Shortcuts, Tips & Techniques - Reasoning Ability

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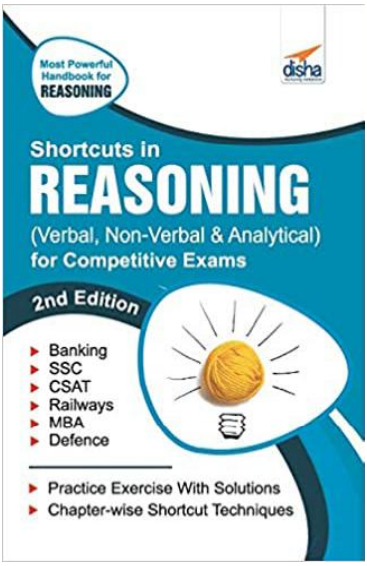

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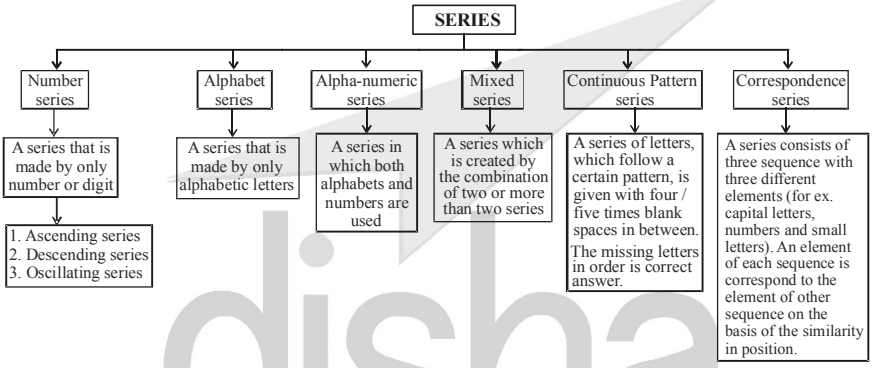
Chapter 2

Series

INTRODUCTION

A series is a sequence of numbers/alphabetical letters or both which follow a particular rule. Each element of series is called 'term'. We have to analyse the pattern and find the missing term or next term to continue the pattern.

TYPES OF SERIES



NUMBER SERIES

Number series is a form of numbers in a certain sequence, where some numbers are mistakenly put into the series of numbers and some number is missing in that series, we need to observe first and then find the accurate number to that series of numbers.

Remember

- Even and odd numbers.
- Prime and composite numbers.
- Square and square roots of a numbers.
- Cube and cube roots of a numbers.
- Arithmetic Operations → Addition, Subtraction, Division, Multiplication

Types of Number Series

1. PERFECT SQUARE SERIES

This type of series are based on square of a number which is in same order and one square number is missing in that given series.

EXAMPLE **841, ?, 2401, 3481, 4761**

Sol. $29^2, 39^2, 49^2, 59^2, 69^2$

2. PERFECT CUBE SERIES

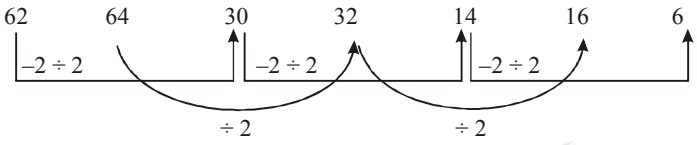
Perfect Cube series is a arrangement of numbers in a certain order, where some number which is in same order and one cube is missing in that given series.

EXAMPLE **4096, 4913, 5832, ?, 8000**

Sol. $16^3, 17^3, 18^3, 19^3, 20^3$

EXAMPLE **62, 64, 30, 32, 14, 16, ?**

Sol.



3. MIXED NUMBER SERIES

Mixed number series is a arrangement of numbers in a certain order. This type of series are more than are different order which arranged in alternatively in single series or created according to any non conventional rule.

4. PRIME SERIES

When numbers are a series of prime numbers.

EXAMPLE **2, 3, 5, 7, 11, 13, __ , 19**

Sol. Here, the terms of the series are the prime numbers in order. The prime number, after 13 is 17. So, the answer to this question is 17.

5. ALTERNATE PRIMES

It can be explained by below example.

EXAMPLE **2, 11, 17, 23, __, 41**

Sol. Here, the series is framed by taking the alternative prime numbers. After 23, the prime numbers are 29 and 31. So, the answer is 31.

6. The difference of any term from its succeding term is constant (either increasing series or decreasing series):

EXAMPLE **4, 7, 10, 13, 16, 19, __, 25**

Sol. Here, the diffrence of any term from its succeding term is 3.

$7 - 4 = 3$

$10 - 7 = 3$

So, the answer is $19 + 3 = 22$

7. The difference between two consecutive terms will be either increasing or decreasing by a constant number:

EXAMPLE **2, 10, 26, 50, 82, __**

Sol. Here, the difference between two consecutive terms are

$10 - 2 = 8$

$26 - 10 = 16$

$50 - 26 = 24$

$82 - 50 = 32$

Here, the difference is increased by 8 (or you can say the multiples of 8). So the next difference will be 40 (32 + 8). So, the answer is $82 + 40 = 122$

8. The difference between two numbers can be multiplied by a constant number:

EXAMPLE **15, 16, 19, 28, 55, __**

Sol. Here, the differences between two numbers are
16 – 15 = 1
19 – 16 = 3
28 – 19 = 9
55 – 28 = 27
Here, the difference is multiplied by 3. So, the next difference will be 81. So, the answer is 55 + 81 = 136

9. The difference can be multiples by number which will be increasing by a constant number:

EXAMPLE **2, 3, 5, 11, 35, __**

Sol. The difference between two number are
3 – 2 = 1
5 – 3 = 2
11 – 5 = 6
35 – 11 = 24

10. Every third number can be the sum of the preceding two numbers :

EXAMPLE **3, 5, 8, 13, 21, __**

Sol. Here, starting from third number
3 + 5 = 8
5 + 8 = 13
8 + 13 = 21
So, the answer is 13 + 21 = 34

11. Every third number can be the product of the preceeding two numbers :

EXAMPLE **1, 2, 2, 4, 8, 32. __**

Sol. Here, starting from the third number
1 × 2 = 2
2 × 2 = 4
2 × 4 = 8
4 × 8 = 32
So, the answer is 8 × 32 = 256

12. Every succeeding term is got by multiplying the previous term by a constant number or numbers which follow a special pattern.

EXAMPLE **5, 15, 45, 135, __**

Sol. Here,
5 × 3 = 15
15 × 3 = 45
45 × 3 = 135
So, the answer is 135 × 3 = 405

13. In certain series the terms are formed by various rule (miscellaneous rules). By keen observation you have to find out the rule and the appropriate answer.

EXAMPLE **4, 11, 31, 90, __**

Sol. Terms are,
4 × 3 – 1 = 11
11 × 3 – 2 = 31
31 × 3 – 3 = 90
So, the answer will be 90 × 3 – 4 = 266

14. TRIANGULAR PATTERN SERIES:

Sometimes the difference between consecutive terms of a series, again form a series. The differences between the consecutive terms of the new series so formed, again form a series. This pattern continues till we attain a uniform difference between the consecutive terms of the series.

EXAMPLE

2, 12, 36, 80, 150, ?

Sol. As discussed above, we may lebel the given series as I and then form series II to IV as shown, below:

Series-I: 2 12 36 80 150 ?
Series-II: 10 24 44 70 ?
Series-III: 14 20 26 ?
Series-IV: 6 6

Clearly, the pattern in series III is +6.

So, missing term in series III = 26 + 6 = 32

Missing term in series II = 70 + 32 = 102

Missing term in series I = 150 + 102 = 252

Thus the missing term = 252

(i.e. 150 + 70 + 26 + 6)

Remember

Elementry Idea of Progressions:

1. ARITHMETIC PROGRESSION (A. P.):

The sequence of the form a, $a + d$, $a + 2d$, $a + 3d$, ... is known as an A.P., whose n^{th} term is $a + (n-1)d$. Here 'a' is first term and 'd' is common difference.

2. GEOMETRIC PROGRESSION (G. P.):

The sequence of the form a, ar, ar^2, ar^3, ... is known a G.P., whose n^{th} term is ar^{n-1}.

3. FIND THE WRONG NUMBER:

In this type of questions, a series of numbers is given which follow a certain pattern and one its term does not fit into the series. The candidate is required to identify the pattern involved in the formation of series and then find out that number which does not follow the specific pattern of the series. This particular number is the wrong term in the series.

EXAMPLE

One number is wrong in the following series. Find out this wrong number.

1, 5, 9, 15, 25, 37, 49,

Sol. The pattern is as follows

17

1 5 9 (15) 25 37 49

↓ ↓ ↓ ↓ ↓ ↓ ↓

1^2 $(2^2 + 1)$ 3^2 $(4^2 + 1)$ 5^2 $(6^2 + 1)$ 7^2

Hence number 15 is wrong and should be replaced by 17.

❑ Shortcut Approach

(1) If numbers are in ascending order in the number series, then the numbers may be **added or multiplied** by certain numbers from the first number.

(A) 19 23 26 30 33 ?
19 23 26 30 33 37
+4 +3 +4 +3 +4

(B) 1 3 12 60 ?
1 3 12 60 360
×3 ×4 ×5 ×6

(2) If numbers are in descending order in the number series, then the numbers may be **subtracted or divided** by certain numbers from the first number.

(A) 34 18 10 6 4 ?
34 18 10 6 4 3
−16 −8 −4 −2 −1

(B) 720 120 24 6 2 ?
720 120 24 6 2 1
/6 /5 /4 /3 /2

(3) If numbers are in mix order (increasing and decreasing) in the number series, then the numbers may be in **addition, subtraction, multiplication, division, square and cube** in the alternate numbers.

(A)

200 165 148 117 104 ?
200 165 148 117 104 77
$(14)^2+4$ $(13)^2-4$ $(12)^2+4$ $(11)^2-4$ $(10)^2+4$ $(9)^2-4$

(B)

14 17 31 48 ? 127

14 17 31 48 79 127

14+17=31 → 17+31=48 → 31+48=79 → 48+79=127

(4) Check the direct formula if any.

(5) Check whether all numbers are odd, even or prime.

(6) Check whether all the number are perfect squares or cubes.

ALPHABET SERIES

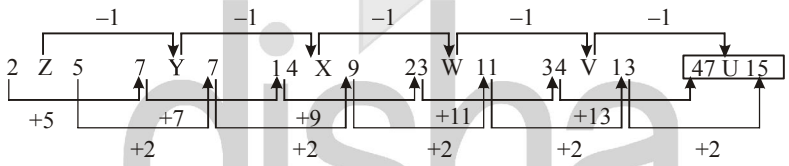
A series that is made by only alphabetic letters.

EXAMPLE **G, H, J, M, ?**

Sol. G H J M Q

+1 +2 +3 +4

Sol.

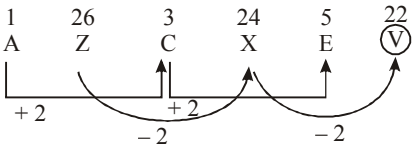


MIXED SERIES

A series formed with the combination of more than one series.

EXAMPLE A, Z, C, X, E, ?

Sol. There are two interwoven series.



∴ ? = V

❑ Shortcut Approach

- Remember all the alphabets and their place number.
- Intervals like :

E J O T Y , C F I L O R U X

5 10 15 20 25 3 6 9 12 15 18 21 24

ALPHA NUMERIC SERIES

These kind of problems used both mathematical operation and position of letters in the alphabet in forward, backward order.

EXAMPLE 2 Z 5, 7 Y 7, 14 X 9, 23 W 11, 34 V 13, ?

EXAMPLE **Z, L, X, J, V, H, T, F, __, __**

Sol. The given sequence consists of two series

(i) Z, X, V, T, __

(ii) L, J, H, F, __. Both consisting of alternate letters in the reverse order.

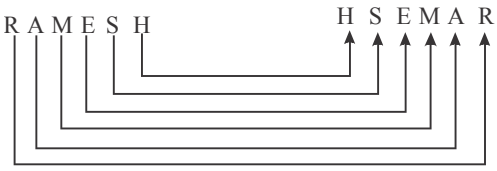
∴ Next term of (i) series = R, and Next term of (ii) series = D

Reverse Order Repetition Series:

In such series, first part is written in reverse order of the second part of the series.

EXAMPLE R, A, M, S, H, H; S, E, M A,?

Sol.



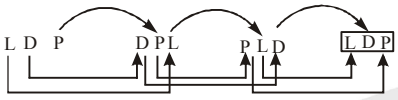
$\therefore$? = R

SERIES HAVING GROUP OF LETTERS AS ITS ELEMENTS:

In such series, each element consists of group of letters instead of a single letter.

EXAMPLE LDP, DPL, PLD, ?

Sol.



$\therefore$? = LDP

CONTINUOUS PATTERN SERIES

It is a series of small/capital letters that follow a certain pattern like repetition of letters.

EXAMPLE **b a a b – a b a – b b a – –**

Sol. b a a b b a / b a a b b a / b a

CORRESPONDENCE SERIES:

This type of series consists of three sequences with three different elements (usually capital letters, digits and small letters). On the basis of the similarity in position in the three sequences, a capital letter is found to correspond with a unique digit and a unique small letter, whenever it occurs. The candidate is required to trace out this correspondence and accordingly choose the elements to be filled in at the desired places.

EXAMPLE

C B – – D – B A B C C B

– – 1 2 4 3 – – ? ? ? ?

a – a b – c – b – – – –

Sol. Comparing the positions of the capital letters, numbers and small letters, we find a corresponds to c and 1 correspond to a. So, a and 1 correspond to c. b corresponds to A and 2 corresponds to b. So, b and 2 correspond to A. Also, 4 corresponds to D. Therefore, the remaining number i.e. 3 corresponds to B. Hence, BCCB corresponds to 3113.

PRACTICE EXERCISE

DIRECTIONS (Qs. 1-2): *In the following Questions, which one set of letters when sequentially placed at the gaps in the given letter series shall complete it?*

1. ccbab _ caa _ bccc _ a _
(a) babb (b) bbba
(c) baab (d) babc

2. a_ _ dba_ _bcad__ _da__ _cd
(a) bccdbcab (b) abcddcba
(c) cbcddcba (d) aabbccdd

DIRECTIONS (Qs. 3-4): *A series is given,with one term missing. Choose amongst the given responses choose the meaningful one.*

3. CUS, DVT, EWU, ____
(a) FXV (b) VXF
(c) XFV (d) XVF

4. 206, 221, 251, 296, ?, 431
(a) 326 (b) 356
(c) 311 (d) 341

5. A series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series.
CAT , DBT , ECT , ?
(a) DCT (b) FDT
(c) FCT (d) FAT

DIRECTIONS (Qs. 6-10) : *What should come in place of the question mark (?) in the following number series?*

6. 2 16 112 672 3360 13440 ?
(a) 3430 (b) 3340
(c) 40320 (d) 43240
(e) None of these

7. 4 9 19 ? 79 159 319
(a) 59 (b) 39
(c) 49 (d) 29
(e) None of these

8. 4000 2000 1000 500 250 125 ?
(a) 80 (b) 65
(c) 62.5 (d) 83.5
(e) None of these

9. 588 563 540 519 ? 483 468
(a) 500 (b) 496
(c) 494 (d) 490
(e) None of these

10. 121 ? 81 64 49 36 25
(a) 92 (b) 114
(c) 98 (d) 100
(e) None of these

DIRECTIONS (Qs. 11-15) : *Each of the following number series, a wrong number is given. Find out that number.*

11. 3 5 13 43 178 891 5353
(a) 43 (b) 178
(c) 891 (d) 5353
(e) None of these

12. 80640 10080 1440 240 48 10 4
(a) 240 (b) 48
(c) 1440 (d) 10
(e) None of these

13. 3 5 10 12 17 23 24
(a) 5 (b) 17
(c) 24 (d) 23
(e) None of these

14. 1, 11, 38, 78, 175, 301
(a) 11 (b) 78
(c) 175 (d) 301
(e) None of these

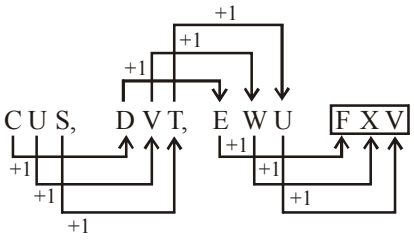
15. 17, 39, 85, 179, 369, 879
(a) 369 (b) 211
(c) 179 (d) 879
(e) None of these

HINTS & SOLUTIONS

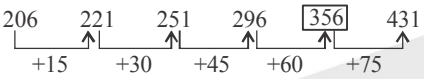
1. (a) c c b a/b b c a/a a b c/c c b a/b

2. (a) a b c d/b a c d/b c a d/b c d a/ a b c d.

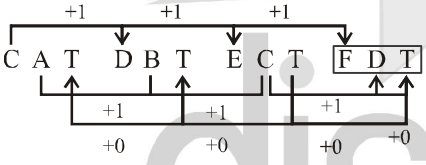
3. (a)



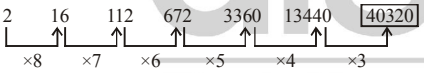
4. (b)



5. (b)

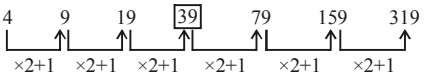


6. (c) Given series.



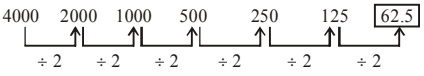
∴ ? = 40320

7. (b) Given series.



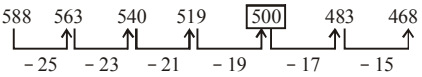
∴ ? = 39

8. (c) Given series



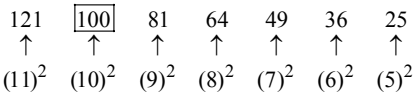
∴ ? = 62.5

9. (a) Given series.



∴ ? = 500

10. (d) Given series.



∴ ? = 100

11. (b) $3 \times 1 + 2 = 5$
$5 \times 2 + 3 = 13$
$13 \times 3 + 4 = 43$
$43 \times 4 + 5 = 177$
Wrong No = 178
Correct Number = 177

12. (d) $80640 \div 8 = 10080$
$10080 \div 7 = 1440$
$1440 \div 6 = 240$
$240 \div 5 = 48$
$48 \div 4 = 12$
Wrong No = 10
Correct Number = 12

13. (e) First series: 3, 10, 17, 24 (increased by 7)
Second Series: 5, 14, 23 (increased by 9)
Wrong Number: 12
Correct Number: 14

14. (b) $1 + 3^2 + 1 = 11$
$11 + 5^2 + 2 = 38$
$38 + 7^2 + 3 = 90$
$90 + 9^2 + 4 = 175$
$175 + 11^2 + 5 = 301$
Wrong Number = 78
Correct Number = 90

15. (d) $7 \times 2 + 3 = 17$
$17 \times 2 + 5 = 39$
$39 \times 2 + 7 = 85$
$85 \times 2 + 9 = 179$
$179 \times 2 + 11 = 369$
$369 \times 2 + 13 = 751$
Wrong Number = 879
Correct Number = 751