CHAPTER 1

Series and Analogies

Number and Letter Series form an important part of the Reasoning Section in various competitive examinations. There are two or three broad categories of questions that appear in various exams from this particular chapter.

In the first category of questions, a series of numbers/letters is given with one number/letter (or two numbers/letters) missing, represented by a blank or a question mark. The given series of numbers/letters will be such that each one follows its predecessor in a certain way, i.e., according to a definite pattern. Students are required to find out the way in which the series is formed and hence work out the missing number/numbers or letter/letters to complete the series. For the purpose of our discussion, we will refer to this category of questions as Number Series Type I or Letter Series Type I questions. Under Type I questions, there are a large variety of patterns that are possible and the student requires a proper understanding of various patterns to be able to do well in these types of questions.

In the second category of questions, a series of numbers/letters is given and the student is required to count how many numbers/letters in that series satisfy a given condition and mark that as the answer. For the purpose of our understanding, we will refer to this category of questions as Number Series Type II or Letter Series Type II questions. These questions will mainly involve counting of numbers/letters satisfying a given condition.

NUMBER SERIES – TYPE I

For better understanding, we will classify this into the following broad categories.

1. Difference series
2. Product series
3. Squares/Cubes series
4. Miscellaneous series
5. Combination series

Difference Series

The difference series can be further classified as follows.

(a) Number series with a constant difference.
(b) Number series with an increasing or decreasing difference.

In the number series with a **constant difference**, there is always a constant difference between two consecutive numbers. For example, the numbers of the series 1, 4, 7, 10, 13, ….. are such that any number is obtained by adding a constant figure of 3 to the preceding term of the series.

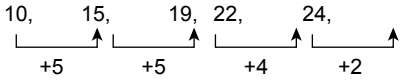
If we have to find the next number in the above series, we need to add a 3 to the last term 13. Thus, 16 is the next term of the series.

Under the series with constant difference, we can have series of odd numbers or series of even numbers also.

In the series with **increasing/decreasing difference**, the difference between consecutive terms keeps increasing (or decreasing, as the case may be). For example, let us try to find out the next number in the series 2, 3, 5, 8, 12, 17, 23, …...

Here, the difference between the first two terms of the series is 1; the difference between the second and third terms is 2; the difference between the third and the fourth terms is 3 and so on. That is, the difference between any pair of consecutive terms is one more than the difference between the first number of this pair and the number immediately preceding this number. Here, since the difference between 17 and 23 is 6, the next difference should be 7. So, the number that comes after 23 should be (23 + 7) = 30.

We can also have a number series where the difference is in decreasing order (unlike in the previous example where the difference is increasing). For example, let us find out the next term of the series 10, 15, 19, 22, 24, ...

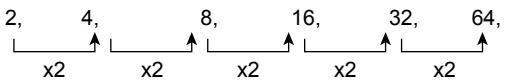


Here the differences between 1st and 2nd, 2nd and 3rd, 3rd and 4th numbers, etc., are 5, 4, 3, 2, and so on. Since the difference between 22 and 24 is 2, the next difference should be 1. So, the number that comes after 24 should be 25.

Product Series

A product series is usually a number series where the terms are obtained by a process of multiplication. Here also, there can be different types of series. We will look at these through examples.

Consider the series 2, 4, 8, 16, 32, 64, …...



Here, each number in the series is multiplied by 2 to get the next term. So, the term that comes after 64 is 128. **So, each term is multiplied by a fixed number to get the next term.** Similarly we can have a series where we have numbers obtained by **dividing** the previous term with a constant number. For example, in the series 64, 32, 16, 8, ..., each number is obtained by dividing the previous number by 2 (or in other words, by multiplying the previous term by $^1/_2$). So, here, the next term will be 4 (obtained by dividing 8 with 2).

Squares/Cubes Series

There can be series where all the terms are related to the squares of numbers or cubes of numbers. With squares/cubes of numbers as the basis, there can be many variations in the pattern of the series. Let us look at various possibilities of series based on squares/cubes.

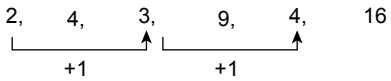
Each term of the series may be the square of a natural number, such as 1, 4, 9, 16, …..

1,	4,	9,	16
↓	↓	↓	↓
1^2	2^2	3^2	4^2

The numbers are squares of 1, 2, 3, 4 .... respectively. The number which follows 16 (which is the square of 4) will be 25 (which is the square of 5).

The terms of the series may be the squares of odd numbers (for example, 1, 9, 25, 49, ……) or even numbers (for example, 4, 16, 36, 64, ……..).

The terms of the series could be such that a number and its square are both given one after the other and such pairs are given in some specific pattern. For example, take the series 2, 4, 3, 9, 4, 16, ...



Here, 2 is followed by its square 4; then comes the number 3 (which is one more than 2) followed by its square 9 and so on. Hence, the next number in the series is 5 and the one after that is its square i.e., 25.

Miscellaneous Series

There are series that do not come under the other patterns and are of general nature but are important and are fairly common. Even here, some times, there can be a specific pattern in some cases.

Take the series 3, 5, 7, 11, 13, ... This is a series of consecutive PRIME NUMBERS. It is an important series and the student should look out for this as one of the patterns. The next term in this series is 17.

There can also be variations using prime numbers. Take the series 9, 25, 49, 121, ... In this series, the terms are squares of prime numbers. Hence, the next term is 13^2, i.e., 169.

Take the series 15, 35, 77, ...The first term is 3×5; the second term is 5×7; the third term is 7×11; here the terms are product of two consecutive prime numbers. So, the next term will be the product of 11 and 13, i.e., 143.

Combination Series

A number series which has more than one type of (arithmetic) operation performed or more than one series combined together is a combination series. The series that are combined can be two series of the same type or could be different types of series as described above. Let us look at some examples.

First let us look at those series which are formed by more than one arithmetic operation performed on the terms to get the subsequent terms.

Consider the series: 2, 6, 10, 3, 9, 13, 4, 12, ... Here, the first term 2 is multiplied by 3 to get the second term, and 4 is added to get the third term. The next term is 3 (one more than the first term 2) and it is multiplied by 3 to get 9 (which is the next term) and then 4 is added to get the next term 13. The next term 4 (which is one more than 3) which is multiplied with 3 to get 12. Then 4 is added to this to get the next number 16.

Consider the series: 1, 2, 6, 21, 88, ... Here, we can observe that 88 is close to 4 times 21. It is in fact $21 \times 4 + 4$. So, if we now look at the previous term 21, it is related to the previous term 6 as $6 \times 3 + 3$. Now we get the general pattern: to get any term, multiply the previous term with k and then add k where k is a natural number with values in increasing order from 1.So, to get the second term, the first term has to be multiplied with 1 and then 1 is added. To get the third term, the second term is multiplied with 2 and then 2 is added and so on. Hence, after 88, the next term is 88 x 5 + 5, i.e., 445.

Now, let us look at a series that is formed by combining two (or more) different series. The two (or more) series can be of the same type or of different types described above.

Consider the series: 8, 12, 9, 13, 10, 14, ….. Here the 1st, 3rd, 5th, ... terms which are 8, 9, 10, ... form one series whereas the 2nd, 4th, 6th, etc., terms which are 12, 13, 14 form another series. Here, both series that are being combined are two simple constant difference series. Therefore the missing number will be the next term of the first series 8, 9, 10, ... which is equal to 11.

Consider the series: 0, 7, 2, 17, 6, 31, 12, 49, 20, …. Here, the series consisting of 1st, 3rd, 5th, ... terms (i.e., the series consisting of the odd terms) which is 0, 2, 6, 12, 20, ... is combined with another series consisting of 2nd, 4th, 6th, ... terms (i.e., the series consisting of the even terms) which is 7, 17, 31, 49, ….. The first series has the differences in increasing order 2, 4, 6, 8, 10 and so on. The second series also has the difference in increasing order 10, 14, 18, …… Since, the last term 20 belongs to the first series, a number from the second series should follow next. The next term of the second series will be obtained by adding 22 to 49, that is 71.

Consider the series: 1, 1, 2, 4, 3, 9, 4, 16, …….. Here, one series consisting of odd terms, which is 1, 2, 3, 4, ..., is combined with the series of even terms which is 1, 4, 9, 16, ... The first series is a series of natural numbers. The second series is the squares of natural numbers. Hence, the next term is 5.

Consider the series: 1, 1, 4, 8, 9, 27, …….. Here, the series of squares of natural numbers is combined with the series of cubes of natural numbers. The next term in the series will be 4.

Consider the series: 2, 4, 5, 9, 9, 16, 14, ?, 20, ... Here, we have to find out the term that should come in place of the question mark. The odd terms form one series 2, 5, 9, 14, 20, ... where the difference is increasing. The differences are 3, 4, 5, 6, ... This series is combined with the series of even terms 4, 9, 16, ... where the terms are squares of numbers 2, 3, 4, ... Hence, the term that should come in place of the question mark is the next term of the second series which is 5^2, i.e., 25.

A General Approach to Number Series

The best way of approaching the number series questions is to first observe the difference between terms. If the difference is constant, it is a constant difference series. If the difference is increasing or decreasing by a constant number, then it is a series with a constant increasing or decreasing difference. If there is no constant increasing or decreasing difference, then try out the product series approach. For this, first divide the second term with the first term, third with the second, and so on. If the numbers obtained are the same, then it is a product series. Alternatively, try writing each term of the series as a product of two factors and see if there is any pattern that can be observed. If still there is no inference, but the difference is increasing or decreasing in a rapid manner, then check out the square series. If the increase is very high, and it is not a square series, then try out the cube series.

If the difference is alternately decreasing and increasing (or increasing for some time and alternately decreasing), then it should most probably be a mixed series. Therefore test out the series with alternate numbers. If still the series is not solved, try out the general series.

NUMBER SERIES – TYPE II

In these types of questions, a series of numbers are given. These numbers need not (and very often, DO NOT) follow any specific pattern. The objective here is not to find out a missing term. The objective is to find out how many times a given condition is satisfied in the given series of numbers. So, basically, what is expected of the student is COUNTING the digits subject to the conditions given. Let us take a look at the couple of examples given below.

Solved Examples

1. In the following number sequence how many 4's are there that are immediately preceded by 6 and immediately followed by 5?

3 4 2 6 5 4 3 6 4 5 9 8 6 4 5 3 8 7 4 6 8 2 1 7 6 4 5 8 6 4 5 9 7 4 5

Solution: In the given number sequence

3 4 2 6 5 4 3 6 4 5 9 8 6 4 5 3 8 7 4 6 8 2 1

1 2

7 6 4 5 8 6 4 5 9 7 4 5

3 4

There are four such 4's which are immediately preceded by 6 and immediately followed by 5.

2. In the following number sequence how many odd numbers are there that are immediately preceded by an odd number and immediately followed by an even number?

7 8 6 5 2 4 3 1 8 7 9 4 6 8 3 1 4 2 7 5 6 4 8 1 3 8 9 7 2 6 4 8 3 6 5 2

Solution: In the given number sequence,

7 8 6 5 2 4 3 1 8 7 9 4 2 6 8 3 1 4 2 7 5 6 4

8 1 3 8 9 7 2 6 4 8 3 5 2

There are 7 odd numbers which are immediately preceded by an odd number and immediately followed by an even number.

LETTER SERIES - TYPE I

The questions here are similar to the questions in Number Series Type I. Instead of numbers we have letters of the alphabet given here. We have to first identify the pattern that the series of letters follow. Then, we have to find the missing letter based on the pattern already identified. In Number Series, we saw different patterns that the numbers in the series can follow - like squares, cubes. In letter series, obviously, patterns like squares, cubes will not be possible. In Letter Series, in general, we have a series with constant or increasing or decreasing differences. The position of the letters in the English alphabet is considered to be the value of the alphabet in questions on Letter Series. Also, when we are counting, after we count from A to Z, we again start with A, i.e., we treat the letters as being cyclic in nature. Like in Number Series, in this type of Letter Series also, we can have a "combination" of series, i.e., two series are combined and given. We need to identify the pattern in the two series to find out the missing letter. Sometimes, there will be some special types of series also. Let us look at a few examples to understand questions on Letter Series.

Solved Examples

1. Find the next letter in the series

D, G, J, M, P, _____.

(1) Q (2) R

(3) S (4) T

Solution: Three letters are added to each letter to get the next letter in the series.

i.e., D^{+3}, G^{+3}, J^{+3}, M^{+3}, P^{+3}, S

P + 3 and P = 16 and 16 + 3 = 19 and the 19th letter in the alphabet is S.

Choice (3)

2. Find the next letter in the series

A, B, D, H, _____.

(1) L (2) N

(3) R (4) P

Solution: Each letter in the given series is multiplied with 2 to get the next letter in the series.

A × 2 ⇒ 1 × 2 = 2 and the 2nd letter is B,

B × 2 ⇒ 2 × 2 = 4 and the 4th letter is D.

Similarly, H × 2 ⇒ 8 × 2 = 16 and the 16th letter is P.

Choice (4)

LETTER SERIES – TYPE II

The questions here are similar to those that we saw in Number Series Type II. Instead of a sequence of numbers given here we have a sequence of letters given. The letters given in the sequence need not (and in most of the cases, do not) follow any order or pattern. The student is asked to count how many times a particular letter (or group of letters) satisfying some conditions occurs and mark that number as the answer choice. Let us take some examples.

Solved Examples

1. In the following sequence of letters how many vowels are immediately preceded by a vowel and immediately followed by a vowel?

cpeajebcsmatammfdadhcoauidpakseadfaje
afdcaaaekaaakaea

(1) Three (2) Four
(3) Five (4) Six

Solution: In the given letter sequence
cpeajebcsmajammfdadhcoauidpakseadfaje
1 2

afdcaaaekaaakaea
3 4 5 6

There are 6 vowels which are immediately preceded by a vowel and immediately followed by a vowel

Choice (4)

2. In the following letter sequence, how many instances are there in which a vowel is immediately preceded and immediately followed by a consonant?

spruatpghjtkpserplmijkmporkgluwrablhtupqm

(1) Six (2) Five
(3) Seven (4) Eight

Solution: In the given letter sequence
spruatpghjtkpserplmijkmporkgluwrabltupqm
1 2 3 4 5 6

There are six instances where a vowel is immediately preceded and is followed by a consonant.

Choice (1)

LETTER SERIES – TYPE III

A series of letters is given with one or more missing letters. From the choices, the choice that gives the letters that go into the blanks has to be selected as the answer. In these types of questions, the series itself can be looked at as being basically composed of smaller groups of letters. Each of the smaller groups has a pattern of its own. There are different patterns that the groups are made of and the way the groups of letters are put together to form the series. With the help of examples, we will look at different types of questions that can come in this area. Please note that in these types of questions, the number of blanks in the series indicates the number of missing letters, i.e., every missing letter is represented by one blank.

The letters a, b and c, may be arranged in a cyclic order to form a group and then repeated to form a series. In typical questions, some letters of this series would be missing and you have to find the pattern of the series and choose the correct alternative from the choices given to complete the series. In such type of problems, it is always better to proceed from the choices by inserting the letters given in the choices so as to obtain a sequence of a particular pattern.

Or

One can count the number of letters in the entire series and then break it up into smaller groups. For example, if a series has 15 letters one can break the series into 5 groups of 3 letters each or 3 groups of 5 letters each and then look for a pattern.

Solved Examples

1. Given below is a sequence in which some letters are missing. From the choices, select the choice that gives the letters that can fill the blanks in the given sequence.

a __ b __ __ __ a a __ b c __.

(1) abcabc (2) abccba
(3) abccbc (4) ababcc

Solution: Inserting the letters of choice (3), in place of the blanks, we get a series which is a a b b c c a a b b c c.

Hence, the missing letters in the sequence are abccbc.

Choice (3)

2. Given below is a sequence in which some letters are missing. From the choices select the one that contains in order, the letters that can fill the blanks in the given series.

a b __ __ a __ __ d __ b c __ a __ __ d

(1) cdbcabbc (2) cdbcadbc
(3) cdbacdbc (4) cdabcbcd

Solution: a b c d | a b c d | a b c d | a b c d

The given sequence is divided into four parts, each of four letters. The first letter in each part is a, the second letter in each part is b, the third letter in each part is c, and the fourth letter in each part is d. Hence, the missing letters in the sequence are cdbcadbc.

Choice (2)

Analogy means "similarity" or "similar relationship". In questions on number or letter analogies, a pair, that has a certain relationship between them, is given. This number/letter pair is followed by a third number/letter. The student is expected to identify the relationship between the pair given and find out a FOURTH number such that the relationship between the third and the fourth is similar to the relationship that exists between the first and the second. (In some cases, it may not be the fourth one that has to be found out. The fourth one will be given and the student has to find out one of the other three, whichever is not given).

Number Analogies

Typical relationships between the numbers in a given pair can be any of the following:

- One number is a multiple of the other.
- One number is the square or square root of the other.
- One number is the cube or cube root of the other.
- The two numbers are squares of two other numbers which themselves are related. For example, the two numbers are squares of two consecutive integers or squares of two consecutive even integers or squares of two consecutive odd integers.
- The two numbers are such that they are obtained by subtracting a certain number from the squares or cubes of the two related numbers.
- The two numbers are such that they are obtained by adding a certain number to the squares or cubes of the two related numbers.
- The two numbers can be consecutive, even, odd or prime numbers.

Let us take a few examples and understand the questions on Number Analogies.

Solved Examples

1. Find the missing number.

25 : 36 : : 49 : _____.

(1) 61 (2) 63
(3) 65 (4) 60

Solution: When the numbers in the question are considered the students tend to consider 25 and 36 as squares of two consecutive natural numbers. But the answer choices does not consist of an answer suitable to the above logic. Hence, it

is important that, the student keeps the answer choices in view in arriving at the logic.

$25 + 11 = 36$

Similarly, $49 + 11 = 60$

Choice (4)

2. Find the missing number.

27 : 51 : : 83 : ____.

(1) 102
(2) 117
(3) 123
(4) 138

Solution: The given analogy can be written as $5^2 + 2 : 7^2 + 2 : : 9^2 + 2 :$ ____.

5 and 7 are successive odd numbers.

Similarly, next odd number to 9 is 11 and $11^2 + 2 = 121 + 2 = 123$.

Choice (3)

Letter Analogies

The questions in this area are similar to Verbal Analogies. Here, the questions are based on the relationship between two groups of letters (instead of two words as in Verbal Analogies). Typically, three sets of letters are given followed by a question mark (where a fourth set of letters is supposed to inserted). The student has to find the relation or order in which the letters have been grouped together in the first two sets of letters on the left hand side of the symbol : and then find a set of letters to fit in place of the question mark so that the third and the fourth set of letters will also have the same relationship as the first and the second. The sequence or order in which the letters are grouped can be illustrated by the following examples.

Solved Examples

1. BDEG : DFGI : : HKMO : ____.

(1) ILNP
(2) JMOP
(3) JMOQ
(4) JNOQ

Solution: Two letters are added to each letter to get the next letters in the analogy.

B	D	E	G;	Similarly,	H	K	M	O
+2	+2	+2	+2		+2	+2	+2	+2
D	F	G	I		J	M	O	Q

Choice (3)

2. ACDF : CGJN : : BEHI : ____.

(1) DJNQ
(2) DINQ
(3) DINR
(4) DHNQ

Solution:

A	C	D	F;	Similarly,	B	E	H	I
+2	+4	+6	+8		+2	+4	+6	+8
C	G	J	N		D	I	N	Q

Choice (2)

VERBAL ANALOGIES

Here, the questions are based on relationship between two words. In these kind of questions three words are followed by a blank space, which the student has to fill up in such a way that the third and the fourth words have the same relationship between them as the first and the second words have. The following examples help in understanding the concepts.

Solved Examples

1. Gum : Stick : : Needle : ___

(1) Cloth
(2) Prick
(3) Taylor
(4) Stitch

Solution: Gum is used to stick and needle is used to stitch.

Choice (4)

2. Socks : Feet : _____ : Hands

(1) Arms
(2) Shirt
(3) Gloves
(4) Fingers

Solution: Socks are worn on feet, similarly gloves are worn on hands.

Choice (3)

PRACTICE EXERCISE 1 (A)

Directions for questions 1 to 3: Complete the following series.

1. 13, 39, 118, 356, 1071, 3217, ____

(1) 9656 (2) 6459
(3) 6355 (4) 9651

2. $\frac{50}{500}, \frac{40}{1200}, \frac{30}{1500}, \frac{20}{1400}$, ____

(1) $\frac{10}{1000}$ (2) $\frac{100}{1900}$
(3) $\frac{10}{900}$ (4) $\frac{10}{800}$

3. 10, 200, 3000, 40000, ____

(1) 500000 (2) 400000
(3) 50000 (4) 6000000

Directions for questions 4 and 5: In each of the following number series a wrong number is given. Find the wrong number.

4. 2785 922 303 94 25 2

(1) 94 (2) 303
(3) 922 (4) 25

5. 8200 10944 8747 10475 9164 10144

(1) 9164 (2) 10475
(3) 8747 (4) 10944

Directions for questions 6 and 7: In each of the following series two wrong numbers are given out of which one differs by a margin of 1 i.e., +1 or –1 and the other with a greater margin. From the choices choose the number that is differing by the greater margin. The first and the last number in the series are always correct.

6. 1, 2, 7, 21, 88, 445, 2673, 18739

(1) 7 (2) 21
(3) 445 (4) 2673

7. 2, 10, 30, 65, 130, 222, 349, 520

(1) 10 (2) 30
(3) 349 (4) 65

Directions for questions 8 and 9: In each of these questions, a number series is given. After the series, a number is given along with (a), (b), (c), (d) and (e). You have to complete the series starting with the number given to find the values of (a), (b), (c), (d) and (e) applying the same pattern followed in the given series. Then answer the question given below.

8. 10, 11, 101, 111, 1011, 1101
1101, (a), (b), (c), (d), (e)
What is the value of (d) in the series?

(1) 11011 (2) 10111
(3) 11101 (4) 1101

9. 7, 9, 18, 21, 63, 67, 268
(a), (b), (c), (d), 39, (e)
What is the value of (b) in the series?

(1) 3 (2) 10
(3) 5 (4) 12

***Directions for questions 10 and 11*:** Each questions contains a number series one of the number is a wrong number. Find out the wrong number and form a new series starting with the wrong number and using the pattern in the given series. Answer the questions based on the new series.

10. 7, 21, 66, 138, 420, 846
What is the fifth term of the new series?

(1) 1098 (2) 3652
(3) 924 (4) 512

11. 5, 7, 12, 15, 60, 65
What is the fourth term in the new series?

(1) 19 (2) 125
(3) 20 (4) 382

Directions for questions 12 to 15: In each of the following questions, two rows of numbers are given. The resultant number of each row is to be worked out separately based on the following rules and the question below the row of numbers is to be answered. The operations of numbers progress from left to right.

Rules:

(i) If an odd number is followed by a composite odd number, they are to be multiplied.
(ii) If an even number is followed by an odd number, they are to be added.
(iii) If an even number is followed by a number, which is a perfect square, the even number is to be subtracted from the perfect square.

(iv) If an odd number is followed by a prime number, the first number is to be divided by the second number.
(v) If an odd number is followed by an even number, the second one is to be subtracted from the first one.

12. 14 196 23
10 x 152
If x is the resultant of the first row, what is the resultant of the second row?
(1) 367 (2) 91
(3) 63 (4) 105

13. 65 5 9
109 24 5
What is the difference between the resultants of the two rows?
(1) 5 (2) 90
(3) 17 (4) 100

14. 42 7 76
10 p 5
If p is the resultant of the first row, what is the resultant of the second row?
(1) 10 (2) 12
(3) 20 (4) 30

15. 7 9 2
3 2 15
What is the difference between the resultants of the two rows?
(1) 26 (2) 75
(3) 20 (4) 10

Directions for questions 16 to 19: Complete the following series.

16. GKF, IPC, LTY, PWT, UYN, ____
(1) ABZ (2) XBX
(3) XAH (4) AZG

17. FTJMP, GRMIU, EUINO, ____, DVHON, IPOGW
(1) BYDTL (2) HQNHV
(3) YNHAV (4) HQDTL

18. ATNHG, DKCMB, CVPJI, GNFPE, EXRLK, JQISH, GZTNM, _____
(1) MTLVK (2) HSKUJ
(3) RIJTU (4) PQMTH

19. BC25, CE64, EG144, GK324, ____
(1) HO529 (2) KM729
(3) HI289 (4) KM576

Directions for question 20: Select the correct alternative from the given choices.

20. In the following sequence of digits, how many digits are immediately preceded by a digit which is a multiple of 3 and immediately followed by a digit which is a multiple of 4?
7 3 2 4 6 8 9 3 5 7 8 4 3 2 1 5 6 3 8
(1) 5 (2) 2
(3) 4 (4) 6

Directions for questions 21 to 24: These questions are based on the set of numbers given below.
417 258 193 624 275

21. If 1 is added to the first digit and 1 is subtracted from the last digit then which of the given numbers becomes the smallest number?
(1) 417 (2) 258
(3) 193 (4) 624

22. If the first and the second digits are interchanged and then the new numbers so obtained are arranged in ascending order then which of given numbers take the second place from the right?
(1) 417 (2) 258
(3) 193 (4) 275

23. If each number is written in reverse order and then the first and the third digits of the numbers so obtained are interchanged, then which of the given numbers becomes the second smallest number?
(1) 462 (2) 264
(3) 642 (4) 426

24. If 1 is added to the middle digit and 1 is subtracted from the last digit and then the first and the second digits are interchanged, then which of the given numbers becomes the second smallest number?
(1) 462 (2) 264
(3) 642 (4) 426

Directions for questions 25 to 28: Complete the following series.

25. 57, 60, 63, 66, 69, ____
(1) 72 (2) 73
(3) 70 (4) 74

26. 12, 21, 39, 75, 147, ____
(1) 273 (2) 291
(3) 283 (4) 263

27. 440, 360, 288, 224, ____

(1) 170 (2) 169
(3) 168 (4) 171

28. 12, 30, 56, 132, 182, _____

(1) 240 (2) 300
(3) 316 (4) 306

Directions for questions 29 to 35: Each of the following questions contain a pair of terms on the left side of (: :), which exhibit a certain relation between them. Find the term which exhibits similar relations with the word on the right side of (: :).

29. 324 : 342 : : 196 : _____

(1) 218 (2) 210
(3) 222 (4) 234

30. 121 : 484 : : 235 : _____

(1) 1350 (2) 2750
(3) 2150 (4) 2350

31. F : S : : L : _____

(1) V (2) W
(3) X (4) Y

32. RISHLE : IVHSOR: : PUBLIC : _____

(1) KHVPWY (2) KHYOVX
(3) KIXPWZ (4) KHXNVY

33. MTSRA: OWXYL : : MNRLIH : _____

(1) OQVTVW (2) OQUVRW
(3) OQTPST (4) OQWSTU

34. PSB : NRQUZD : : SET : _____

(1) RTDFSU (2) QUCGRV
(3) QUDFRU (4) QUCGSV

35. DEPRL : LRPED : : POCKET : _____

(1) TECHOP
(2) TEKOCP
(3) TEKCOP
(4) TELNOQ

Directions for question 36: In the English alphabet, the order of the letters in the first half is reversed and written from left to right. Answer the following question based on the above sequence.

36. H : S : : C : ____

(1) P (2) Q
(3) T (4) R

Directions for questions 37 to 40: Each of the following questions contain a pair of terms on the left side of (: :), which exhibit a certain relation between them. Find the term which exhibits similar relations with the word on the right side of (: :).

37. D8 : F12 : : K22 : _____

(1) M13 (2) M26
(3) Q34 (4) P32

38. 6R3 : 8N2 : : 2P3 : _____

(1) 1L2 (2) 4L2
(3) 2K2 (4) 2L4

39. Pig : Piglet : : Dog : _____

(1) Cat (2) Tail
(3) Pug (4) Puppy

40. Kangaroo : Hopping : : Snake : _____

(1) Crawling (2) Mongoose
(3) Poisonous (4) Bite

PRACTICE EXERCISE 1 (B)

Directions for questions 1 to 4: Complete the following series.

1. 29, 29, 27, 23, 25, 19, 23, 17, ____, ____

(1) 19, 13 (2) 19, 15
(3) 21, 13 (4) 19, 13

2. 5, 12, 13, 7, 14, 17, 9, 16, 19, 11, 18, 23, ____, ____, ____

(1) 25, 27, 25 (2) 20, 25, 27
(3) 17, 23, 29 (4) 13, 20, 29

3. $\frac{5}{7}, \frac{11}{13}, \frac{17}{19}, \frac{23}{29}$, _____

(1) $\frac{31}{33}$ (2) $\frac{31}{35}$
(3) $\frac{31}{37}$ (4) $\frac{33}{37}$

4. 2, 4, 6, 4, 6, 10, 6, 8, 14, 8, 10, 18, ___, ___, ___

(1) 10, 11, 110
(2) 9, 10, 19
(3) 10, 11, 21
(4) 10, 12, 22

Directions for questions 5 and 6: In each of the following number series a wrong number is given. Find the wrong number.

5. 40000 10500 2500 625 156.25 39.0625

(1) 2500 (2) 10500
(3) 625 (4) 156.25

6. 671 695 678 802 795 809 792 816 799

(1) 799 (2) 678
(3) 802 (4) 795

Directions for questions 7 and 8: In each of the following series two wrong numbers are given out of which one differs by a margin of 1 i.e., +1 or –1 and the other with a greater margin. From the choices choose the number that is differing by the greater margin. The first and the last number in the series are always correct.

7. 1, 4, 15, 64, 260, 1024, 4096, 16384

(1) 1024 (2) 64
(3) 15 (4) 260

8. 15120, 7560, 2525, 630, 126, 20, 3

(1) 7560 (2) 2525
(3) 630 (4) 126

Directions for questions 9 to 14: In each of these questions a number series is given. After the series, a number is given along with (a), (b), (c), (d) and (e). You have to complete the series starting with the number given to find the values of (a), (b), (c), (d) and (e) applying the same pattern followed in the given series. Then answer the question given below.

9. 0, 6, 24, 60, 120, 210

210, (a), (b), (c), (d), (e)

What is the value of (b) in the series?

(1) 720 (2) 623
(3) 512 (4) 504

10. 1, 3, 11, 47, 239, 1439

(a), (b), (c), (d), (e), 2159

What is the value of (a) in the series?

(1) 1×5 (2) 2
(3) 3 (4) 4

11. 15, 30, 39, 96, 99, 198, 200, 600

What is the third term in the new series?

(1) 400 (2) 796
(3) 76 (4) 80

12. 7, 9, 13, 21, 40, 69, 133

What is the fifth term in the new series?

(1) 49 (2) 86
(3) 70 (4) 142

13. 143 11 8

12 36 3

What is the sum of the resultants of the two rows?

(1) 64 (2) 42
(3) 32 (4) 80

14. 64 55 17

81 32 2t

If t is the resultant of the first row, what is the resultant of the second row?

(1) 9 (2) 7
(3) 56 (4) 35

Directions for questions 15 and 16: In each of the following questions, two rows of numbers are given. The resultant number of each row is to be worked out separately based on the following rules and the question below the rows of numbers is to be answered. The operation of numbers progress from left to right.

Rules:

(i) If an even number is followed by a composite odd number, then the first number is to be subtracted from the second number.
(ii) If an odd number is followed by a prime number, then the numbers are to be added.
(iii) If an odd number is followed by an even number, then the numbers are to be added.
(iv) If an even number is followed by a prime number then the even number is to be divided by the prime number.
(v) If an even number is followed by an even number, then the first number is to be subtracted from the second number.
(vi) If an odd number is followed by a composite odd number, then the numbers are to be multiplied.

15. 17 8 13

19 17 r

If r is the resultant of the first row, what is the resultant of the second row?

(1) 48 (2) 100
(3) 85 (4) None of these

16. 7 6 15
p 5 8
If p is the resultant of the first row, what is the resultant of the second row?
(1) 376 (2) 25
(3) 200 (4) None of these

Directions for questions 17 to 20: Complete the following series.

17. JTU, ____, UCF, BFM, JHU
(1) OYZ (2) JCZ
(3) OCF (4) JCZ

18. TCFK, RADI, OXAF, JSVA, _____
(1) DMPU (2) DMOT
(3) CMOT (4) CLOT

19. ACEGI, BDFHJ, KMOQS, _____, UWYAC, VXZBD
(1) TUVWX (2) LPRTV
(3) LNPRT (4) PQRTV

20. 1I8, 4H6, 9G4, 6F3, ____
(1) 5E2 (2) 2E5
(3) 1D6 (4) 6D1

Directions for question 21: Select the correct alternative from the given choices.

21. In the following sequence of digits, how many digits, which are multiples of three, are either immediately followed by an odd digit or immediately preceded by an even digit?
6 5 7 9 1 1 3 2 3 5 7 8 7 6 2 8
(1) 2 (2) 4
(3) 5 (4) 3

Directions for questions 22 to 24: These questions are based on the set of numbers given below.
417 258 193 624 275

22. If 1 is subtracted from the last digit and then each number is written in reverse order then which of the given numbers becomes the second largest number?
(1) 417 (2) 258
(3) 193 (4) 624

23. If the first and the third digits are interchanged, then the second and the third digits of the new numbers so formed are interchanged, then which of the given numbers becomes the largest number?
(1) 417 (2) 258
(3) 193 (4) 624

24. If 1 is subtracted from the second digit and then the second and the third digits are interchanged and then the first and the third digits so obtained are interchanged, then which of the given numbers becomes the third largest number?
(1) 462 (2) 264
(3) 642 (4) 246

Directions for questions 25 to 35: Each of the following questions contain a pair of terms on the left side of (: :), which exhibit a certain relation between them. Find the term which exhibits similar relations with the word on the right side of (: :).

25. 24 : 576 : : 32 : _____
(1) 1024 (2) 992
(3) 1228 (4) 865

26. 3864 : 5098 : : 4994 : _____
(1) 6228 (2) 6246
(3) 6194 (4) 6286

27. 512 : 504 : : 1728 : _____
(1) 1728 (2) 1716
(3) 1718 (4) 1724

28. 7 : 18 : : 12 : _____
(1) 26 (2) 28
(3) 32 (4) 37

29. 3829 : 3851 : : 2987 : _____
(1) 3013 (2) 3007
(3) 3017 (4) 3023

30. K : P : : S : _____
(1) F (2) H
(3) G (4) I

31. NATURE : PEVASI : : ISOMERS : _____
(1) OTUNJTV (2) OTUNIST
(3) PUVNJST (4) OVTNJST

32. FIELD : LRJXH : : CRICKET : _____
(1) FHRDXLJ (2) FJPDTLN
(3) FJRDXAL (4) FJRFVJN

33. LDCBE : LHIHY : : FKGEA: _____
(1) FXTXB (2) FVTRD
(3) FVUTE (4) FTVPL

34. MARINE : AIENRM : : DISGUISE : _____
(1) IGIEDSUS (2) IDGSIUES
(3) IGESRNPQ (4) IGIESUSD

35. BCE : DIY : : ADFG : _____

(1) APLV
(2) APIW
(3) AIPW
(4) APJW

Directions for question 36: In the English alphabet, the order of the letters in the first half is reversed and written from left to right. Answer the following questions based on the above sequence.

36. EKT : BHW : : RIL : ____

(1) UHJ (2) UFI
(3) ULP (4) UHN

Directions for questions 37 to 40: Each of the following questions contain a pair of terms on the left side of (: :), which exhibit a certain relation between them. Find the term which exhibits similar relations with the word on the right side of (: :).

37. B6H : D10N : : K5P : _____

(1) M9V (2) T72
(3) R8J (4) B6D

38. BCD : 234 : : _____ : 678

(1) CDE (2) EFG
(3) GHF (4) FGH

39. Nut : Shell : : Seed : _____

(1) Plant (2) Tree
(3) Fruit (4) Sapling

40. USA: President : : Germany : _____

(1) Berlin (2) Chancellor
(3) Director (4) Arms

ANSWER KEYS

PRACTICE EXERCISE 1 (A)

1. 1	**2.** 3	**3.** 1	**4.** 2	**5.** 1	**6.** 4	**7.** 4	**8.** 3	**9.** 3	**10.** 3
11. 1	**12.** 3	**13.** 4	**14.** 2	**15.** 4	**16.** 4	**17.** 2	**18.** 1	**19.** 4	**20.** 2
21. 3	**22.** 4	**23.** 2	**24.** 4	**25.** 1	**26.** 2	**27.** 3	**28.** 4	**29.** 2	**30.** 4
31. 4	**32.** 2	**33.** 4	**34.** 2	**35.** 3	**36.** 4	**37.** 2	**38.** 2	**39.** 4	**40.** 1

PRACTICE EXERCISE 1 (B)

1. 3	**2.** 4	**3.** 3	**4.** 4	**5.** 2	**6.** 4	**7.** 4	**8.** 2	**9.** 4	**10.** 2
11. 4	**12.** 3	**13.** 3	**14.** 4	**15.** 4	**16.** 4	**17.** 1	**18.** 4	**19.** 3	**20.** 1
21. 4	**22.** 1	**23.** 2	**24.** 4	**25.** 1	**26.** 1	**27.** 2	**28.** 2	**29.** 1	**30.** 2
31. 2	**32.** 4	**33.** 3	**34.** 4	**35.** 4	**36.** 2	**37.** 1	**38.** 4	**39.** 3	**40.** 2