (a) 38   (b) 39   (c) 40   (d) 42
13) 120, 80, 40, 45, ?, 5
    (a) 15   (b) 20   (c) 25   (d) 30
14) 2, 15, 41, 80, 132 ?
    (a) 184  (b) 144  (c) 186  (d) 197
15) 6, 17, 39, ?, 116
    (a) 72   (b) 75   (c) 85   (d) 80
16) 1, 4, 10, 22, ?, 94
    (a) 46   (b) 48   (c) 49   (d) 47
17) 4, 9, 25, 49, ?, 169, 289, 361
    (a) 120  (b) 121  (c) 122  (d) 164
18) 4, 12, 36, ?, 324
    (a) 107  (b) 109  (c) 108  (d) 110
19) 1, 1, 4, 8, 9, ?, 16, 64
    (a) 27   (b) 28   (c) 32   (d) 40
20) 5760, 960, 192, ?, 16, 8
    (a) 47   (b) 48   (c) 52   (d) 50
21) 1, 2, 6, 7, 21, 22, 66, ?, 201
    (a) 69   (b) 68   (c) 67   (d) 69
22) 48, 24, 96, ?, 192
    (a) 48   (b) 47   (c) 44   (d) 54
23) 165, 195, 255, 285, ?, 435
    (a) 345  (b) 390  (c) 335  (d) 395
24) 2, 3, 3, 5, 10, 13, 39, ?, 172, 177
    (a) 42   (b) 44   (c) 43   (d) 40
25) 7, 26, 63, 124, 215, ? , 511
   (a) 342  (b) 343  (c) 441  (d) 421

26) 3, 7, 15, 31, ? , 127
   (a) 62   (b) 63   (c) 64   (d) 65

27) 8, 28, 116, 584, ?
   (a) 1752  (b) 3502  (c) 3504  (d) 3508

28) 6, 13, 28, 59, ?
   (a) 122  (b) 114  (c) 113  (d) 112

29) 2, 7, 27, 107, 427, ?
   (a) 1707  (b) 4027  (c) 4207  (d) 1207

30) 5, 2, 7, 9, 16, 25, 41, 50, 26, ?
   (a) 65  (b) 66  (c) 67  (c) 68

31) In a certain language, MADRAS is coded NBESBT, how DELHI is coded in that code?
   (a) EMMJI  (b) EFMJ  (c) EMFJP  (d) JIFEM

32) If RAMAN is written as 12325 and DINESH as 675489 how HAMAM is written?
   (a) 92323  (b) 92233  (c) 93233  (d) 93292

33) If RED is coded as 6720 then GREEN would be coded as
   (a) 920716  (b) 167129  (c) 1677209  (d) 1672091

34) If A = 1, FAT = 27, FAITH = ?
   (a) 44   (b) 45   (c) 46   (d) 36

35) If BROTHER is coded 2456784, SISTER coded as 919684, what is coded for BORBERS?
   (a) 2542889  (b) 2542898  (c) 2454889  (d) 2524889

36) If DELHI is coded 73541 and CALCUTTA as 82589662, How can CALICUT be coded?
   (a) 5279431  (b) 5978213  (c) 8251896  (d) 8543962

37) If CLOCK is coded 34235 and TIME is 8679, what will be code of MOTEL?
   (a) 72894  (b) 77684  (c) 72964  (d) 27894

38) If PALE is coded as 2134 and EARTH is coded as 41590, how is PEARL is code?
   (a) 29530  (b) 24153  (c) 25430  (d) 254313

39) If LOSE is coded as 1357 and GAIN is coded as 2468, what do figure 82146 stands for?
   (a) NGLAI  (b) NGLIA  (c) GNLIA  (d) GNLIA

40) If MEKLF is coded as 91782 and LLLJK as 88867, how can IHJED is coded as?
   (a) 97854  (b) 64512  (c) 54610  (d) 75632
41) If in a certain code language NAME is written as 4258 then what is coded as MEAN ?
   (a) 2458   (b) 5842   (c) 8524   (d) 5824

42) If GOLD is written as IQNF, how WIND can be written as code?
   (a) YKPF   (b) VHCM   (c) XJOE   (d) DNIW

43) If ROSE is written as TQUG, how BISCUIT can be written in that code?
   (a) DKUEWKV   (b) C2JTDVJU   (c) DKVEWKV   (d) DKUEWKY

LETTER: C Z N V R S W F D
CODE DIGIT: 8 6 4 7 2 9 3 5 1

(Q. No. 44-46) In each of the following questions find out the correctly coded alternative from amongst the given four alternatives (a), (b), (c), (d).

44) ZDRCVF
   (a) 612875   (b) 619875   (c) 612845   (d) 612835

45) WNCSZV
   (a) 348267   (b) 318267   (c) 348957   (d) 348967

46) RDNFVS
   (a) 21679   (b) 216549   (c) 214579   (d) 218579

47) If DELHI is coded as CCIDD, how would you encode BOMBAY?
   (a) AJMTVT   (b) AMJXVS   (c) MJXVSU   (d) WXYZAX

48) In a certain code, RIPPLE is written as 613382 and LIFE is written as 8192. How is PILLER written in that code?
   (a) 318826   (b) 318286   (c) 618826   (d) 338816

49) If PALAM could be given the code number 43, what code number can be given to SANTACRUZ?
   (a) 123   (b) 85   (c) 120   (d) 125

Directions: The number in each question below is to be codified in the following code:

<table>
<thead>
<tr>
<th>Digit</th>
<th>7</th>
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<th>1</th>
<th>5</th>
<th>3</th>
<th>9</th>
<th>8</th>
<th>6</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter</td>
<td>W</td>
<td>L</td>
<td>M</td>
<td>S</td>
<td>I</td>
<td>N</td>
<td>D</td>
<td>J</td>
<td>B</td>
</tr>
</tbody>
</table>

50) 184632
   (a) MDJBSI   (b) MDJBIL   (c) MDJBWL   (d) MDBJIL

51) In a certain code ‘256’ means ‘you are good’, ‘637’ means ‘we are bad’ and ‘358’ means ‘good and bad’. Which of the following represents ‘and’ in that code?
   (a) 2   (b) 5   (c) 8   (d) 3
Directions: Find odd man out of the following (51-60):

52) 3, 5, 7, 15, 17, 19
   (a) 15   (b) 17   (c) 19   (d) 7

53) 10, 14, 16, 18, 23, 24, 26
   (a) 26   (b) 23   (c) 24   (d) 18

54) 1, 4, 9, 16, 24, 25, 36
   (a) 9    (b) 24   (c) 25   (d) 36

55) 41, 43, 47, 53, 61, 71, 73, 75
   (a) 75   (b) 73   (c) 71   (d) 53

56) 16, 25, 36, 73, 144, 196, 225
   (a) 36   (b) 73   (c) 196  (d) 225

57) 1, 4, 9, 16, 19, 36, 49
   (a) 19   (b) 9    (c) 49   (d) 16

58) 1, 5, 14, 30, 49, 55, 91
   (a) 49   (b) 30   (c) 55   (d) 91

59) 835, 734, 642, 751, 853, 981, 532
   (a) 751  (b) 853  (c) 981  (d) 532

60) 4, 5, 7, 10, 14, 18, 25, 32
   (a) 7    (b) 14   (c) 18   (d) 33

61) 52, 51, 48, 43, 34, 27, 16
   (a) 27   (b) 34   (c) 43   (d) 48

ANSWERS

EXERCISE-9 A

<p>| | | | | | | | | |</p>
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<tbody>
<tr>
<td>1. (c)</td>
<td>2. (d)</td>
<td>3. (c)</td>
<td>4. (d)</td>
<td>5. (a)</td>
<td>6. (b)</td>
<td>7. (a)</td>
<td>8. (a)</td>
<td>9. (b)</td>
</tr>
<tr>
<td>11. (a)</td>
<td>12. (b)</td>
<td>13. (a)</td>
<td>14. (d)</td>
<td>15. (a)</td>
<td>16. (a)</td>
<td>17. (b)</td>
<td>18. (c)</td>
<td>19. (a)</td>
</tr>
<tr>
<td>21. (c)</td>
<td>22. (a)</td>
<td>23. (a)</td>
<td>24. (c)</td>
<td>25. (b)</td>
<td>26. (b)</td>
<td>27. (d)</td>
<td>28. (a)</td>
<td>29. (a)</td>
</tr>
<tr>
<td>31. (b)</td>
<td>32. (a)</td>
<td>33. (c)</td>
<td>34. (a)</td>
<td>35. (a)</td>
<td>36. (c)</td>
<td>37. (a)</td>
<td>38. (b)</td>
<td>39. (a)</td>
</tr>
<tr>
<td>41. (d)</td>
<td>42. (a)</td>
<td>43. (a)</td>
<td>44. (a)</td>
<td>45. (d)</td>
<td>46. (c)</td>
<td>47. (a)</td>
<td>48. (a)</td>
<td>49. (a)</td>
</tr>
<tr>
<td>51. (c)</td>
<td>52. (a)</td>
<td>53. (b)</td>
<td>54. (b)</td>
<td>55. (a)</td>
<td>56. (b)</td>
<td>57. (a)</td>
<td>58. (a)</td>
<td>59. (a)</td>
</tr>
<tr>
<td>61. (b)</td>
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</table>
After reading this chapter, students will be able to understand:

- In this test, the questions consist of a sort of direction puzzle. A successive follow-up of direction is formulated and the students is required to ascertain the final direction. The test is meant to judge then ability to trace and follow correctly and sense the direction correctly.

- The adjoining figure shows the four main directions (North N, South S, East E, and West W) and four cardinal directions (North East (NE), North West (NW), South East (SE), South West (SW)) to help the students know the directions.
Always Remember:

<table>
<thead>
<tr>
<th>Action</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left + left</td>
<td>Down</td>
</tr>
<tr>
<td>Left + right</td>
<td>Up</td>
</tr>
<tr>
<td>Right + left</td>
<td>Up</td>
</tr>
<tr>
<td>Right + right</td>
<td>Down</td>
</tr>
<tr>
<td>Up + left</td>
<td>Left</td>
</tr>
<tr>
<td>Up + right</td>
<td>Right</td>
</tr>
<tr>
<td>Down + left</td>
<td>Right</td>
</tr>
<tr>
<td>Down + right</td>
<td>Left</td>
</tr>
</tbody>
</table>

Examples:

1. A man starts from a point and walks 2 km towards North, turns towards his right and walks 2 km, turns right again and walks. What is the direction now be is facing?
   
   (a) South
   (b) South-East
   (c) North
   (d) West

   **Explanation:** (a) The diagram given below helpful solving the questions and Direction Test.

   South.
2. Ramu walks 5 kms starting from his house towards west then turns right and walks 3 km. Thereafter she takes left turn and walks 2 km. Further, she turn left and walks 3 km. Finally, she turns right and walks 3 kms. In what direction she is now from her house?

(a) West  
(b) North  
(c) South  
(d) East

**Explanation**

It’s clear from the diagram Ramu is West of her house.

3. Gopal started walking 2 km straight from his school. Then he turned right and walked 1 km. Again he turned right and walked 1 km to reach his house. If his house is south-east from his school, then in which direction did Gopal start walking from the school?

(a) East  
(b) West  
(c) South  
(d) North

From the diagram that Gopal Started walking towards East from the school.

4. A man starts from a point, walks 2 km towards north, turns towards his right and walks 2 km, turns right again and walks. What is the direction now he is facing?

(a) South  
(b) East  
(c) North  
(d) West
Based on the diagram the person facing towards south.

5. Janki started from her house and walked 2 km towards North. Then she took a right turn and covered one kilometre. Then she took again a right turn and walked for 2 kms. In what direction is she going?

(a) North  (b) East
(c) South  (d) West

**Explanation:**

Janaki is going on South.
EXERCISE – 10(A)

(Note: Questions are taken from previous exam questions papers of Competitive exams like SSC, RRB, MAT, UPSC etc.)

Choose the appropriate answer (a) or (b) or (c) or (d)

1. Mohan starts from point A and walks 1 km towards south, turns left and walks 1km. Then he turns left again and walks 1 km. Now he is facing.
   (a) East (b) West (c) North (d) South-west

2. Suresh starts from a point, walks 2 miles towards south, turns right and walks 1 1/2 miles, turns left and walks ½ miles and then he turns back. What is the direction he is facing now?
   (a) East (b) West (c) South (d) North

3. A man starts from a point, walks 4 miles towards north and turns left and walks 6 miles, turns right and walks for 3 miles and again turns right and walks 4 miles and takes rest for 30 minutes. He gets up and walks straight 2 miles in the same direction and turns right and walks one mile. What is the direction he is facing?
   (a) North (b) South (c) South-east (d) West

4. Arun started from point A and walked 10 km East to point B, then turned to North and walked 3 km to point C and then turned West and walked 12 kms to point D, then again turned South and walked 3 kms to point E. In which direction is he from his straight point?
   (a) East (b) South (c) West (d) North

5. A starts from a point and walks 5 kms north, then turns left and walks 3 kms. Then again turns left and walks 5 km. Point out the direction in which he is going now.
   (a) North (b) South (c) South-east (d) West

6. A rat run 20 towards East and turns to right runs 10 and turns to right runs 9 and again turns to left runs 5 and then turns to left runs 12 and finally turns to left and runs 6. Now what direction is the rat facing?
   (a) East (b) North (c) West (d) South

7. A driver left his village and drove North for 20 km, after which he stopped for breakfast. Then he turned left and drove another 30 km, when he stopped for lunch. After some rest, he again turned left and drove 20 kms before stopping for evening tea. Once more he turned left and drove 30 kms to reach the town where he had supper. After evening tea in which direction did he drive?
   (a) West (b) East (c) North (d) South

8. A man is facing East, then he turns left and goes 10 m, then turns right and goes 5 m then goes 5 m to the South and from there 5 m to West. In which direction is he from his original place?
   (a) East (b) West (c) North (d) South
9. From her home Prerna wishes to go to school. From home she goes towards North and then turns left and then turns right, and finally she turns left and reaches school. In which direction her school is situated with respect to her home?
(a) North-East  (b) North-West  (c) South-East  (d) South-West

10. A child walks 25 feet towards North, turns right and walks 40 feet, turns right again and walks 45 feet. He then turns left and walks 20 feet. He turns left again walks 20 feet. Finally, he turns to his left to walks another 20 feet. In which direction is the child from his starting point?
(a) North  (b) South  (c) West  (d) East

11. Raju facing North and moves 20 km, then he turned to his right and moves 20 km and then he moves 10 km in North-East, then he turned to his right and moves 20 km and then he turned to his right and moves 20 km and again he turned to his left and moves 20 km. Now in which direction Rahu is facing?
(a) South-East  (b) North-East  (c) South-West  (d) North-West

12. K is a place which is located 2 km away in the north-west direction from the capital P. R is another place that is located 2 km away in the south-west direction from K. M is another place and that is located 2 km away in the north-west direction from R. T is yet another place that is located 2 km away in the south-west direction from M. In which direction is T located in relation to P?
(a) South-west  (b) North-west  (c) West  (d) North

13. Babu is Rahim’s neighbour and his house is 200 meters away in the north-west direction. Joseph is Rahim’s neighbour and his house is located 200 meter away in the south-west direction. Gopal is Joseph’s neighbour and he stays 200 meters away in the south-east direction. Roy is Gopal’s neighbour and his house is located 200 meters away in the north-east direction. Then where is the position of Roys’ house in relation to Babu’s?
(a) South-east  (b) south-west  (c) North  (d) North-east

14. A tourist drives 10 km towards west and turns to left and takes a drive of another 4 km. He then drives towards east another 4 km and then turns to his right and drives 5 km. Afterwards he turns to his left and travels 6 km. In which direction is je from the starting point?
(a) North  (b) East  (c) West  (d) South

15. A man started walking West. He turned right, then right again and finally turned left. Towards which direction was he walking now?
(a) North  (b) South  (c) West  (4) East

16. One evening, Raja started to walk toward the Sun. After walking a while, he turned to
his right and again to his right. After walking a while, he again turned right. In which direction is he facing?
(a) South  (b) East  (c) West  (d) North

17. Five boys A, B, C, F, E, are sitting in a park in a circle. A is facing South-West, D is facing South-East, B and E are right opposite A and D respectively and C is equidistant between D and B. Which direction is C facing?
(a) West  (b) South  (c) North  (d) East

18. If a man on a moped starts from a point and rides 4 km South then turns left and rides 2 km and turn again to the right to ride to go more towards which direction is he moving ?
(a) North  (b) West  (c) East  (d) South

19. A man starts from a point, walk 8 km towards North, turns right and walks 12 km, turns left and walks 7 km turns and walks 20 km towards South, turns right and walks 12 km. In which direction is he from the starting point?
(a) North  (b) South  (c) West  (d) East

20. Daily in the morning the shadow of Gol Gumbaz falls on Bara Kaman and in the evening the shadow of Bara Kaman falls on Gol Gumbaz exactly. So in which direction is Gol Gumbaz to Bara Kaman?
(a) Easter side (b) Western side (c) Northern side (d) Southern side

21. Ashok went 8 km South and turned West and walked 3 km again he turned North and walked 5 kms. He took a final turn to East and walked 3 kms . In which direction was Ashok from the starting point?
(a) East  (b) North  (c) West  (d) South

22. If X stands on his head with his face towards south, to which direction will his left hand point ?
(a) East  (b) West  (c) North  (d) South

23. I drove East for 5 miles then drove North 3 miles, then turned to my left and drove for 2 miles and again turned to my left. Which direction am I going now?
(a) South  (b) North  (c) West  (d) North-west

24. If A stands on his head with his face towards north. In which direction will his left hand point ?
(a) North-East  (b) North  (c) East  (d) North-West

25. A car travelling from south covers a distance of 8 km, then turns right and runs another 9 kms and again turns to the right and was stopped. Which direction does it face now?
(a) South  (b) North  (c) West  (d) East
26. A taxi driver commenced his journey from a point and drove 10 km toward north and turned to his left and drove another 5 km. After waiting to meet a friend here, he turned to his right and continued to drive another 10 km. He has covered a distance of 25 km so far, but in which direction would he be now?
(a) South  (b) North  (c) East  (d) South-east

27. A walks 3 kms northward and then he turns left and goes 2 km. He again turns left and goes 3 km. He turns right and walks straight. In which direction is he walking now?
(a) East  (b) West  (c) North  (d) South

28. A walks southwards, then turns right, then left and then right. In which direction is he from the starting point?
(a) South  (b) East  (c) West  (d) North

29. A man starts from a point, walks 15 metres towards East, turns left and walks 10 metres, turns right again and walks. Towards which direction is he now walking?
(a) North  (b) East  (c) West  (d) South

30. A boy starts walking towards West, he turns right and again he turns right and then turns left at last. Towards which direction is he walking now?
(a) West  (b) North  (c) South  (d) East

31. I stand with my right hand extended side-ways towards South. Towards which direction will my back be?
(a) North  (b) West  (c) East  (d) South

32. If a person moves 4 km towards west, then turns right and moves 3 km and then turns right and moves 6 km, which is the directions in which he is now moving?
(a) East  (b) West  (c) North  (d) South

33. If Mohan sees the rising sun behind the temple and the setting sun behind the railway station from his house, what is the direction of the temple from the railway station?
(a) South  (b) North  (c) East  (d) West

34. Laxman went 15 km to North then he turned West and covered 10 kms. Then he turned south and covered 5 kms. Finally turning to East he covered 10 kms. In which direction he is from his house?
(a) East  (b) West  (c) North  (d) South

35. A man starts from a point, walks 4 miles North, turns to his right and walks 2 miles, again turns to his right and walks 2 miles, again turns to his right and walks 2 miles. In
which direction would he be now?

(a) North  
(b) South  
(c) East  
(d) West

36. I started walking down a road in the morning facing the Sun. After walking for sometime I turned to my left. Then I turned to my right. In which direction was I going then?

(a) East  
(b) West  
(c) North  
(d) South

37. Lakshmi walked 2 furlongs north from her house and took a turn to left and continued to walk another one kilometre and finally she turned left and reached the school. Which direction is she facing now?

(a) West  
(b) North  
(c) South  
(d) North

38. You are going straight, first eastwards, then turn to the right, then right again, then left. In which direction would you be going now?

(a) East  
(b) West  
(c) South  
(d) East

39. If Ahmed travels towards North from his house, then to left, then to South covering equal distances in each direction to reach Sohan’s house, in which direction is Ahmed’s house now?

(a) East  
(b) South  
(c) North  
(d) West

40. You go North, turn right, then right again and then go to the left. In which direction are you now?

(a) South  
(b) East  
(c) West  
(d) North

41. Roopa starts from a point and walks 15 metre towards west, turns left and walks 12 metre, turns right again and walks. What is the direction she is now facing?

(a) South  
(b) West  
(c) East  
(d) North

42. A man starts his journey facing the sun early morning. He then turns right and walks 2 km. He then walks 3 km after turning right again. Which is the direction he is facing now?

(a) North-East  
(b) North  
(c) West  
(d) South

43. Roy walks 2 km to East, then turns North-West and walks 3 km. Then he turns South and walks 5 km. Then again he turns West and walks 2 km. Finally he turns North and walks 6 km. In which direction, is he from the starting point?

(a) South-West  
(b) South-East  
(c) North-West  
(d) North-East

44. Seeta starts from a point, walks 2 km towards north, turns towards her right and walks 2 km, turns right again and walks. What is the direction she is facing now?

(a) East  
(b) West  
(c) South  
(d) North
45. Shyam was facing East. He walked 5 km forward and then after turning to his right walked 3 km. Again he turned to his right and walked 4 km. After this he turned back. Which direction was he facing at that time?
   (a) East  (b) West  (c) North  (d) South

46. Raju is standing facing north. He goes 30 metres ahead and turns left and goes for 15 metres. Now he turns right and goes for 50 metres and finally turns to his right and walks. In which direction is he heading?
   (a) North  (b) East  (c) South  (d) West

47. Sanmitra starts from his house and walks 3 km towards north. Then he turns right and walks 2 km and then turns right and walks 5 km, then turns right and walks 2 km and then again turns right and walks 2 km. Which direction is he facing now?
   (a) North  (b) South  (c) West  (d) East

48. Raju is Ramu’s neighbour and he stays 100 metres away towards southeast. Venu is Raju’s neighbour and he stays 100 metres away towards southwest. Khader is Venu’s neighbour and he stays 100 metres away towards, north-west. Then where is the position of Khader’s home in relation to Ramu’s?
   (a) South-East  (b) South-West  (c) North-West  (d) East

49. Ramesh walked 3 km, towards West and turned to his left and walked 2 km. He, then turned to his right and walked 3 km. Finally, he turned to his right again and walked another 2 km. In which direction is Ramesh from his starting point now?
   (a) East  (b) West  (c) North  (d) South

50. Deepa starts walking north towards and after a while she turns to her right. After walking some distance, she turns to his left and walks a distance of 1 km. She then turns to his left again. In which direction she moving now?
   (a) North  (b) West  (c) East  (d) South

51. Raman starts walking in the morning facing the Sun. After sometime, he turned to the left later again he turned to his left. At what direction is Raman moving now?
   (a) East  (b) West  (c) South  (d) North

52. A starts walking towards North turns left, again turns left, turns right, again turns right once again turns left. In which direction is A walking now?
   (a) East  (b) South  (c) West  (d) South-East

53. X walks southwards and then turns right, then left and then right,. In which direction is he moving now?
   (a) South  (b) North  (c) West  (d) South-West
54. A man started to walk East. After moving a distance, he turned to his right. After moving a distance, he turned to his right again. After moving a little he turned in the end to his left. In which direction was he going now?

(a) North   (b) South   (c) East   (d) West

ANSWERS: EXERCISE 10(A)

1. (c)  2. (d)  3. (b)  4. (c)  5. (b)
6. (b)  7. (b)  8. (c)  9. (b)  10. (d)
11. (a) 12. (c) 13. (a) 14. (d) 15. (a)
16. (a) 17. (d) 18. (d) 19. (b) 20. (a)
21. (d) 22. (b) 23. (a) 24. (c) 25. (a)
26. (b) 27. (b) 28. (a) 29. (b) 30. (b)
31. (b) 32. (a) 33. (c) 34. (c) 35. (a)
36. (a) 37. (d) 38. (c) 39. (a) 40. (b)
41. (b) 42. (c) 43. (c) 44. (c) 45. (a)
46. (b) 47. (a) 48. (c) 49. (b) 50. (b)
51. (b) 52. (a) 53. (c) 54. (b)
To understand the Logical statements involved in the Seating Arrangements.

To understand the types of Seating Arrangements.

The process of making a group of people to sit as per a prefixed manner is called Seating Arrangement. These questions, some conditions are given on the basis of which students are required to arrange objects, either in a row or in a circular order.

**CHAPTER 11**

**SEATING ARRANGEMENTS**

**LEARNING OBJECTIVES**

- To understand the Logical statements involved in the Seating Arrangements.
- To understand the types of Seating Arrangements.

**INTRODUCTION**

**11.1 BASED ON VARIOUS PATTERN OF SITTING ARRANGEMENTS ARE CLASSIFIED INTO**

1) Linear Arrangements
2) Circular Arrangements
3) Polygon Arrangements

Here we are limited to our topic linear and circular arrangements only. While making arrangements, it should be noted that all the conditions given are compiled with. These type of questions generally involve five to eight individuals arranged in a certain manner or pre-conditions. They may have to be arranged in a Circle or in a row accordingly.

Sometimes these questions are made more difficult by allowing an individual to a particular position with some conditions.

General instructions to Solve Seating Arrangement Questions are as follows.

1) First of all take a review on the given information. After performing this step, you would get an idea of the situation of people or objects.

2) Next, determine the usefulness of each information’s and classify them accordingly into ‘definite information’, ‘comparative information’ and ‘negative information’.

3) When the place of any objects or persons is definitely mentioned then we say that it is a definite information, X is sitting on the right end of the bench.

4) When the place of any object or person is not mentioned definitely but mentioned only in the comparison of another person or object, then we say that it is a comparative information.

**Example 1:** A is sitting second to the right of E. This type of information can be helpful when we can get the definite information about E.
5) A part of definite information may consist of negative information. A negative information does not tell us anything definitely but it gives an idea to eliminate a possibility.

Example 2: C is not sitting on the immediate left of A.

11.2 TYPE-1 LINEAR ARRANGEMENT

In this type of arrangement, we arrange objects or persons in a line or row. The arrangement is done only on one ‘axis’ and hence, the position of persons or objects assumes importance in terms of order like positions. In this type of arrangement, we take directions according to our left and right.

Steps to Solve the Linear Arrangements:
(a) Identify the number of objects and their names.
(b) Use pictorial method to represent the people or objects and their positions.
(c) Arrange the information with relevant facts and their positions and try to find out the solution.
(d) Answer the questions based on the arrangement having made.

There are few words which must be paid adequate attention, i.e., ‘between’ means sandwiched, ‘immediate left’ is different from ‘to the left’. To understand it let us see some pictorial representation.

When direction of face is not clear, then we take One Row Sequence

(A) When direction of face is not clear, then we take based on diagram will be as follows:

```
    P Q R S T
   Left  Right
```

From the above diagram, it is clear that
(i) Q, R, S, T are right of P but only Q is the immediate right of P.
(ii) S, R, Q, P are left of T but only S is the immediate left of T.
(iii) R, S, T are right of Q only R is the immediate right of Q.
(iv) R, Q, P are left of S but only R is the immediate left of S.
(v) S and T are right of R but only S is the immediate right of R.
(vi) Q and P are left of R but only Q is the immediate left of R.
(vii) A is the immediate left of Q while T is the immediate right of S.

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

```
    P Q R S T
   Right  Left
```
From the above diagram, it is clear that
(i) Left of P = P, R, S and T
(ii) Right of T = S, R, Q and P
(iii) Q is immediate left of P; R is immediate left of Q; S is immediate left of R and T is immediate left of S.
(iv) S is immediate right of T; R is immediate right of S; Q is immediate right of R; and P is immediate right of Q.

Two Rows Sequence
Let us see 6 persons seating in two rows.

<table>
<thead>
<tr>
<th>Right</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>Right</td>
</tr>
</tbody>
</table>

From the above diagram, it is clear that
(i) A is sitting opposite D
(ii) B is sitting opposite E
(iii) C is sitting opposite F
(iv) D and C are sitting at diagonally opposite positions
(iv) S and R are sitting at diagonally opposite positions.

Example 3: Four Children’s are sitting in arrow. A is occupying seat next to B but not next to C. If C is not sitting next to D? Who is occupying seat next to adjacent to D.

(a) B  (b) B and A  (c) Impossible to tell   (d) A

Solution: (d) The arrangements as per given information is possible only if C is sitting next to B and D is sitting next to A.

Therefore, two possible arrangements are C, B, A, D, or D, A, B, C.

Clearly, only A is sitting adjacent to D:


(i) P is fourth to the right of T
(ii) W is fourth to the left of S
(iii) R and U, which are not at the ends, are neighbours of Q and T respectively.
(iv) W is next to the left of P and P is the neighbour of Q, who are sitting at the extreme ends

Solution:
From information
(i) we get that there are three persons between P and TXXP.

In the information (iv), it is given that W is next to the left of P and Q is the neighbour of P. Using the information with (i), we get TXXPQ.
By the information (ii), TXXWPQXS

By the information (iii),

T U V W P Q R S

So, T and S are sitting at the extreme ends.

**Example 5:** There are Five houses P, Q, R, S, T. P is right of Q and T is left of R and right of P. Q is right of S. Which house in the middle.

(a) P  (b) Q  (c) R  (d) T

**Solution:** According to the question the houses can be arranged as follows.

S Q P T R

Therefore, house P is middle.

**Example 6:** Friends are sitting on a bench. A is to the left of B but on the right of C, D is to the right of B but one the left of E. Who are at the extremes?

(a) A, B (b) A, D (c) C, E (d) B, D

**Solution:** Arrangements according to the question as follows.

Left

C A B D E

Right

Clearly C and E are the extremes.

**Example 7:** In a college party, 5 girls are sitting in a row. F is to the left of M and to the right of O. R is sitting to the right of N but to the left of O. Who is sitting in the middle?

(a) O (b) R (c) P (d) M

**Solution:** (a) arrangements of the question as follows.

Left

N R O P M

Right

Therefore, O is sitting in the middle.

**Example 8:** Five boys A, B, C, D and E are standing in a row. D is on the right of E, B is on the left of E but on the right of A. D is one the left of C, who is standing on the extreme right. Who is standing in the middle?

(a) B (b) C (c) D (d) E

**Solution:** The sequence of Boys as follows.

Left End

A B E D C

Right

There E is standing in the middle.
Circular Arrangement:
In this arrangement, some persons are sitting around a circle and they are facing the centre.

1. Left movement is called clockwise rotation.
2. Right movement is called anti-clockwise rotation.
   (i) The above presentation is for 4 persons but for any number of persons, the direction is taken in the same manner.
   (ii) For rectangular and sequence arrangement, directions are taken as discussed in two rows sequence.

Example 9: (Q Nos. 1 to 3) Study the following Question carefully and answer the given questions.
Four ladies & A, B, C and D and Four Gentlemen E, F, G and H are sitting in a circle around a table facing each other.
I. No two ladies or gentlemen are sitting side by side.
II. C, who I sitting between G and E, is facing D.
III. F is between D and A and facing G.
IV. H is to the right of B.
(1) Who is sitting left of A?
   (a) E   (b) F   (c) G   (d) H
(2) E is facing whom?
   (a) F   (b) B   (c) G   (d) H
(3) Who is immediate neighbour of B?
   (a) G and H   (b) E and F   (c) E and H   (d) F and H

Solution: On the basis of given information in the question, the seating arrangements of the persons are as follows.
Example 10: Eight persons A, B, C, D, E, F, G and H are sitting around the circle as given in the figure. They are facing the direction opposite to centre. If they move upto three places anti-clockwise, then.

(a) B will face west  
(b) E will face East  
(c) H will face North-West  
(d) A will face South

Solution: Following Seating arrangement is formed from the given in formation.
Clearly B will Face west

**Example 11:** Five People A, B, C, D and E are seated about a round table. Every chair is spaced equidistant from adjacent chairs. (UPSC (CSAT) 2013)

I. C is seated next to A.
II. A is seated two seats from D.
III. B is not seated next to A.

Which of the following must be true?
I. D is seated next to B.
II. E is seated next to A.

Select the correct from the options given below:
(a) Only I
(b) Only II
(c) Both I and II
(d) Neither I nor II

**Solution:**
According to the given information there are possible Seating arrangements.

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From the above arrangements. It is clear that D is seated next to B . Also E is next to A.
Clearly both statements I and II are true.

**Example 12:** Study the following Question carefully and answer the given questions.

Eight friends A, B, C, D, E, G and H are sitting in a circle facing the centre, not necessarily in the same order. D sits third to the left of A. E sits to the immediate right of A. B is third to left of D. G is second to the right of B. C is neighbour of B. C is third to left of H. (GIC 2012)

1) Who amongst the following is sitting exactly between F and D?
   (a) C  (b) E  (c) H  (d) A

2) Three of the following four are alike in a certain way based on the information given above and so form a group. Which is does not belong to that group.
   (a) DC  (b) AH  (c) EF  (d) DF

3) Who amongst the following second to the left of H?
   (a) E  (b) B  (c) A  (d) Noe of these

4) Who amongst the following are immediate neighbours of G?
   (a) CA  (b) AF  (c) DC  (d) DF

5) Who amongst the following is sitting third to the right of A?
   (a) F  (b) B  (c) H  (d) C

**Solution:** Arrangements according to the question is as follows.
1) (c) Clearly H is sitting exactly F and D
2) (d) DGC AFH EAF C none B
   Skipped Skipped Skipped No member is skipped in between
   So, CB does not belong to the group.
3) (d) Clearly H is sitting exactly between F and D
4) (c) Clearly D and C immediate neighbours of G
5) (d) Clearly, C is sitting third to the right of A

EXERCISE 11.A
(Note: Questions are taken from previous exam questions papers of Competitive exams like SSC, RRB, MAT, UPSC etc.)

Choose the appropriate answer (a) or (b) or (c) or (d)

1. Five boys A, B, C, D and E are sitting in a row A is to the right of B and E is to the left of B but to the right of C. A is to the left of D. Who is second from the left end? (U.P.B.Ed 2013)
   (a) D (b) A (c) E (d) B

2. There are five different houses, A to E, in a row. A is to the right of B and E is to the left of C and right of A, B is to the right of D. Which of the houses is in the middle? IB CA (IO) 2013)
   (a) A (b) B (c) C (d) D

3. Five friends P, Q, R, S and T are sitting in a row facing North. Here, S is between T and Q and Q is to the immediate left of R. P is to the immediate left of T. Who is in the middle? (SSC (Multi Task) 2014)
   (a) S (b) T (c) Q (d) R

4. Six children A, B, C, D, E and F are standing in a row. B is between F and D. E is between A and C. A does not stand next to eight F or D. C does not stand next to D. F is between which of the following pairs of children? (SSC (FCI) 2012)
   (a) B and E (b) B and C (c) B and D (d) B and A

5. There are eight books kept one over the other. Two books are on Organisation Behaviour, two books on TQM, three books on Industrial Relations and one book is on Economics. Counting from the top, the second, fifth and sixth books are on Industrial Relations. Two books on Industrial Relations are between two books on TQM. One book of Industrial Relations is between two books on Organizational Behaviour while the book above the book of Economics is a book of TQM. Which book is the last book from the top? (MAT 2011)
   (a) Economics (b) TQM
   (c) Industrial Relations (d) Organizational Behaviour
6. Five boys are standing in a row facing East. Pavan is left of Tavan, Vipin and Chavan to the left of Nakul. Chavan is between Tavan and Vipin. Vipin is fourth from the left, then how far is Tavan to the right? (CLAT 2014)
   (a) First  (b) Second  (c) Third  (d) Fourth

7. Six persons M, N, O, P, Q and R are sitting in two row with three persons in each row. Both the row are in front of each other. Q is not at the end of any row. P is second the left of R. O is the neighbour of Q and diagonally opposite to P. N is the neighbour of R. Who is in front N? (UPSC (CSAT) 2011)
   (a) R  (b) Q  (c) P  (d) M

8. Six persons A, B, C, D, E and F are sitting in two row, three in each row. (MAT 2011)
   (I) E is not at the end of any row
   (II) D is second to the left of F
   (III) C, the neighbor of E, is sitting diagonally opposite
   (IV) B is the neighbor of F.
   Which of the following are in one of the two rows?
   (a) D, B and F  (b) C, E and B  (c) A, E and F (d) F, B

Direction (Q.No.9): Read the following information carefully and answer that question that follows.

Five boys A₁, A₂, A₃, A₄ and A₅ are sitting in a stair in the following way. (RRB (TC/CC) 2010)
   I. A₅ is above A₁
   II. A₄ is under A₂
   III. A₂ is under A₁
   IV. A₄ is between A₂ and A₃.

9. Who is at the lowest position of the stair?
   (a) A₁  (b) A₃  (c) A₅  (d) A₂

10. Five children are sitting in a row. S is sitting next to P but not T. K is sitting next to R, who is sitting on the extreme left and T is not sitting next to K. Who is/are adjacent to S? (NIFT (UG) 2014)
    (a) K and P  (b) R and P  (c) Only P  (d) P and T

11. Five senior citizens are living in a multi-storeyed building. Mr. Muan lives in a flat above Mr. Ashokan, Mr. Lokesh in a flat below Mr. Gaurav, Mr. Ashokan lives in a flat below Mr. Gaurav and Mr. Rakesh lives in a flat below Mr. Lokesh. Who lives in the topmost flat? (MAT 2013).
    (a) Mr. Lokesh  (b) Mr. Gaurav  (c) Mr. Muan  (d) Mr. Rakesh

12. In a gathering seven members are sitting in a row. ‘C’ is sitting left to ‘B’ but on the right to ‘D’. ‘A’ is sitting right to ‘B’, ‘F’ is sitting right to ‘E’ but left to ‘D’. ‘H’ is sitting left to ‘E’. Find the person sitting in the middle (SSC (10+2) 2013)
    (a) C  (b) D  (c) E  (d) F
**Directions (No: 13-17):** Study the following information carefully to answer the given questions.

A to H are seated in straight line facing North. C sits fourth left of G. D sits second to right of G. Only two people sit between D and A. B and F are immediate neighbours of each other. B is not an immediate neighbour of A. H is not neighbour of D. (GIC 2012)

13. Who amongst the following sits exactly in the middle of the persons who sit fifth from the left and the person who sit sixth from the right?
   (a) C  (b) H  (c) E  (d) F

14. Who amongst the following sits third to the right of C?
   (a) B  (b) F  (c) A  (d) E

15. Which of the following represents persons seated at the two extreme ends of the line?
   (a) C, D  (b) A, B  (c) B, G  (d) D, H

16. What is the position of H with respect to F?
   (a) Third to the left  (b) Immediate right (c) Second to right  (d) Fourth to left

17. How many persons are seated between A and E?
   (a) One  (b) Two  (c) Three  (d) Four

**Directions (Q. No. 18-22) (MAT 2012)**

Study the following information carefully to answer the given questions.

Ten students are A to J are sitting in a row facing west.

I. B and F are not sitting on either of the edges.
II. G is sitting left of D and H is sitting to the right of J.
III. There are four persons between E and A.
IV. I is the north of B and F is the south of D.
V. J is between A and D and G is in E and F.
VI. There are two persons between H and C.

18. Who is sitting at the seventh place counting from left?
   (a) H  (b) C  (c) J  (d) Either H or C

19. Who among the following is definitely sitting at one of the ends?
   (a) C  (b) H  (c) E  (d) Cannot be determined

20. Who are immediate neighbours of I?
   (a) BC  (b) BH  (c) AH  (d) Cannot determined

21. Who is sitting second left of D?
   (a) G  (b) F  (c) E  (d) J

22. If G and A interchange their positions, then who become the immediate neighbours of E?
   (a) G and F  (b) Only F  (c) Only A  (d) J and H
Directions (Q. Nos. 23-24) Read the following information carefully and then answer the questions that follow.

A group of singers, facing the audience, are standing in line on the stage as follows.

I. D is not right to C
II. F is not standing beside G.
III. B is not left of F
IV. E is not left of A
V. C and B have one person between E and F
VI. There are two persons H and C.

23. Who is on the Second extreme right?
   (a) D  (b) F  (c) G  (d) E

24. If we start counting from the left, on which number is B?
   (a) 1st  (b) 2nd  (c) 3rd  (d) 5th

Directions (Q. No. 25-27): Study the following information carefully to answer the given questions.

Eight persons P to W are sitting in front of one another in two rows. Each row has four persons. P is between U and V and facing North. Q, who is to the immediate left of M is facing W. R is between T and M and W is to the immediate right of V.

(UCO Bank 2011)

25. Who is sitting in front of R?
   (a) U  (b) Q  (c) V  (d) P

26. Who is to the immediate right of R?
   (a) M  (b) U  (c) M or T  (d) None of these

27. In which of the following pairs, persons are sitting in front of each other?
   (a) MV  (b) RV  (c) TV  (d) UR

28. Four girls A, B, C, D are sitting around a circle facing the centre. B and C infront of each other, which of the following is definitely true? (MAT 2009)
   (a) A and D infront of each other  (b) A is not between B and C
   (c) D is left of C  (d) A is left of C

ANSWERS

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12.1 DEFINITION

A person who is related to another by birth rather than by marriage.

Prerequisites:

To remember easily the relations may be divided into two sides as given below:

(i) Relations of Paternal side:
   - Father’s father → Grandfather
   - Father’s mother → Grandmother
   - Father’s brother → Uncle
   - Father’s sister → Aunt
   - Children of uncle → Cousin
   - Wife of uncle → Aunt
   - Children of aunt → Cousin
   - Husband of aunt → Uncle

(ii) Relations of Maternal side:
   - Mother’s father → Maternal grandfather
   - Mother’s mother → Maternal grandmother
   - Mother’s brother → Maternal uncle
   - Mother’s sister → Aunt
   - Children of maternal uncle → Cousin
   - Wife of maternal uncle → Maternal aunty


## Relations:

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<th>1. Grandfather’s son</th>
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<td>2. Grandmother’s son</td>
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<td>5. Mother’s or father’s mother</td>
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<td>6. Son’s wife</td>
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<td>7. Daughter’s husband</td>
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<td>9. Brother’s son</td>
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<td>10. Brother’s daughter</td>
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<td>11. Uncle or aunt’s son or daughter</td>
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<td>12. Sister’s husband</td>
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<td>13. Brother’s wife</td>
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<td>14. Granson’s or grand daughter’s daughter</td>
<td>• Great grand Daughter</td>
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The efficiency in doing the problems of blood relations depends upon the knowledge of the blood relations. Some of the important relations are given below:

a) My mother’s or father’s son is my Brother.
b) My mother’s or father’s daughter is my Sister.
c) My mother’s or father’s father is my Grandfather.
d) My mother’s or father’s sister is my Aunt.
e) My mother’s or father’s brother is my Uncle.
f) My son’s wife is my Daughter-in-law.
g) My daughter’s husband is my Son-in-law.
h) My brother’s son is my Nephew.
i) My brother’s daughter is my Neice.
j) My sister’s husband is my Brother-in-law.
k) My brother’s wife is my Sister-in-law.
l) My husband’s wifer’s sister is my Sister-in-law.
m) My husband’s or wife’s brother is my Brother-in-law.
n) My uncle’s or aunt’s son or daughter is my Cousin.
o) My wife’s father or husband’s father is my Father-in-law.
p) My wife’s mother or husband’s mother is my Mother-in-law.
q) My father’s wife is my Mother.

r) My mother’s husband is my Father.

s) My son’s or daughter’s son is my Grandson.

t) My son’s or daughter’s daughter is my Grand-daughter.

**Different types of questions with explanation:**

(1) A is B’s daughter, B is C’s mother. D is C’s brother. How is D related to A?
   
   (a) Father (b) Grandfather (c) Brother (d) Son
   
   *Explanation:* A is daughter B.
   
   B is mother of C.
   
   Therefore, D is Son of B.

(2) P is Q’s brother. R is Q’s mother. S is R’s father. T is S’s mother. How is P related to T?
   
   (a) Grand-daughter (b) Great grandson (c) Grandson (d) Grandmother
   
   *Explanation:* P is brother of Q. Therefore, P is a male.
   
   R is mother of P and Q and R is daughter of S. S is Son of T.
   
   S is grandfather of P.

(3) A is B’s brother. C is D’s father. E is B’s mother. A and D are brothers. How is E related to C?
   
   (a) Sister (b) Sister-in-law (c) Niece (d) Wife
   
   *Explanation:* A is brother of B. Therefore, A is male.
   
   C is father of D. Therefore, C is male.
   
   E is mother of B. Therefore, E is Female.
   
   A and D are brothers.
   
   Therefore, D is male.

   **Deductions:**
   
   (i) A and D are brothers of D
   
   (ii) C is the father of A, B and D
   
   (iii) C is the mother of A, B and D
   
   (iv) E is wife of C

(4) A is the sister of B. B is the brother of C. C is the son of D. How is D related to A?
   
   (a) Mother (b) Daughter (c) Son (d) Uncle
   
   *Explanation:* (1) B is brother of C
   
   C is son of D.
   
   A is the sister of B and C.
   
   According to the options given, we are left with no choice. But selection option (a) is correct.
5. B is the brother of A. whose only sister is mother of C. D is maternal grandmother of C. How is A related to D?
   (a) Daughter-in-law  (b) Daughter  (c) Aunt  (d) Nephew
   **Explanation:** Although sex of A is not mentioned clearly in the question. On the basis of information given is A is daughter of B.

6. A and B are sisters. R and S are brothers. A’s daughter is R’s sister. What is B’s relation to S?
   (a) Mother  (b) Grandmother  (c) Sister  (d) Aunt
   **Explanation:** A’s daughter R and S.
   B is sister of A. B is aunt of S.

7. E is the sister of B. A is the father of C. B is the son of C. How is A related to E?
   (a) Grandfather  (b) Grand-daughter  (c) Father  (d) Great-grandfather
   **Explanation:** is the Son of C and Grandson C and Grandson A.
   E is sister of B.
   Therefore, A is Grandfather of E.

8. Given that:
   A is the mother of B.
   C is the son of A.
   D is the brother of E.
   E is the daughter of B.
   Who is grandmother of D?
   (a) A  (b) B  (c) C  (d) D
   **Explanation:** E is the daughter of B and D is brother of E. Therefore B is son A and A is mother of B.
   Thus A, is Grandmother of D.

   (a) Son  (b) Grandson  (c) Father  (d) Uncle
   **Explanation:** B and C daughters of D .
   A is brother of D .
   Therefore A is uncle of C.

10. A is B’s sister. C is B’s mother. D is C’s father. E is D’s mother, then how A is related to D?
    (a) Grandfather  (b) Daughter  (c) Grandmother  (d) Granddaughter
    **Explanation:** D is Father of C and B is mother of C.
    Thus, A is grandfather of D
11. (i) F is the brother of A.
   (ii) G is the daughter of A.
   (iii) K is the sister of F.
   (iv) G is the brother of C.
Who is the uncle of G?
(a) A  (b) C  (c) K  (d) F

Explanation: G is A and F is brother of A.

12. A is father of C and D is son of B. E is brother of A. If C is sister of D how is B related to E?
(a) Sister-in-law  (b) Sister  (c) Brother  (d) Brother-in-law

Explanation: C and D Children of A and B.
B is mother of C and D.
Therefore, B is Sister-in-law of E.

13. C is wife of B. E is the son of C A is the brother of B and father of D. What is the relationship of E to D?
(a) Mother  (b) Sister  (c) Brother  (d) Cousin

Explanation: E is B and C.
A is uncle of E and Father of D.
Therefore E is cousin of D.

14. M is the son of P. Q is the grand-daughter of O, who is the husband of P. How is M related to O?
(a) Son  (b) Daughter  (c) Mother  (d) Father

Explanation: O is the Husband of P. M is the son of P.
Therefore, M is son of O.

15. X and Y are brothers. R is the father of Y. S is the brother of T and maternal uncle of X. What is T to R?
(a) Mother  (b) Wife  (c) Sister  (d) Brother

Explanation: R is the Father of X and Y.
S is the maternal uncle of X and Y.
Considering the option (b), T is wife of R.
EXERCISE 12 (A)

(Note: Questions are taken from previous exam questions papers of Competitive exams like SSC, RRB, MAT, UPSC etc.)

Choose the appropriate answer (a) or (b) or (c) or (d)

1. A is B’s brother. C is A’s mother. D is C’s father. E is B’s son. How is D related to A?
   (a) Son  (b) Grandson  (c) Grandfather  (d) Great Grandfather

2. As is B’s brother. C is A’s father. D is C’s sister and E is D’s mother. How is B related to E?
   (a) Grand-daughter  (b) Great grands daughter  (c) Grandaunt  (d) Daughter

3. A is B’s Sister. C is B’s Mother. D is C’s Father. E is D’s Mother. Then how is A related to D?
   (a) Grandmother  (b) Grandfather  (c) Daughter  (d) Grands-daughter

4. A is the father of B. C is the daughter of B. D is the brother of B. E is the son of A. What is the relationship between C and E?
   (a) Brother and sister  (b) Cousins  (c) Niece and uncle  (d) Uncle and aunt

5. If P is the husband of Q and R is the mother of S and Q. What is R to P?
   (a) Mother  (b) Sister  (c) Aunt  (d) Mother-in-law

6. P and Q are brothers. R and S are sister. P’s son is S’s brother. How is Q related to R?
   (a) Uncle  (b) Brother  (c) Father  (d) Grandfather

7. X is the husband of Y. W is the daughter of X. Z is husband of W. N is the daughter of Z. What is the relationship of N to Y?
   (a) Cousin  (b) Niece  (c) Daughter  (d) Grand-daughter

8. A reads a book and find the name of the author familiar. The author ‘B’ is the paternal uncle of C. C is the daughter of A. How is B related to A?
   (a) Brother  (b) Sister  (c) Father  (d) Uncle

9. A’s mother is sister of B and she has a daughter C who is 21 years old. How is B related to D?
   (a) Uncle  (b) Maternal Uncle  (c) Niece  (d) Daughter

10. A is B’s brother. C is A’s mother. D is C’s father. F is A’s son. How is F related to D?
     (a) Son  (b) Grandson  (c) Grand-grandson  (d) Grand-daughter

11. A is B’s brother. C is A’s mother. D is C’s father. E is B’s son. How is B related to D?
     (a) Son  (b) Grand-daughter  (c) Grandfather  (d) Great grand grandfather

12. A is B’s brother. C is A’s mother. D is C’s father. F a is A’s son. How is B related to F’s child?
     (a) Aunt  (b) Cousin  (c) Nephew  (d) Grandfather
13. A is B’s daughter. B is C’s mother. D is C’s brother. How is D related to A?
   (a) Father  (b) Grandfather  (c) Brother  (d) Son
14. A is D’s brother. D is B’s father. B and C are sisters. How is C related to A?
   (a) Cousin  (b) Niece  (c) Aunt  (d) Nephew
15. A is B’s brother. C is A’s mother, D is C’s father. E is B’s son. How is D related to E?
   (a) Grandson  (b) Great Grandson  (c) Great Grandfather  (d) Grandfather
16. X and Y are the children of A. A is the father of X but Y is not his son. How is Y related to A?
   (a) Sister  (b) Brother  (c) Son  (d) Daughter
17. A is B’s brother. C is A’s mother. D is C’s father. E is B’s son. How is E related to A?
   (a) Cousin  (b) Nephew  (c) Uncle  (d) Grandson
18. Based on the statements given below, find out who is the uncle of P?
   (i) K is the brother of J
   (ii) M is the sister of K
   (iii) P is the brother of N
   (iv) N is the daughter of J
   (a) K  (b) J  (c) N  (d) M
19. A and B are sisters. A is mother of D. D has a daughter C who is married to F. G is the husband of A. How is C related to D?
   (a) Cousin  (b) Niece  (c) Aunt  (d) Sister-in-law
20. R and S are brothers. X is the sister of Y and X is mother of R. What is Y to S?
   (a) Uncle  (b) brother  (c) Father  (d) Mother
21. A is B’s brother. C is A’s mother. D is C’s father. B and D’s grand-daughter. How is B related to D. Who is A’s son?
   (a) Aunt  (b) Cousin  (c) Niece  (d) Grandaunt
22. A is the son of B while B and C are sisters to one another. E is the mother of C. If D is the son of E, which of the following statements is correct?
   (a) D is the maternal uncle of A  (b) E is the brother of B
   (c) D is the cousin of A  (d) B and D are brothers
23. P is the father of T. T is the daughter of M. M is the daughter of K. What is P to K?
   (a) Father  (b) Father-in-law  (c) Brother  (d) Son-in-law
24. A and B are brothers. E is the daughter of F. F is the wife of B. What is the relation of E to A?
   (a) Sister  (b) Daughter  (c) Niece  (d) Daughter
25. M and F are a married couple. A and B are sisters. A is the sister of F. Who is B to M?
   (a) Sister (b) Sister-in-law (c) Niece (d) Daughter

26. If A is the mother of D. B is not the son of C. C is the father of D, D is the sister of B, then how is A related to B?
   (a) Mother (b) Brother (c) Step son (d) Sister

27. A and B are brother and sister respectively. C is A’s father. D is C’s sister and E is D’s mother. How is B related to E?
   (a) Grand-daughter (b) Great grand-daughter (c) Aunt (d) Daughter

28. Q is the son of P. X is the daughter of Q. R is the aunty (Bua) of X and L is the son of R, then what is L to P?
   (a) Grandson (b) Grand-daughter (c) Daughter (d) Nephew

29. P and Q are brothers. R and S are sisters. P’s son is S’s brother. How is Q related to R?
   (a) Uncle (b) Brother (c) Father (d) Grandfather

30. A and B are the young ones of C. If C is the mother of B but A is not the daughter of C, then what is the relationship between C and A?
   (a) Nephew and Aunty (b) Brother and Sister (c) Mother and son (d) Niece and Aunty

31. A is the mother of D and sister of B. B has a daughter C who is married to F. G is the husband of A. How is G related to D?
   (a) Uncle (b) Husband (c) Son (d) Father

32. Pointing towards A, B said “your mother is the younger sister of my mother”. How is A related to B?
   (a) Uncle (b) Cousin (c) Nephew (d) Father

33. A is B’s wife’s husband’s brother. C and D are sisters of B. How is A related to C?
   (a) Brother (b) Sister-in-law (c) Wife (d) Sister

34. A and B are brothers. C and D are sisters. A’s son is D’s brother. How is B related to C?
   (a) Father (b) Brother (c) Uncle (d) Son

35. A is B’s sister. C is B’s mother. D is C’s father. E is D’s mother. Then how is A related to D?
   (a) Grandmother (b) Grandfather (c) Daughter (d) Grand-daughter

36. P, Q, R, S, T, U are 6 members of a family in which there are two married couples. T, a teacher is married to a doctor who is mother of R and U. Q the lawyer is married to P. P has one son and one grandson. Of the two married ladies one is a housewife. There is also one student and one male engineer in the family. Which of the following is true about the grand-daughter of the family?
   (a) She is a lawyer (b) She is an engineer (c) She is a student (d) She is a doctor
37. Six members of a family namely A, B, C, D, E and F are travelling together. ‘B’ is the son of C but C is not the mother of B. A and C are married couple. E is the brother of C. D is the daughter of A. F is the brother of B. How many male members are there in the family?

(a) 3  (b) 2  (c) 4  (d) 1

38. A’s mother is sister of B and has a daughter C. How can A be related to B from among the following?

(a) Niece  (b) Uncle  (c) Daughter  (d) Father

39. Rajiv is the brother of Atul. Sonia is the sister of Sunil. Atul is the son of Sonia. How is Rajiv related to Sonia?

(a) Nephew  (b) Son  (c) Brother  (d) Father

40. Sita is the niece of Ashok. Ashok’s mother is Lakshmi. Kalyani is Lakhshmi’s mother. Kalyani’s husband is Gopal. Parvathi is the mother-in-law of Gopal. How is Sita related to Gopal?

(a) Great grandson’s daughter  (b) Gopal’s Sita’s father  (c) Sita is Gopal’s great grand-daughter  (d) Grand niece

41. Seema is the daughter-in-law of Sudhir and sister-in-law of Ramesh. Mohan is the son of Sudhir and only brother of Ramesh. Find the relation between Seema and Mohan.

(a) Sister-in-law  (b) Aunt  (c) Cousin  (d) Wife

42. Suresh introduces a man as “He is the son of the woman who is the mother of the husband of my mother”. How is Suresh related to the man?

(a) Uncle  (b) Son  (c) Cousin  (d) Grandson

43. Pointing to a lady in a photograph. Meera said. “Her father’s only son’s wife is my mother-in-law” How is Meera’s husband related to that lady in the photo?

(a) Nephew  (b) Uncle  (c) Son  (d) Father

44. Pointing to a photograph Vikas said “She is the daughter of my grandfather’s only son”. How is the related to Vikas in the photograph?

(a) Father  (b) Brother  (c) Sister  (d) Mother

45. Suresh’s sister is the wife of Ram. Ram is Rani’s brother. Ram’s father is Madhur. Sheetal is Ram’s grandmother. Rema is Sheetal is daughter-in-law. Rohit is Rani’s brother’s son. Who is Rohit to Suresh?

(a) Brother-in-law  (b) Son  (c) Brother  (d) Nephew

46. Vinod introduces Vishal as the son of the only brother of his father’s wife. How is Vinod related to Vishal?

(a) Cousin  (b) Brother  (c) Son  (d) Uncle
47. Among her children, Ganga’s favourites are Ram and Rekha. Rekha is the mother of Sharat, who is loved most by his uncle Mithun. The head of the family is Ram Lal, who is succeeded by his sons Gopal and Mohan. Gopal and Ganga have been married for 35 years and have 3 children. What is the relation between Mithun and Mohan?
(a) Uncle  
(b) Son  
(c) Brother  
(d) No relation

48. Rahul and Robin are brothers. Promod is Rohin’s father. Sheela is Pramod’s sister. Prema is Promod’s niece. Shubha is Sheela’s grand-daughter. How is Rahul related to Shubha?
(a) Brother  
(b) Cousin  
(c) Uncle  
(d) Nephew

49. Preeti has a son, named Arun. Ram is Preeti’s brother. Neeta too has a daughter named Reema. Neeta is Ram’s sister. What is Arun’s relationship to Reema?
(a) Brother  
(b) Nephew  
(c) Cousin  
(d) Uncle

50. There are 2 firm stars. One is the father of the other’s son. What is the relationship of the two with each other?
(a) Grandfather and Grandson  
(b) Grandfather and son  
(c) Husband and wife  
(d) Father and Son

51. Ramu’s mother said to Ramu,“My mother has a son whose son is Achyut”. How is Achyut relation to Ramu?
(a) Uncle  
(b) Cousin  
(c) Brother  
(d) Nephew

52. Ravi’s father has a son Rohit who has an aunt Laxmi who has a husband Rao whose father-in-law is Mohan. What is the relation of Mohan to Ravi?
(a) Nephew  
(b) Grandfather  
(c) Son  
(d) Uncle

53. Vijay says, Ananda’s mother is the only daughter of my mother”. How is Ananda relation to Vijay?
(a) Brother  
(b) Father  
(c) Nephew  
(d) Grandfather

54. Introducing a man, a woman said, “His wife is the only daughter of my mother.” How is the woman related with the man?
(a) Sister-in-law  
(b) Wife  
(c) Aunt  
(d) Mother-in-law

55. A prisoner introduced a boy who came to visit him to the jailor as “Brothers and sisters I have none, he is my father’s son’s son”. Who is the boy?
(a) Nephew  
(b) Son  
(c) Cousin  
(d) Uncle
## ANSWERS

### EXERCISE 12(A)

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<td>(c)</td>
<td>54.</td>
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</table>
13.1 INTRODUCTION

Syllogism is a ‘Greek’ word that means inference or deduction. As such inferences are based on logic, then these inferences are called logical deduction. These deductions are based on propositions (premise).

Different types of questions covered in this chapter are as follows:

- Two Statements and Two Conclusions

‘Syllogism’ checks basic aptitude and ability of a candidate to derive inferences from given statements using step by step methods of solving problems.

Proposition

Let us consider the following sentences:

(i) All Rats are Cats
(ii) No Rat is Cat
(iii) Some Rats are Cats
(iv) Some Rats are not Cats

In all the sentences mentioned above, a relation is established between subject and predicate with the help of quantifier and copula.

Now, we can define proposition as under:

A proposition or premise is grammatical sentence comprising of four components.

- Quantifier
- Subject
- Copula
- Predicate
**Components of Proposition**

- **Quantifier** – The words ‘All’ ‘No’ and ‘Some’ are called quantifiers as they specify a quantity. Keep in mind that ‘All’ and ‘No’ are universal quantifiers because they refer to each and every object of a certain set. ‘Some’ is a particular quantifier as it refers to at least one existing object in a certain set.

- **Subject** – Subject is the part of the sentence something is said about. It is denoted by S.

- **Copula** – It is that part of a proposition that denotes the relation between subject and predicate.

- **Predicate** – It is that part of a proposition which is affirmed detail about that subject.

**Classification of Proposition**

A proposition can mainly be divided into three categories.

(i) **Categorical Proposition**: In categorical proposition, there exists a relationship between the subject and the predicate without any condition. It means predicate is either affirmation or denial of the subject unconditionally.

   **Example**: I. All cups are pens.
   II. No boy is girl.

(ii) **Hypothetical Proposition**: In a hypothetical proposition, relationship between subject and predicate is asserted conditionally.

   **Example**: I. If it rains, he will not come.
   II. If he comes, I will accompany him.

(iii) **Disjunctive Proposition**: In a disjunctive proposition, the assertion is of alteration.

   **Example**: I. Either he is sincere or he is loyal.
   II. Either he is educated or he is scholar.

Keeping in view with the existing pattern of Syllogism in competitive examinations, we are concerned only with the categorical type of proposition.
**Venn Diagram Representation of Two Propositions**

Types of Venn diagram can be understood by the following diagram:

![Venn Diagram](image)

From the above diagram, following things are very much clear:

(i) Universal propositions, Either
   (a) completely include the subject (A-type)
   Or
   (b) completely exclude the subject (E-type)

(ii) Particular propositions, Either
   (a) partly include the subject (I-type)
   Or
   (b) partly exclude the subject (O-type)

Now, we can summarize the four standard types of propositions (premises) as below:

<table>
<thead>
<tr>
<th>Format</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>All S are P (Universal Affirmative)</td>
<td>A</td>
</tr>
<tr>
<td>No S is P (Universal Negative)</td>
<td>E</td>
</tr>
<tr>
<td>Some S are P (Particular Affirmative)</td>
<td>I</td>
</tr>
<tr>
<td>Some S are not P (Particular Negative)</td>
<td>O</td>
</tr>
</tbody>
</table>

**Venn Diagram Representation**

(i) A-Type (All S are P)
(ii) E-Type (No S is P)
(iii) E Type (No S is P)
(iv) O Type (Some S are not P)
Hidden Propositions

The type of propositions we have discussed earlier are of standard nature but there are propositions which do not appear in standard format and yet can be classified under any of the four types.

Let us now discuss the type of such propositions.

I. A-Type Propositions

(i) All positive propositions beginning with ‘every’ and ‘any’ are A type propositions.

Example:
(a) Every cat is dog
   ⇒ All dogs are cats
(b) Each of students of class has passed
   ⇒ All students of class X have passed
(c) Anyone can do this job
   ⇒ All (Women) can do this job

(ii) A positive sentence with a particular person as its subject is always an A-type proposition.

Example: (a) He should be awarded Noble Prize

(b) Raman is a Great Scientist

(iii) A sentence with a definite exception is A type.

Example: (a) All girls except Sanjana is healthy

(b) All boys except Ram is intelligent
II. E-Type Propositions

(i) All negative sentences beginning with ‘no one’, ‘not a single’ etc., are E-type propositions.

Example:
(a) Not a single student could answer the question.
(b) None can cross the English channel.

(ii) A negative sentence with a very definite exception is also of E-type proposition.

Example: (a) No girl except Sanjana is healthy
(b) No boy except Ram is intelligent

(iii) When an Introgattive sentence is used to make an assertion, this could be reduced to an E-type proposition. Example: Is there any person who can scale Mount Everest? ⇒ Non can climb Mount Everest.

(iv) A negative sentence with a particular person as its subject is E-type proposition.

Example: (a) He does not deserve Noble Prize
(b) Raman is not a Great Scientist
III. I-Type Propositions

(i) Positive propositions beginning with words such as ‘most’, ‘a few’ ‘mostly’, ‘generally’, ‘almost’, ‘frequently’, and ‘often’ are to be reduced to the I-type propositions.

Example:
(a) Almost all the Vegetables have been sold. \( \Rightarrow \) Some vegetables have been sold.
(b) Most of the students will qualify in the test. \( \Rightarrow \) Some of the students will qualify in the test.
(c) Boys are frequently physically weak \( \Rightarrow \) Some boys are physically weak.

(ii) Negative propositions beginning with words such as ‘few’, ‘seldom’, ‘hardly’, ‘rarely’, ‘little’ etc. are to be reduced to the I-type propositions.

Example:
(a) Seldom writers do not take rest. \( \Rightarrow \) Some writers take rest.
(b) Few Teachers do not tell a lie. \( \Rightarrow \) Some teachers tell a lie.
(c) Rarely Scientists do not get a good job \( \Rightarrow \) Some Scientists get a good job.

(iii) A positive sentence with an exception which is not definite, is reduced to an I-type proposition.

Example:
(a) All boys except a few are handsome

Indefinite exception as names of girls are not given

(b) All girls except four have passed

Indefinite exception as names of girls are not given
IV. O-Type Propositions

(i) All negative propositions beginning with words such as ‘all’, ‘every’, ‘any’, ‘each’ etc. are to be reduced to O-type propositions.

Example:
(a) All Psychos are not guilty. ⇒ Some Psychos are not guilty.
(b) All that glitters is not gold. ⇒ Some glittering objects are not gold.
(c) Everyone is not Scientist ⇒ Some are not Scientist.

(ii) Negative propositions with words as ‘most’, ‘a few’, ‘mostly’, ‘generally’, ‘almost’, ‘frequently’ are to be reduced to the O-type propositions.

Example:
(a) Boys are usually not physically weak. ⇒ Some boys are not physically weak.
(b) Priests are not frequently thieves. ⇒ Some priests are not thieves.
(c) Almost all the questions cannot be solved. ⇒ Some questions cannot be solved.

(iii) Positive propositions with starting words such as ‘few’, ‘seldom’, ‘hardly’, ‘scarcely’, ‘rarely’, ‘little’, etc., are to be reduced to the O-type propositions.

Example:
(a) Few boys are intelligent. ⇒ Some boys are not intelligent
(b) Seldom are innocents guilty. ⇒ Some innocent are not guilty.

(iv) A negative sentence with an exception, which is not definite is to be reduced to the O-type propositions.

E.g.
(a) No girls except two are beautiful
(b) No cricketers except a few are not given

Indefinite exception as names of girls are not given

Indefinite exception as names of cricketer are not given
Exclusive Propositions

Such propositions start with ‘only’, ‘alone’, ‘none but’, ‘none else but’ etc., and they can be reduced to either A or E or I-type.

Example:
- Only Post-graduates are officers. (E-type)
- None Post-graduate is officer. (A-type)
- All officers are Post-graduates. (I-type)
- Some Post-graduates are officers

Types of Inferences

Inferences drawn from statements can be of two types:

1. **Immediate Inference**: When an inference is drawn from a single statement, then that inference is known as an immediate inference.

   **Example**: Statement: All books are pens.
   
   **Conclusion**: Some pens are books.

   In the above example, a conclusion is drawn from a single statement and does not require the second statement to be referred, hence the inference is called an immediate inference.

2. **Mediate Inference**: In mediate inference, conclusion is drawn from two given statements.

   **Example**: Statements: All cats are dogs. All dogs are black.
   
   **Conclusion**: All cats are black.

   In the above example, conclusion is drawn from the two statements or in other words, both the statements are required to draw the conclusion. Hence, the above conclusion is known as mediate inference.

Method to Draw Immediate Inferences

There are various methods to draw immediate inferences like conversion, obversion, contraposition; etc. Keeping in view the nature of questions asked in various competitive examinations, we are required to study only two methods, implications and conversion.

(i) **Implications (of a given proposition)**: Below we shall discuss the implications of all the four types of propositions. While drawing a conclusion through implication, subject remains the subject and predicate remains the predicate.

   **A-Type: All boys are blue.**

   From the above A-type proposition, it is very clear that if all boys are blue, then some boys will definitely be blue because some is a part of all. Hence, from A-type proposition, we can draw I-type conclusion (through implication).
E-Type: No cars are buses.

If no cars are buses, it clearly means that some cars are not buses. Hence, from E-type proposition, O-type conclusion (through implication) can be drawn.

I-Type: Some chairs are tables.

‘From the above I-type proposition, we cannot draw any valid conclusion (through implication).

O-Type: Some A are not B.

From the above O-type proposition, we can not draw any valid inference (through implication). On first look, it appears that if some A are not B, then conclusion that some A are B must be true but the possibility of this conclusion being true can be over ruled with the help of following example:

Case I A = \{a, b, c\} and B = \{d, e, f\}

Case II A = \{a, b, c\} and B = \{b, c, d\}

The above two cases show the relationship between A and B given by O-type proposition. “Some A are not B”. Now, in case I, none of the element of set A is the element of set B. Hence, conclusion “Some A are B” cannot be valid. However, in case II, elements b and c are common to both sets A and B. Hence, here conclusion “Some A are B” is valid. But for any conclusion to be true, it should be true for all the cases. Hence, conclusion “Some A are B” is not a valid conclusion drawn from an O-type proposition.

All the results derived for immediate inference through implication can be presented in the table as below:

<table>
<thead>
<tr>
<th>Types of propositions</th>
<th>Proposition</th>
<th>Types of Inferences</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>All S are P</td>
<td>I</td>
<td>Some S are P</td>
</tr>
<tr>
<td>E</td>
<td>No S is P</td>
<td>O</td>
<td>Some S are not P</td>
</tr>
<tr>
<td>I</td>
<td>Some S are P</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>O</td>
<td>Some S are not P</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

Conversion: Conversion is other way of getting immediate inferences. Unlike implication, in case of conversion, subject becomes predicate and predicate becomes subject. Let us see

- **Conversion of A-type**

  All \( S \) are \( S \) (A-type)

  After conversion it becomes

  Some \( P \) are \( S \) (I-type)

  Clearly, A gets converted into I-type.
**Conversion of E-type**

No $S$ is $P$  

After conversion it becomes

No $P$ is $S$ (E-type)

Clearly, E gets converted into E-type.

**Conversion of I-type**

Some $S$ is $P$  

Clearly I gets converted into I-type.

Conversion of O – type.

O type propositions cannot be converted.

Now we can make a conversion as follows:

<table>
<thead>
<tr>
<th>Types of propositions</th>
<th>Gets Converted into</th>
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<tbody>
<tr>
<td>A</td>
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</tr>
<tr>
<td>E</td>
<td>E</td>
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<tr>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>O</td>
<td>Never gets Converted</td>
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**Immediate Inference Table**

<table>
<thead>
<tr>
<th>Types of propositions</th>
<th>Proposition</th>
<th>Valid immediate inference</th>
<th>Types of Immediate inference</th>
<th>Method</th>
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<td>Some P are S</td>
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<td></td>
<td>No Valid Inference</td>
<td>-</td>
<td>Implication Conversion</td>
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</table>
**Venn Diagram Representation of Immediate Inferences:**

Immediate inferences are drawn from each type of Propositions (A, E, I, O)

1) **A type All S are P**

   (i) \( S = \{ a, b, c \} , \ P = \{ a, b, c, d, e \} \)

   ![Diagram](image1)

   (i) \( S = \{ a, b, c \} , \ P = \{ a, b, c, d, e, f \} \)

   (ii) \( S = \{ a, b, c \} , \ P = \{ a, b, c \} \)

   The above cases show all the possibilities of two sets S and P showing the relationship by the proposition.

   All S are P in both cases.

   Some S are P. (Is true from relationship)

   Some P are S. (Its true)

   Some P are not S is not valid because from it is case (i) but false from case (ii)

   Inference All (P are S) is not valid because its true from case (ii) and False from case (i)

2) **E type – No S Is P**

   ![Diagram](image2)

   We can draw the inferences as

   (i) No P is S

   (ii) Some S are not P

   (iii) Some P are not S

   Any other inference drawn from E-type proposition is not valid.
3) I-type: Some S are P

(i) \( S = \{ a, b, c, d\} , P = \{c, d, e, f\} \)

![Venn diagram showing S and P](image)

Some S are P

(ii) \( S = \{ a, b, c, d\} \) and \( P = \{ a, b\} \)

![Venn diagram showing S and P](image)

Set \( \{a, b\} \) is the part of S as well as Set P, hence some set S are P.

(iii) \( S = \{a, b\} , P = \{a, b, c, d\} \)

![Venn diagram showing S and P](image)

Set \( \{b\} \) is the part of the set S as well as Set P, hence some S are P.

(iv) \( S = \{a, b, c\} , P = \{a, b, c\} \)

![Venn diagram showing S and P](image)

The above diagrams show the relationship between S and P from I-type relationship. From the possible combinations, it’s clear that inference (Some P are S) is true. Inference (S are not P) is true from combinations (i) and (ii) but is not true from combinations (iii) and (iv).

Therefore inference (Some S are not P) is not a valid inference drawn from the above proposition. Set \( \{a, b\} \) is part of set S and P, hence some s are P.
4) O-Type: Some S are not P

(i) $S = \{a, b, c, d\} , P = \{c, d, e, f\}$

Set $\{a, b\}$ is part of the set $S$ but not set $P$
Hence Some S are not P

(ii) $S= \{a, b, c\}$ and $P = \{d, e, f\}$
Set $\{a, b\}$ is the part of S but not set P
Hence the above relation represented by Some S are not P.

(iii) $S = \{a, b, c, d, e, f\} , P = \{e,f\}$
Set $\{a, b, c\}$ is the part of set S but not P. Hence Proposition Some S are not P.

On the basis of all possible combinations showing relationship between S and P, no valid inference can be drawn. Inference from Some P are not S) is true combination (i) and (iii) but not true for combination (iii). Hence it is invalid inference.

Inference (Some P are not S) is true from combination (i) and (ii) but not true for combination (iii), hence it is also invalid.

Following are the main rules for solving syllogism problems.

1) All + All = All
2) All + No = No
3) All + Some = No conclusion
4) Some + No = Some Not
5) Some + Some = No conclusion
6) No + All = Some not (Reversed)
7) No + All = Some Not (Reversed)
8) No + Some = Some Not (Reserved)
9) \( \text{No} + \text{No} = \text{No conclusion} \)
10) \( \text{Some Not/ Some not reserved} + \text{Anything} = \text{No conclusion} \)
11) If all A are B then we can say – Some B are Not A is a possibility
12) If Some B are not A then we can say – All A are B is a possibility
13) If some A are B then we can say All A are B is a possibility. All B are A is a possibility.
14) All \( \Leftrightarrow \) Some not reserved
15) Some \( \Rightarrow \) All
16) No conclusion = Any possibility is true

Implications (In case of Conclusions from Single Statement)
All \( \Rightarrow \) Some That means If A are B then Some B is true.
Some \( \Leftrightarrow \) Some that means if Some A are B then Some B are A is true.
No \( \Leftrightarrow \) No that means if No A is B then No B is true.

Examples:
In this type of questions two statements and two conclusions are given. Its required to check.

Example 1:
Statement:
I. Some boys are student.
II. All students are Engineers.

Conclusions:
I. All Engineers are students.
II. Some boys are Engineers.

(a) Only I follows
(b) Only II follows
(c) Both I and II follow
(d) Neither I nor II follow.

Solution
(b) Statement I is an I-type proposition which distributes neither the subject nor the predicate. Statement II is an A-type propositions which distributes the subject ‘Engineers’ only.

Since, the Engineers is distributed in Conclusion I without being distributed in the premises. So, Conclusion I cannot follow. In second conclusion, where it is asked that some boys are Engineers but from Statement I nit is clear that some boys are not students. These boys may not be Engineers.
Example 2:

Statements:
I. All Lotus are flowers.
II. No Lily is a Lotus.

Conclusions:
I. No Lily is a flower
II. Some Lilies are flowers.

(a) Only I follows
(b) Only II follows
(c) Either I or II follows
(d) Neither I nor II follows

Solution: (c)

Here, the first premise is an A-type proposition and so the middle term ‘Lotus’ forming the subject is distributed. The second premise is an E proposition and so the middle term ‘Lotus’ forming the predicate is distributed. Since, the middle term is distributed twice, so the conclusion cannot be universal.

Example 3:

Statements
I All A’s are C’s
II All D’s are C’s

Conclusion
I All D’s are C’s
II. Some D’s are not A’s

(a) Only I follows
(b) Only II follows
(c) Both I and II follows
(d) None follows

Solution: (a) Now, taking conclusion I, it is clear that all D’s are also C’s but taking conclusion II, we cannot say that some D’s are not A’s because from Statement I it is clear that all D’s are A’s.

Hence, only Conclusion I follows.
Example 4:

**Statements:** All balls are bats.
All bats are stumps.
The sentences are already aligned. From the above given Table, $A + A = A$. Hence the conclusion is of type-A whose subject is the subject of the first proposition and the predicate is the predicate of the second proposition?
So the conclusion is *All balls are Stumps.*

Example 5:

**Statements:** All Professors are readers.
All Professors are writers.
This pair is not properly aligned because the subject of both the sentences is ‘Professors’.
Since both the sentences are of type-A, we may convert any of them. So the aligned pair is Some readers are Professors.
All Professors are writers.
Here the conclusion will be of type - I
because $I + A = I$.
The conclusion is *Some readers are writers.*

Example 6:

**Statements:** Some Mangos are sweets.
All Mangos are Fruits.
The subject of both the sentences is the same. By the rule of IEA, we convert the I - type statement. So the aligned pair is,
Some Sweets are Mangos.
All Mangos are Fruits
$I + A = I$. So the conclusion is
Some Sweets are Fruits.

Example 7:

**Statements:** All lights are bats.
No balls are lights.
By changing the order of the statements itself.
We can align the sentences. The aligned pair is
No balls are lights.
All lights are bats.
$E + A = O^*$.  
*So the conclusion is,*
*Some bats are not balls.*
**Example 8:** **Statements:** Some caps are blue.

No clip is blue.

Here the common term is ‘blue’ which is the predicate of both the sentences. By the rule of IEA, we convert the I-type statement. After conversion, the given pair becomes,

Some blue are caps.

No clip is blue.

Now by changing the order of the statements, we can align the sentences. So the aligned pair is, No clip is blue.

Some blue are caps.

The conclusion is of type O* since, E + I = O*. Hence the conclusion is *Some caps are not clips.*

**Example 9:**

**Statements:** Some powders are not soaps.

All soaps are detergents.

The given pair is properly aligned. But no definite conclusion can be drawn from this type because it is a O+A - type combination.

**Complementary Pair**

Consider the following.

**Conclusions:**

i) Some vans are trucks.

ii) Some vans are not trucks.

We know that either some vans will be trucks or some vans will not be trucks.

Hence either (i) or (ii) is true. Such pair of statements are called complementary pairs. So in a complementary pair, at least one of the two statements is always true. We can call a pairs a complementary pair if i) The subject and predicate of both the sentences are the same.

ii) They are an I + O - type pair or an A + O type pair or an I + E - type pair.

Some complementary pairs are given below.

i) All birds are Pigeons.

Some birds are not Pigeons.

ii) Some Chairs are watches.

Some Chairs are not watches.

iii) Some kids are cute.

No kids are cute.
Note: The steps to be followed to do a syllogism problem by analytical method are mentioned below.

i) Align the sentences properly.

ii) Draw conclusion using the table.

iii) Check for immediate inferences.

iv) Check for complementary pair if steps ii and iii fail.

EXERCISE 13 (A)

Directions (Qs. 1 - 25): Each of the following questions contains two statements followed by two conclusions numbered I and II. You have to consider the two statements to be true, even if they seem to be at variance at the commonly known facts. You have to decide which of the given conclusions definitely follows from the given statements.

Give answer (a) if only I follows; (b) if only conclusion II follows; (c) if either I or II follows; (d) if neither I nor II follows and (e) if both I and II follow.

1. **Statement:** Some Chairs are glasses.
   All trees are Chairs.

   **Conclusions:**
   I. Some trees are glasses
   II. Some glasses are trees.

2. **Statement:** No man is a lion.
   Ram is a man.

   **Conclusions:**
   I. Ram is not a lion.
   II. All men are not Ram.

3. **Statement:** All boys are Fathers.
   All Fathers are Mothers.

   **Conclusions:**
   I. All Fathers are boys.
   II. All boys are Mothers.

4. **Statement:** All pens are cups.
   All cups are bowls.

   **Conclusions:**
   I. All pens are bowls.
   II. All cups are pots.

5. **Statement:** All students are boys.
   No boy is dull
Conclusions: I. There are no girls in the class
II. No student is dull.

6. Statement: Some cats are kittens.
   All Rats are kittens.
Conclusions: I. Some cats are Rats.
II. Some Rats are cats.

7. Statement: All names are dogs.
   No dogs are foxes.
Conclusions: I. All names are foxes.
II. No dogs are names.

8. Statement: All pens are dogs.
   Some pens are lights.
Conclusions: I. Some dogs are lights.
II. Some lights are not dogs.

9. Statement: Some animals are clouds.
   Horse is an animal.
Conclusions: I. Some clouds are animals.
II. Hen is not a cloud.

10. Statement: All tables are rats.
    Some Rats are chairs.
Conclusions: I. All rats are tables
II. Some chairs are not rats.

11. Statement: All tigers are birds.
    Some birds are cows.
Conclusions: I. Some cows are birds.
II. Some tigers are cows.

12. Statement: All papers are pens.
    All pens are erasers.
Conclusions: I. Some erases are papers.
II. Some pens are no papers.
13. Statement: Some trees are monkeys.
   Some ships are trees.

   Conclusions: I. Some Monkeys are ships.
               II. Some trees are neither ships nor monkeys.

14. Statement: All glasses are mirrors.
    Some mirrors are Black.

   Conclusions: I. All mirrors are glasses.
               II. Some glasses are black.

15. Statement: Some dogs are monkeys.
    No monkey is black.

   Conclusions: I. Some dogs are black.
               II. Some monkeys are dogs.

16. Statement: All roads are poles.
    No poles are Bungalows.

   Conclusions: I. Some roads are Bungalows.
               II. Some Bungalows are poles.

17. Statement: Many actors are directors.
    All Directors are dancers.

   Conclusions: I. Some actors are dancers.
               II. No director is an actor.

18. Statement: Only dogs are animals.
    No historian is an animal.

   Conclusions: I. Some dogs are not historians.
               II. Some historians are not dogs.

19. Statement: Some chairs are caps.
    No cap is red.

   Conclusions: I. Some caps are chairs.
               II. No Chair is red.
20. **Statement:** Some cups are belts.
   No belt is black.

   **Conclusions:**
   I. Some cups are black.
   II. Some cups are not black.

21. **Statement:** Some girls are flowers.
   Some flowers are books.

   **Conclusions:**
   I. Some girls are books.
   II. No books are girls.

22. **Statement:** Some files are rats.
   All animals are rats.

   **Conclusions:**
   I. All files are rats.
   II. Some rats are animals.

23. **Statement:** All cricketers are tall.
   Rajesh is tall.

   **Conclusions:**
   I. Rajesh is a cricketer.
   II. Rajesh is not cricketer.

24. **Statement:** Some cats are cows.
   All cows are horses.

   **Conclusions:**
   I. Some horses are cats.
   II. Some cats are horses.

25. **Statement:** All scientists are hard working.
   No scientists are superstitious.

   **Conclusions:**
   I. No scientists are superstitious.
   II. All superstitious are not scientists.
### ANSWERS:

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