



SET

← State Eligibility Test →

Volume - 2

**Mathematical & Logical Reasoning
Aptitude**



STATE ELIGIBILITY TEST

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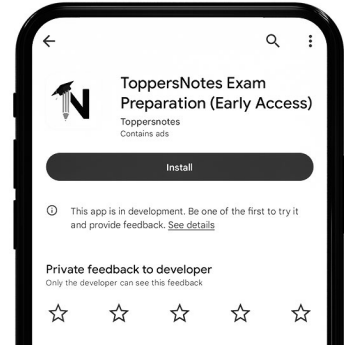
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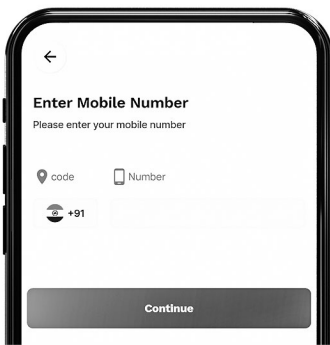
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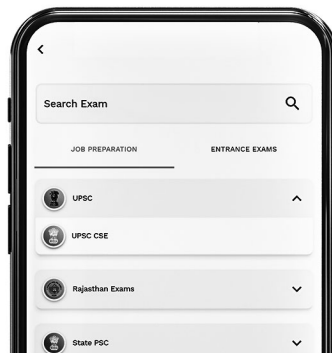
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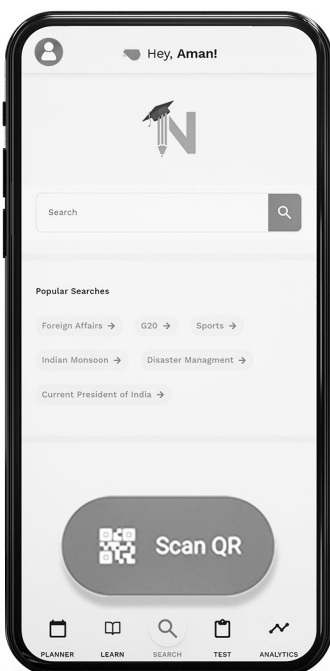
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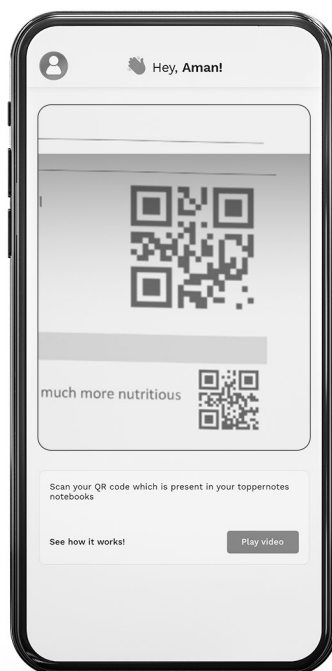
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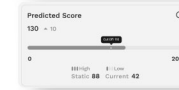
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Chapter Analysis

UNIT - 5

Mathematical Reasoning and Aptitude

Chapter	1	2	3
Questions	2	3	2-3



- ✓ Weightage from the examination point of view: 4-5 Questions.
- ✓ Every time only basic calculative questions are asked in this unit
- ✓ Students must practice all PYQs after clearing their concepts from this book.
- ✓ 50% of Questions were asked directly from the reasoning part & 50% of Questions were from the mathematics part.

Key Points

- Number Series & letter series
- Find Missing Number
- Blood Relation
- Coding Decoding
- Time & Distance, Percentage, Average, Profit & Loss

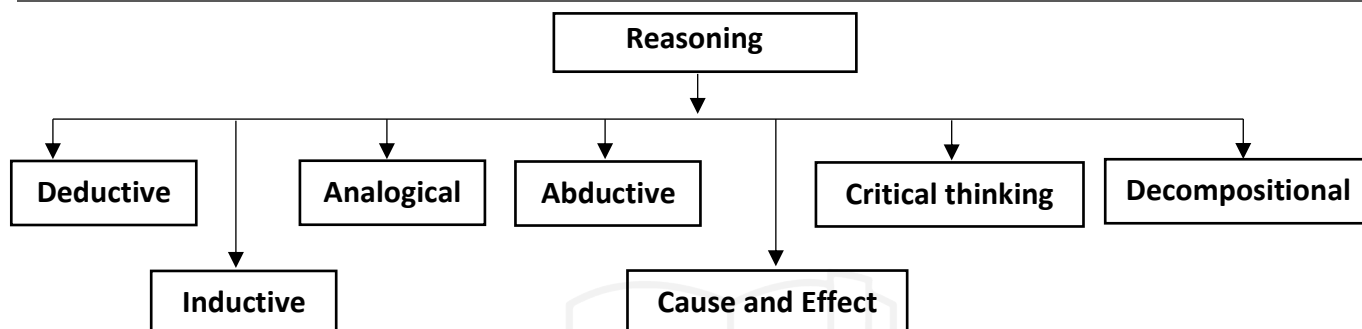
5 UNIT

MATHEMATICAL REASONING APTITUDE

What is Reasoning?

Reasoning is the process of thinking about things in a logical, rational way. It is considered an innate human ability that has been formalized by fields such as logic, mathematics and artificial intelligence.

Types of Reasoning:



1. Deductive reasoning:

- Deductive reasoning is a method of proving a theory or hypothesis using formal logic and observations.
- Deductive reasoning starts with a hypothesis that is then supported or disproved through observations or rational thought.
- A marketing division, for example, analyses data and confirms that their company's most important demographic is young parents. They opt to give more of the marketing money to social media channels that target that category based on this information.

For example, "All men are mortal. Harold is a man. Therefore, Harold is mortal." For deductive reasoning to be sound, the hypothesis must be correct. It is assumed that the premises, "All men are mortal" and "Harold is a man" are true. Therefore, the conclusion is logical and true.

2. Inductive reasoning:

- To validate observations, inductive reasoning employs theories and assumptions.
- It's the polar opposite of deductive reasoning in that it requires deducing a general rule from a specific case or cases.
- Because it employs conclusions from observations to make generalisations, the outcomes of inductive reasoning are not always certain.
- Extrapolation, forecasts, and part-to-whole arguments all benefit from inductive reasoning.

An example of inductive logic is, "The coin I pulled from the bag is a 5 Rs Coin. Again I pulled its again a coin of 5 Rs. A third coin from the bag is a 5 Rs Coin. Therefore, all the coins in the bag are 5 Rs Coin."

3. Analogical reasoning:

- Analogical reasoning is a style of reasoning that looks for similarities between two or more objects and then uses those similarities to find other properties they share.
- It is based on the brain's tendency to notice patterns and make connections.

4. Abductive reasoning:

- Abductive reasoning is a style of reasoning that reaches a logical conclusion based on an observation or group of observations.
- Abductive reasoning is similar to inductive reasoning, but it allows you to make the greatest estimates to get the simplest conclusions.
- Abduction can help with both troubleshooting and decision-making, especially when dealing with uncertainties.

For example, a person walks into their living room and finds torn up papers all over the floor. The person's dog has been alone in the room all day. The person concludes that the dog tore up the papers because it is the most likely scenario. Now, the person's sister may have brought by his niece and she may have torn up the papers, or it may have been done by the landlord, but the dog theory is the more likely conclusion.

5. Cause-and-effect reasoning:

- Cause-and-effect reasoning is a style of reasoning in which the relationship between two events is demonstrated. This logic is used to describe what might happen if a certain action is taken or why certain things happen when certain circumstances are met.
- When people draw on personal experience and a drive to improve, this form of reasoning is frequently used to guide daily decision-making.

6. Critical thinking

- Critical thinking is a process of rational thought that seeks to draw conclusions in an objective, thorough and informed manner.
- It's a product of human thought and is influenced by factors such as culture and language.
- Human thought is based on natural language that allows for a great range of ideas to be contemplated.

For example, critical thinking can be used to critique a film or book.

7. Decompositional reasoning:

- Decompositional reasoning is the process of breaking things down into their basic components in order to comprehend how each component contributes to the overall functionality of the object.
- Decompositional reasoning allows an observer to derive powerful conclusions about the total by evaluating each portion separately.

Series



The series test series has to be studied carefully to find out whether this series is following the order/rule or not.

The questions asked under this test can be classified into the following categories.

1. Digit series
2. Alphabet series
3. Frequency Series of Digits/Characters

There are a few things to keep in mind while doing chain test.

- A. First try to play the whole chain.
- B. If the chain does not work, then we run it by laughing.
- C. At the very end run the alternate series

1. Digit series -

In this, a series of marks is given in the questions asked. This series is based on addition, subtraction, multiplication, division, square, square root, cube, cube root etc.

Type - (i) Finding the wrong term in the series.



In the series sequence, a wrong digit is added in place of the digit appearing at a particular place. For this, first of all it should be known that which term is not changing according to that rule, that is the wrong term.

Ex.1 Which number is missing in the following number series?

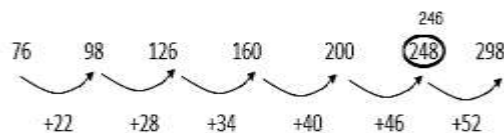
76, 98, 126, 160, 200, 248, 298

- (A) 248 (B) 200
(C) 160 (D) 298

Ans. (A)

Sol. After observing the above series carefully, we find that the sixth term of the series is inappropriate

Because the number to be added to each term is 6 digits more than its first number.



So instead of 248, there will be 246.

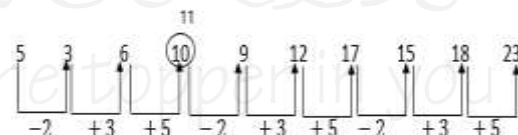
Ex.2 Which number in the following series is such that it is inappropriate in the series?

5, 3, 6, 10, 9, 12, 17, 15, 18, 23

- (A) 6 (B) 9
(C) 12 (D) 10

Ans. (D)

Sol. After observing the above series carefully, we find that the series is decreasing and increasing in the order of -2, +3, +5, -2, +3, +5



In the above series, 11 should come after the digit '6'. Hence the wrong number in the series is 10.

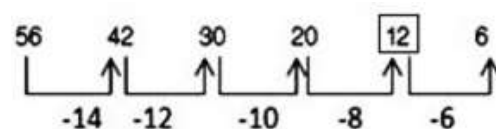
Directions: Question (1-7) Find the missing number in the following series.

Q.1 56, 42, 30, 20, ?, 6

- (A) 15 (B) 12
(C) 18 (D) 14

Ans. (B)

Explanation-



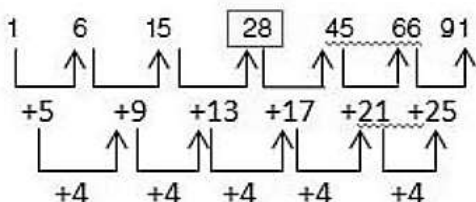
So, ? = 12

Q.2 1, 6, 15, ?, 45, 66, 91

- (A) 25 (B) 26
(C) 27 (D) 28

Ans. (D)

Explanation-



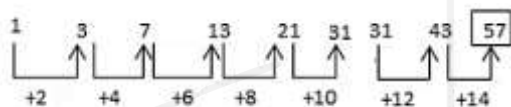
So, ? = 28

Q.3 1, 3, 7, 13, 21, 31, 43, ?

- (A) 55 (B) 57
(C) 59 (D) 61

Ans. (B)

Explanation-

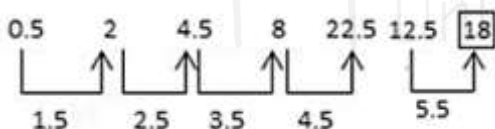


So, ? = 57

Q.4 0.5, 2, 4.5, 8, 12.5, ?

- (A) 17 (B) 16
(C) 16.5 (D) 18

Ans. (D)



Explanation-

So, ? = 18

Q.5 3, 6, 18, 21, 63, 66, ?

- (A) 181 (B) 160
(C) 147 (D) 198

Ans. (D)

Explanation-

$3 + 3 = 6$, $6 \times 3 = 18$
 $18 + 3 = 21$, $21 \times 3 = 63$
 So, $63 + 3 = 66$
 $? = 66 \times 3 = 198$

Q.6 510, 322, 404, ?

- (A) 422 (B) 371
(C) 629 (D) 819

Ans. (A)

Explanation –

There are even numbers in the sequence.

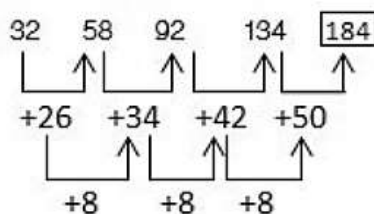
So, ? = 422

Q.7 32, 58, 92, 134, ?

- (A) 184 (B) 194
(C) 156 (D) 169

Ans. (A)

Explanation-



So, ? = 184

Type – (II)



Completing the series -

Under this, in the given series sequence, a particular place is left blank or is denoted by the question mark (?), then the candidates are expected to find that sequence and mark the question mark (?). Select the appropriate number to come in place of.

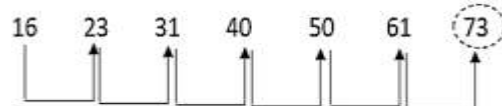
Ex.3 Which of the given number will come in place of question mark in the series?

16, 23, 31, 40, 50, 61, ?

- (A) 81 (B) 83
(C) 77 (D) 73

Ans. (D)

Sol. On observing the above series, we find that the series is increasing in the order of +7,+8,+9,+10.....



Sol. First Term $a = 3$
 Common ratio $d = 9/3 = 3$
 6th term $T_6 = a \cdot r^{n-1}$
 $= 3 \cdot 3^6 - 1$
 $= 3 \times 3^5$
 $= 3 \times 243 = 729$
 $= 3 \times 243 = 729$
 So the 6th term is 729

Ex.8 What will be the 10th term of the series 7, 14, 28,..... ?

- (A) 3216 (B) 2736
 (C) 2684 (D) 3584

Ans. (D)

Sol. First Term $a = 7$
 Common ratio $= 14/7 = 2$
 10th term
 $T_{10} = a \cdot r^{n-1}$
 $= 7 \times 2^{10-1}$
 $= 7 \times 2^9$
 $= 7 \times 512$
 $= 3584$
 Hence the 10th term is 3584

Type-IV

Q.1 In the following questions, select the odd number pair from the given alternatives.

- (A) 10.30 (B) 11.33
 (C) 50.150 (D) 13.37

Ans. (D)

Explanation-

Except the number pair 13-37, in all the other number-pairs, the second number is three times the first number.

$10 \times 3 = 30$
 $11 \times 3 = 33$
 $50 \times 3 = 150$
 but,
 $13 \times 3 - 2 = 37$

Q.2 In the following questions, select the odd number pair from the given alternatives.

- (A) 18 : 37 (B) 24 : 47
 (C) 32 : 65 (D) 48 : 97

Ans. (B)

Explanation-

Number pair 24: Except 47, in all other number-pairs, the second number is one more than twice the first number.

$18 \times 2 = 37$
 $32 \times 2 = 65$
 $48 \times 2 = 97$

but,
 $24 \times 2 - 1 = 47$

3. Alphabet series -

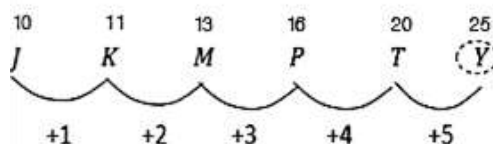
Under this, a series of letters related to the English alphabet is given in the given series, in which one or two letters are omitted, or is represented by a question mark (?) in that place.

Ex.9 What will come in place of question mark (?) in the given series?

- J K M P T ?
 (A) X (B) W
 (C) Y (D) none

Ans. (C)

Sol.



Hence the appropriate letter coming in place of question mark (?) will be Y.

Ex.10 L7C, N9F, P12I, R16L, ? What will come at the question mark in this series?

- (A) U21O (B) S21P
 (C) S20O (D) T21O

Ans. (D)

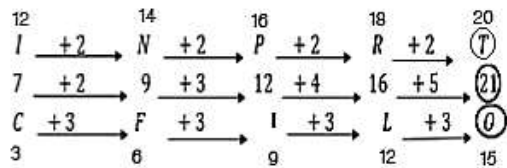
Sol. Therefore, in place of the question mark (?), the appropriate number-letter group will be T21O.

Ex.11 What will come in place of the missing letters of the following series?

ab__baabc__aabcb__abcb__

- (A) bcaa (B) cbaa
(C) abca (D) aacb

Ans. (B)

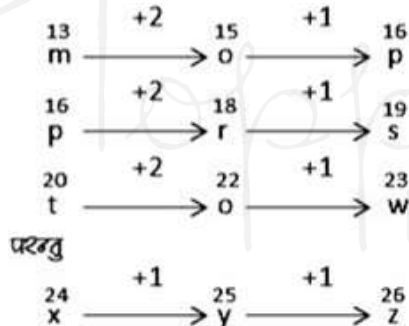


Q.1 In the following question, select the odd letters from the given alternatives.

- (A) mop (B) prs
(C) tvw (D) xyz

Ans. (D)

Explanation-

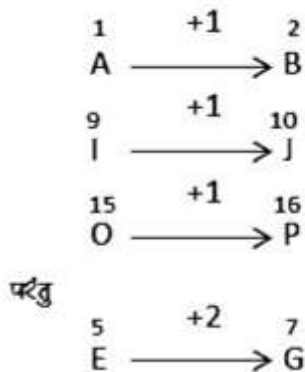


Q.2 In the following questions, select the odd letters from the given alternatives.

- (A) AB (B) EG
(C) IJ (D) OP

Ans. (B)

Explanation-

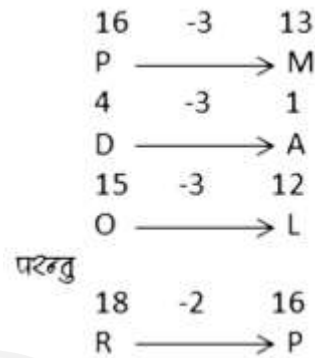


Q.3 In the following questions, select the odd letters from the given alternatives.

- (A) PM (B) DA
(C) RP (D) OL

Ans. (C)

Explanation -

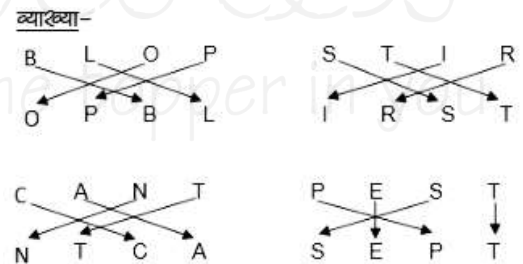


Q.4 In the following questions, select the odd letters from the given alternatives.

- (A) BLOP-OPBL (B) STIR-IRST
(C) CANT-NTCA (D) PEST-SEPT

Ans. (D)

Explanation-



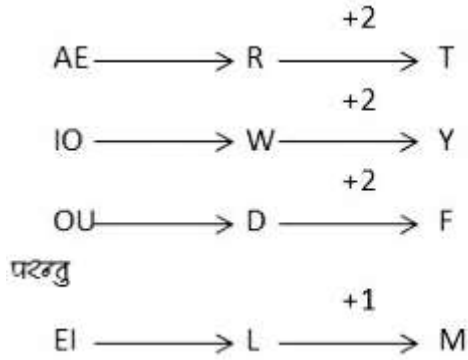
Q.5 In the following questions, select the odd letters from the given alternatives.

- (A) EI-LM (B) AE-RT
(C) IO-WY (D) OU-DF

Ans. (A)

Explanation -

'Letter-pair' is a letter gap between the letters of the second unit in all other letter-pairs except 'EI-LM'. The first unit has a continuous vowel.



Q.6 In the following questions, select the odd letters from the given alternatives.

- (A) DEGJ (B) QRTW
 (C) YZBE (D) JKNQ

Ans. (D)

Explanation -

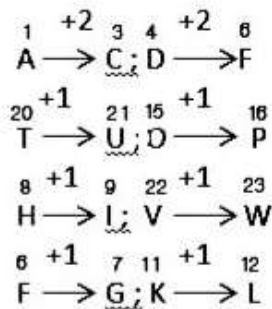


Q.7 In the following questions, select the odd letters from the given alternatives.

- (A) ACDF (B) TUOP
 (C) HIVW (D) FGKL

Ans. (A)

Explanation -



3. Frequency series of digits or letters -

Under this, the numbers or letters appear repeatedly in a certain sequence, thus forming a series of numbers / letters in

which one or two digits in the middle or end or

Alphabets are lost and candidates have to find out the missing number/letters.

Ex.12 02487503001024875030010

- (A) 2,4 (B) 0,1
 (C) 0,2 (D) 4,8

Ans. (A)

Sol. After looking carefully at the given series of numbers, we find that 02487503001 is appearing repeatedly in the sequence.

So the next two digits will be 2 and 4.

Directions: (1-7) Find the missing term in the following series-

Q.1 Y, S, N, J, G, ?

- (A) F (B) E
 (C) H (D) I

Ans. (B)

Explanation-

Hence, the appropriate term coming in place of (?) will be E.

Q.2 NZ, OY, PX, QW, RV, ?

- (A) FS (B) SU
 (C) UF (D) TU

Ans. (B)

Explanation-

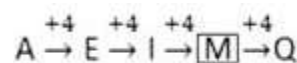
Hence, the appropriate term will come in place of (?) will be SU.

Q.3 A, E, I, ?, Q

- (A) O (B) M
 (C) U (D) L

Ans. (B)

Explanation-



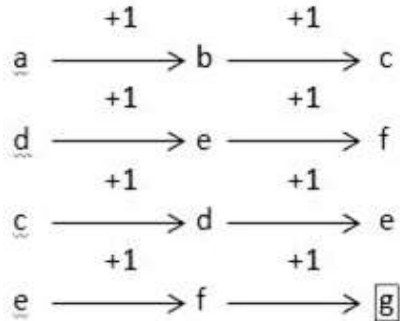
Hence, the appropriate term to come in place of (?) will be M.

Q.4 a d c e b e d f c f e ?

- (A) h (B) g
(C) f (D) d

Ans. (B)

Explanation-



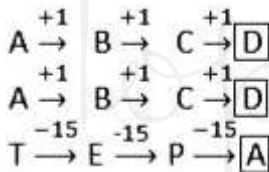
Hence, the appropriate term coming in place of (?) would be g.

Q.5 AAT, BBE, CCP, ?

- (A) DDA (B) DDB
(C) DDC (D) DDD

Ans. (A)

Explanation-



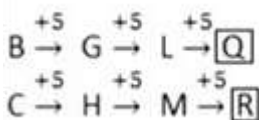
Hence, the appropriate term to come in place of (?) will be DDA

Q.6 BC, GH, LM, ?

- (A) PQ (B) RS
(C) QR (D) OP

Ans. (C)

Explanation-



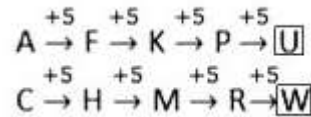
Therefore, the appropriate term that comes in place of (?) will be QR.

Q.7 AC, FH, KM, PR, ?

- (A) UX (B) TV
(C) UW (D) VW

Ans. (C)

Explanation-



Hence, the appropriate term to come in place of (?) will be UW.

Q.8 In the following questions, select the odd number from the given alternatives.

- (A) 362 (B) 145
(C) 26 (D) 625

Ans. (D)

Explanation-

Except the number 625, all other numbers are one more than the perfect square of certain natural numbers. The number 625 is a perfect square number.

$$362 = 19 \times 19 + 1$$

$$145 = 12 \times 12 + 1$$

$$26 = 5 \times 5 + 1$$

But,

$$625 = 25 \times 25$$

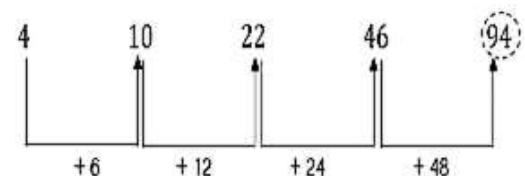
Example with Solution

1. 4, 10, 22, 46, ? Find the missing number.

- (A) 56 (B) 66
(C) 76 (D) 94

Ans. (D)

Sol.



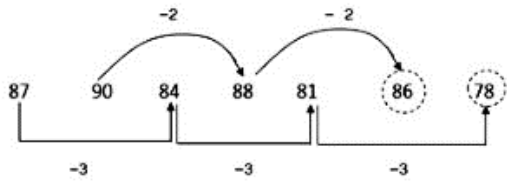
So, (?) = 94

2. 87, 90, 84, 88, 81, ?, ?

- (A) 86,78 (B) 86,88
(C) 86,88 (D) 85,93

Ans. (A)

Sol.



Hence, option(A) 86,78 will be correct.

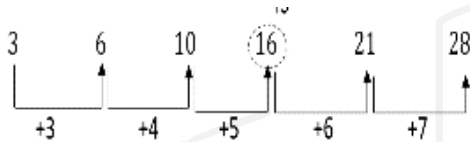
3. Which of the following numbers is not correct in the sequence -

3, 6, 10, 16, 21, 28

- (A) 10 (B) 3
(C) 16 (D) 21

Ans. (C)

Sol.



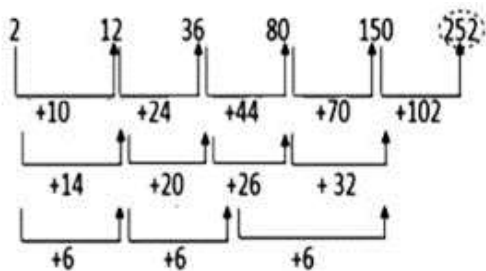
Hence, option (C) 16 will be correct.

4. 2, 12, 36, 80, 150, ? Find the missing number.

- (A) 210 (B) 258
(C) 252 (D) 194

Ans. (C)

Sol.



Hence, option (C) 252 will be correct.

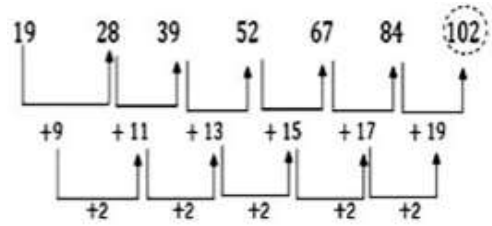
5. Which of the following numbers is not suitable in the sequence?

19, 28, 39, 52, 67, 84, 102

- (A) 84 (B) 102
(C) 67 (D) 52

Ans. (B)

Sol.



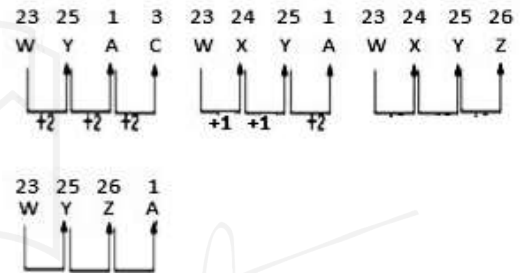
Hence, option (B) 102 will be wrong number.

6. Find the missing letter

- (A) WYAC (B) WXYA
(C) WXYZ (D) WYZA

Ans. (A)

Sol.



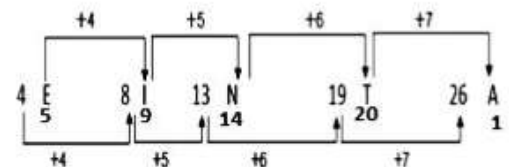
Hence, option (A) would be correct.

7. 4E, 8I, 13N, 19T, ? Find the missing term.

- (A) 26U (B) 26A
(C) 26Z (D) 25X

Ans. (B)

Sol.



Hence, option (B) will be correct.

8. ab__dbc__ __cda__d__bcab__d

- (A) cdabac (B) cdaabc
(C) adabac (D) dadabc

Ans. (A)

Sol. abcd/bcda/cdab/dabc/abcd

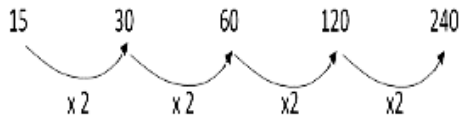
Hence, option (A) would be correct.

9. 15, 30, 60, 120, ? Find the missing number.

- (A) 250 (B) 245
(C) 240 (D) 260

Ans. (C)

Sol.



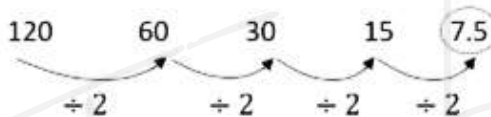
Hence, option (C) will be correct.

10. 120, 60, 30, 15, ? Find the missing number.

- (A) 7.5 (B) 5.7
(C) 3.0 (D) 8.5

Ans. (A)

Sol.

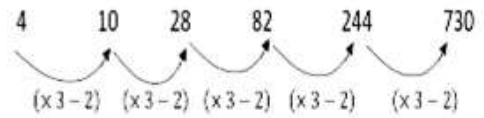


11. 4, 10, ? 82, 244, 730

- (A) 218 (B) 28
(C) 24 (D) 77

Ans. (B)

Sol.



Hence, option (B) will be correct.

English Alphabet Test



The English alphabet test is based on the English letters or alphabet being arranged in a certain format. In this test, questions are solved based on the formation of words by the selected letters, finding the letters in the pair of letters and between 2 letters, etc.

Some important facts related to the English alphabet.

1. Capital/Small letters of the English alphabet

Block letters	A B C D E F G
	H I J K L M
Lowercase letters	a b c d e f
	g h i j k l m
Block letters	N O P Q R S T
	U V W X Y Z
Lowercase letters	n o p q r s t
	u v w x y z

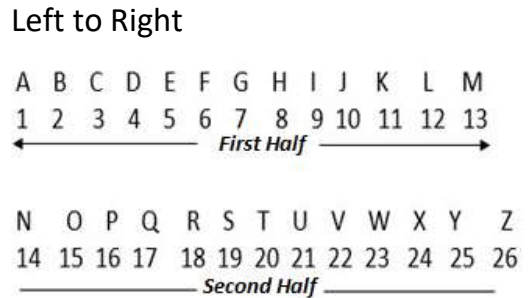
2. Vowels and consonants of the English alphabet

- (i) Vowel - There are 5 vowels in the English alphabet, which are as follows -
A, E, I, O, U
- (ii) Consonants - There are 21 consonants in the English alphabet, which are as follows -
B, C, D, F, G, H, J, K, L, M, N, P, Q, R, S, T, V, W, X, Y, Z

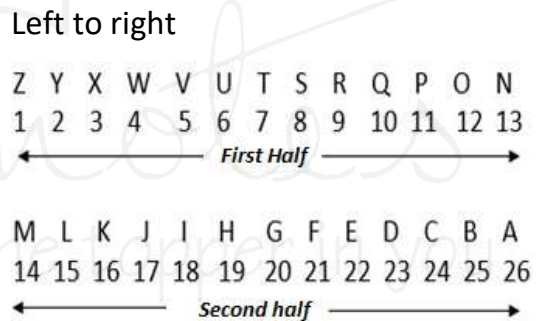
3. The place of letters in the English - Alphabet is the first 13 and the last 13 letters of the alphabet are called the first and second half of the alphabet

respectively. This location depends on two sequences.

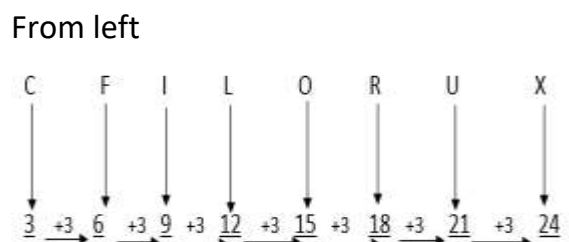
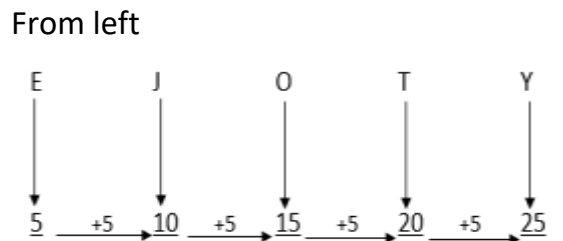
- (i) **First and second half of straight sequence** - In this sequence the letters from A to M are placed in the first half and the letters from N to Z are called the second half.



- (ii) **The first second half of the opposite order** - In this sequence the letters from Z to N are called the first half and the letters from M to A are called the second half.



4. Finding the Position Order of Letters by EJOTY and CFILORUX



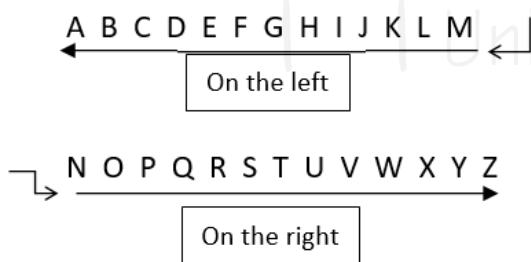
Opposite Letter - Each letter in the English alphabet has an opposite letter.

A	Z	1 + 26 = 27
B	Y	2 + 25 = 27
C	X	3 + 24 = 27
D	W	4 + 23 = 27
E	V	5 + 22 = 27
F	U	6 + 21 = 27
G	T	7 + 20 = 27
H	S	8 + 19 = 27
I	R	9 + 18 = 27
J	Q	10 + 17 = 27
K	P	11 + 16 = 27
L	O	12 + 15 = 27
M	N	13 + 14 = 27

If the letter of the English alphabet whose opposite letter is to be found, then the corresponding number of that letter is subtracted from 27. The number obtained after subtracting is the corresponding number of the opposite letter.

Finding the letter to the left and right of letters

- Whatever is on our right is the right of the same letters and whatever else is on our left, is the left of those other letters. like –



Question Types

Type-I Questions Based on Alphabet Test

1. The position of the letters in the direct sequence shall be -

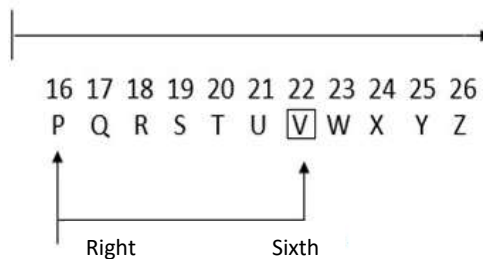
Ex.1 Which letter is 6th to the right of the sixteenth letter from the left in the alphabet A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ?

- (a) F (b) Q
 (c) U (d) V

Ans. (d)

Sol. As per question

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
 A B C D E F G H I J K L M N O



16th letter from left in English alphabet = P
Hence 6th letter to the right of P = V

Alternative Method

n^{th} letter to the right of m^{th} letter from left in English alphabet = $(m+n)^{\text{th}}$ letter from left.

$m = 16$ and $n = 6$

$(16+6)^{\text{th}}$ letter from left = 22^{nd} letter from left = V

2. **Position of letters in reverse order**

Ex.2 If the English alphabet is written in reverse order, then which letter will be 13th to the left of the 3rd letter from the right?

- (a) C (b) P
 (c) R (d) L

Ans. (b)

Sol. n^{th} letter to left of m letter from your right in reverse order of English alphabet = $(m + n)^{\text{th}}$ letter from right.
 Here, $m = 3$ and $n = 13$
 $= (3+13)^{\text{th}}$ letter from right = 16^{th} letter from right = P **Ans.**

3. **Position of letters in the first half of the reverse order**

Under this, the first half of the letters of the English alphabet i.e. letters from A to M are written in reverse order and the remaining half of the letters are written as they are.

Ex.3 If the first half of the English alphabet is written in reverse order, then which letter will be to the left and seventh letter of the tenth letter from your right?

- (a) C (b) E
(c) D (d) J

Ans. (c)

Sol. According to question,

13 12 11 10 9 8 7 6 5
M L K J I H G F E

4 3 2 1 14 15 16 17
D C B A N O P Q
 ↑ ← to the left of → ↑
 7th 10th

18 19 20 21 22 23 24 25 26
R S T U V W X Y Z

← from the right |

The 10th letter from the right is Q and the seventh letter to the left of the letter Q is D.

So required letter = D

4. Position of letters in reverse order of multiple letter segments

Ex.4 If the first four letters of the English alphabet are written in reverse order, then 5 letters also in reverse order, again 6 letters also in reverse order, 5 letters also in reverse order, again 6 letters also in reverse order, again If 7 letters are also written in reverse order and remaining letters are also written in reverse order, then which letter will be the seventh letter to the left of the eighth letter from the right?

- (a) O (b) L
(c) N (d) M

Ans. (d)

As per question,

4 3 2 1 9 8 7 6 5 15 14
D C B A I H G F E O N

13 12 11 10 22 21 20 19
M L K J V U T S
 ↑ ← from left → |
 7th 8th

18 17 16 26 25 24 23
R Q P Z Y X W

← from right |

The eighth letter from the right is S and the seventh letter to the left of the letter S is M. So required letter = M

5. Number of letters between 2 letters -

Ex.5 How many letters are there in the middle of the eighth letter from the left and the seventh letter from the right in the English alphabet?

- (a) 8 (b) 9
(c) 10 (d) 11

Ans. (d)

Sol. As per Question

1 2 3 4 5 6 7 8
A B C D E F G H
 | ↑
 eighth from left

9 10 11 12 13 14 15 16 17 18 19
I J K L M N O P Q R S
 | | | | | | | | | |
 11 letter

20 21 22 23 24 25 26
T U V W X Y Z
 | ← from right → |
 7th

Hence, the eighth letter from the left is H and the seventh letter from the right is T and there are 11 letters in between these two.

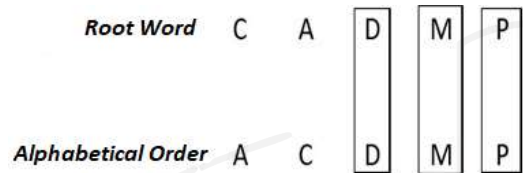
6. Same position of letters when arranged alphabetically -

Ex.6 If each letter in the word CADMP is arranged alphabetically, then the positions of how many letters will remain unchanged.

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

Ans. (c)

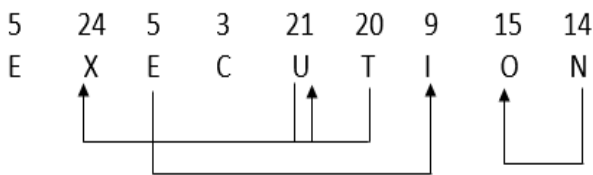
Sol.



Hence such letters are D, M, and P.

Type-2 Letter- Pair Based Question

If there are as many letters between two letters of a word as there are between them in the English alphabet, then the pair thus formed between those two letters is called a letter pair.



Ex.7 How many such pairs of letters are there in the given word EXECUTION, which have as many letters between them in the word as there are between them in the English alphabet?

- (a) 1 (b) 2
 (c) 3 (d) more than 3

Ans. (d)

Sol. According to question
 So the required letter pair is UX, TU EI and NO i.e. 4.

Type - 3 Word Formation and Alphabet Arrangement

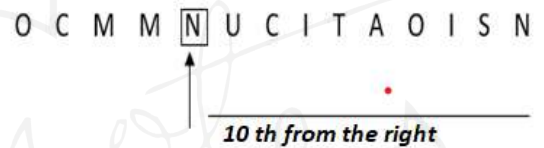
(i) Changing the letters of a meaningful word

Ex.8 If the letters of the first and second, third and fourth, fifth and sixth and so on are interchanged in the words, then what will be the tenth letter when counted from its right?

- (a) T (b) N
 (c) U (d) A

Ans. (b)

Sol. The word formed by interchanging the letters of the given word COMMUNICATIONS



Hence, the required alphabet = N

(ii) Making meaningful words from selected / consecutive letters of a semi-complete word

Ex.9 If any one meaningful word can be formed from the first, third, fifth and eighth letters of the word SHARE HOLDING, then what will be its second letter? If no such word can be formed, give the answer 'X' and if more than one word can be formed, give the answer 'Y'.

- (a) L (b) E
 (c) S (d) X
 (e) Y

Ans. (e)