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## BY PHYSICS WALLAH

# BPSC WALLAH

# BIHAR SPECIAL

## COMPREHENSIVE LEARNING SERIES FOR PRELIMS AND MAINS

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# Bihar: At a Glance

## General Introduction

- The word "Bihar" has been derived from **"Vihara"**, which means Buddhist monasteries. It is located in the **eastern part of India** and is an entirely land-locked state.

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| Capital of Bihar | • Patna<br>• It is located on the **southern bank** of the river Ganga.<br>• It is bounded by **nine districts**: Nalanda, Arwal, Jehanabad, Lakhisarai, Begusarai, Samastipur, Vaishali, Saran and Bhojpur. |
| Foundation | • **22nd March 1912** (as Bihar-Orissa Province)<br>  ○ Bihar Diwas is celebrated on **22nd March** every year.<br>  ○ It was first celebrated on a grand scale in **2010** due to efforts of present chief minister Nitish Kumar.<br>  ○ **112th Statehood day** was celebrated on 22nd March, 2024.<br>• First division: Orissa in 1936.<br>• Second division: Jharkhand (15th November, 2000)<br>  ○ **45.85% of Bihar's total area** was carved out to form the new state of Jharkhand. |
| Official Language | • Hindi<br>• Second official language: Urdu<br>• Maximum Spoken Regional Language: **Maithili** (added in 8th Schedule of the Indian Constitution by **92nd Constitutional Amendment Act, 2003)** |
| High Court | • Patna High Court<br>  ○ **K Vinod Chandran** has been appointed as the new Chief Justice of Patna High Court.<br>  ○ He **replaced Justice Sanjay Karol,** who has been elevated as the judge of the Supreme Court.<br>  ○ He was **administered the oath of office and secrecy by the Governor of Bihar**, Rajendra Vishwanath Arlekar on **29th March, 2023.**<br>  ○ He will retire on **26th April, 2025.**<br>  ○ Earlier, he served as the **senior most judge of the Kerala High Court.**<br>• **Important Facts to Remember:**<br>  ○ The foundation stone of the High Court Building of Patna was laid on **1st December, 1913 by Lord Hardinge.**<br>  ○ Patna High Court was established on **3rd February 1916.**<br>  ○ It started its work with one Chief Justice and six other puisne judges.<br>  ○ **Sir Edward Maynard Des Champs Chamier** was the first Chief Justice of the Patna High Court.<br>  ○ The Patna High Court has a **sanctioned strength of 53 judges.**<br>  ○ At present (till 8th June, 2024), it has 34 judges [1 Chief Justice+33 other Judges].<br>    ♦ Justice Arvind Singh Chandel took oath as a judge of the Patna High Court on 8th June, 2024.<br>    ♦ He was administered oath by the Bihar Governor Rajendra Vishwanath Arlekar.<br>    ♦ He was transferred to Patna High Court from Chhattisgarh High Court on May 29. |
| State Symbols | • State Animal: **Gaur** (Scientific Name: Bos Indicus)<br>• State Flower: **Marigold** (Scientific Name: Tagetes Erecta)<br>• State Bird: **Home Sparrow** (Scientific Name: Passer Domesticus)<br>• State Tree: **Peepal** (Scientific Name: Ficus Religiosa) |

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| Area of Bihar | • **94,163** square kms.<br>• It is **2.86%** of India's total area.<br>• Bihar is the **12th largest state** of India by area among states. |
| Geographical Boundaries | • North: **Nepal**<br>  ○ **Districts [7]** sharing boundary with Nepal: West Champaran, East Champaran, Sitamarhi, Madhubani, Supaul, Araria and Kishanganj.<br>  ○ Length of Bihar-Nepal border: **729 kms.**<br>  ○ **Five States of India share a boundary** with Nepal: Bihar [729 kms], Uttar Pradesh [560 kms], Uttarakhand [263 kms], West Bengal [100kms] and Sikkim [99 kms]<br>• West: **Uttar Pradesh**<br>  ○ **Districts [8 ]** sharing boundary with Uttar Pradesh are: West Champaran, Gopalganj, Saran, Siwan, Bhojpur, Buxar, Kaimur and Rohtas.<br>• South: **Jharkhand**<br>  ○ **Districts [8]** sharing boundary with Jharkhand are Rohtas, Kaimur, Aurangabad, Gaya, Nawada, Jamui, Bhagalpur and Banka.<br>• East: **West Bengal**<br>  ○ **Districts [3]** sharing boundary with West Bengal are Kishanganj, Purnia, and Katihar. |
| Physical Features | • Latitudinal extent: 24°20'10" N to 27°31'15" N<br>• Longitudinal extent: 83°19'50" E to 88° 17'40" E<br>• East-West Extent: 483 kms<br>• North-South Extent: 345 kms<br>• Height above Sea Level: 173 feet |
| Administrative Units | • Divisions: 9<br>• Districts: 38 [**Arwal in Magadh division=38th district**]<br>• Top **five districts** in terms of area:<br>  ○ West Champaran<br>  ○ Gaya<br>  ○ East Champaran<br>  ○ Rohtas<br>  ○ Kaimur.<br>• **Sheohar** is the **smallest district** in terms of area in Bihar.<br>• Sub-division: 101<br>• Community Development blocks: 534. |
| Polity | • Lok Sabha seats: 40<br>• Rajya Sabha seats : 16<br>• Legislative Assembly seats: **243**<br>  ○ It came into existence in 1937.<br>• Legislative Council seats: **75**<br>  ○ It was formed in **1912** with a strength of 43 members.<br>  ○ The first sitting of the council took place on 20th January, 1913 at Bankipore.<br>  ○ Under the Government of India Act, 1935, the council consisted of 29 members.<br>  ○ After the 1st General elections in 1952, no of members increased to 72 and in 1958, it was increased to 96.<br>  ○ By **Bihar Reorganisation Act, 2000**, the strength of council was reduced from **96 to 75 members**.<br>• Seats Reserved for SC in Lok Sabha: 06<br>• Seats Reserved for SC in Legislative Assembly: 38<br>• Seats reserved for ST in Legislative Assembly: 02 |
| Bihar: First in World | • First democratic Republic of the World: Vajji Sangha.<br>• First Yoga University in the World: Munger.<br>• World's Highest Buddha Stupa: Kesariya [Champaran]<br>• First Mathematician of the World: Aryabhatt<br>• First University in the World: Nalanda University. |

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| First in Bihar | • First Chief Minister: Shri Krishna Singh.<br>• First female Chief Minister: Rabri Devi.<br>• First Muslim Chief Minister: Abdul Gaffoor<br>• First Dalit Chief Minister: Bhola Paswan Shastri.<br>• First Deputy Chief Minister: Anuragha Naryan Sinha<br>• First Independent Chief Minister: Mahamaya Prasad Sinha.<br>• First Governor after Independence: Jai Ram Das Daulat Ram<br>• First Muslim Governor: Zakir Hussain |
| First Post-holders from Bihar | • First Indian Governor during British rule: **S.P Sinha [1921]**<br>• First Chairman of the Constituent Assembly:<br> ○ Dr. Sachchidanand Sinha (Temporary President on **9th December, 1946**).<br> ○ Dr Rajendra Prasad (Elected as permanent President on **11th December, 1946**).<br>• First President of India: Dr Rajendra Prasad<br>• First Mathematician in India: Aryabhatt<br>• First Woman Lok Sabha Speaker: Meira Kumar<br>• First Deputy Prime Minister of India: Jagjivan Ram |
| First-Movies in Bihar | • First Bhojpuri movie: Ganga Maiya Tohe Piyari Chadhaibo.<br>• First Maithili movie: Kanyadaan.<br>• First Hindi movie: Kal Hamara Hai. |
| First-Newspapers in Bihar | • First daily Hindi Newspaper: Sarvahitaishi.<br>• First weekly Hindi Newspaper: Bihar Bandhu<br>• First English daily newspaper: The Searchlight.<br>• First English weekly newspaper: The Bihar Herald. |
| Others: First in Bihar | • First T.V Relay Centre: Muzaffarpur [1978]<br>• First Ancient University: Nalanda University [5th Century AD]<br>• First Modern University: Patna University (1917)<br>• First Open University: Nalanda University.<br>• First to receive Jnanpith Award: Dr. Ramdhari Singh Dinkar for "Urvashi" (1972).<br>• First to receive Ashok-Chakra: Randheer Verma.<br>• First Oil Refinery Centre: Barauni in Begusarai with Russia's support.<br>• First Sugar Mill in Bihar: Marhaura **[1904]** in Saran district.<br>• First Irrigation Project: Son Project. |
| UNESCO World Heritages Sites in Bihar [02] | • Mahabodhi Temple Complex, Bodh Gaya (2002)<br>• Archaeological site of Nalanda Mahavihara (2016) |
| Persons from Bihar who received the Bharat Ratna | • Dr. Rajendra Prasad in 1962.<br>• Dr. Zakir Hussain in 1963.<br>• Maulana Abul Kalam Azad in 1992<br>• Jai Prakash Narayan in 1999<br>• Ustad Bismillah Khan in 2000.<br>• Karpoori Thakur in 2024. |

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| Alternative Names of Eminent Personalities | Jai Prakash Narayan | Loknayak, JP |
| | Dr. Rajendra Prasad | Deshratna, Ajatshatru |
| | Dr. Shri Krishna Singh | Bihar Kesari |
| | Ramdhari Singh Dinkar | Rashtra Kavi |
| | Babu Jagjivan Ram | Babujee |
| | Baidya Nath Mishra | Baba, Nagarjuna |
| | Dr. Anugraha Naryana Sinha | Bihar Vibhuti |
| | Vidyapati | Mahakavi, Maithil Kokil |
| | Karpoori Thakur | Jannayak |

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## GENERAL MENTAL ABILITY & DI

COMPREHENSIVE LEARNING SERIES FOR PRELIMS AND MAINS

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# Series

## INTRODUCTION

A series is a sequence of letters, numbers, words, or objects that are arranged in a certain way. This arrangement follows specific patterns or rules. These can be patterns with numbers, letters, or both together.

Learning about series is important because it teaches us how to arrange things in order. It also helps us spot any mistakes or things that don't fit in the sequence. Understanding series is crucial for you as it familiarises you with the structured way of organising things in a particular order. It also helps identify irregularities or flaws in a series that disrupts its organisation.

In this chapter, we will cover three types of series, which will have further subtypes:

   I.  **Number series**

  II.  **Alphabetical series**

 III.  **Alphanumeric series**

## I. NUMBER SERIES

In this section, we deal with the questions in which a series of numbers (generally called the terms of the series) is given. These terms follow a certain pattern throughout the series. Basically, the following patterns can be asked in the exam:

### Series Based on Addition and Subtraction

In an addition and subtraction series, each number in the sequence is linked to the previous one through a simple rule of adding or subtracting a fixed amount. For example, if we start with a number and consistently add the same number to it, we get a series like 2, 5, 8, 11, where we're adding 3 each time. Alternatively, if we subtract a number each time, like starting with 10 and subtracting 2, we get 10, 8, 6, 4, and so on. This kind of series is easy to understand and solve once we know the amount being added or subtracted.

### SOLVED EXAMPLES

**E1.** **What is the value of X in the given series: 4, 5, 8, 13, 20, 29, X ?**

    (*a*)  38           (*b*)  40

    (*c*)  42           (*d*)  39

**Ans:** (*b*)
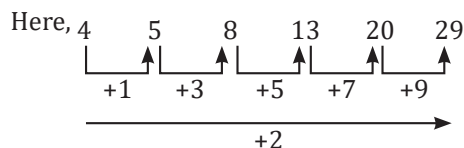
**Explanation:**

Here,



We can clearly see the pattern by the diagram

So the difference between X and 29 should be 11

Hence X = 29 + 11 = 40

**E2.** **Find the odd one out in the following series: 197, 165, 131, 97, 57**

    (*a*)  165          (*b*)  131

    (*c*)  97           (*d*)  51

**Ans:** (*c*)

**Explanation:**

Here,

$1^{st}$ term = 197

$2^{nd}$ term = 197 – 32 = 165

$3^{rd}$ term = 165 – 34 = 131

$4^{th}$ term should be 131 – 36 = 95

But, in the given series the 4th term is 97 Hence, 97 doesn't follow the pattern of the series.

## Series Based on Multiplication and Division

In a series based on multiplication and division, each term in the sequence is connected to the previous one through either multiplying or dividing by a certain number. For instance, if we start with a number and continuously multiply it by the same number, like starting with 2 and multiplying by 3 each time, we get a series like 2, 6, 18, 54, and so on. Conversely, if we divide by a fixed number each time, such as starting with 100 and dividing by 2, the series would be 100, 50, 25, 12.5, etc.

### SOLVED EXAMPLES

**E3.** **What is the missing term in the given series: 32, 48, 120, ?, 450, 675**

    (*a*)  150          (*b*)  180

    (*c*)  210          (*d*)  275

**Ans:** (*b*)

**Explanation:**

Here, 1st term = 32

2nd term = 32 × **1.5** = 48

3rd term = 48 × **2.5** = 120

4th term = X (lets say)

5th term = 180 × **2.5** = 180

6th term = 450 × **1.5** = 675

Observe that the terms of series are 1.5 and 2.5 times multiple of previous term alternatively.

Hence, the 4th term should be 120 × 1.5 = 180.

**E4.** **Consider the following matrix:**

| 51 | 60 | 75 | 84 | 93 | 102 |
|----|----|----|----|----|-----|
| 19 | 23 | 29 | 31 | 37 | 41 |

**Which number is wrongly placed in the matrix?**

(*a*)  84

(*b*)  41

(*c*)  75

(*d*)  60

**Ans:** (*a*)

**Explanation:**

Consider the 1st column and 1st row, 51 = (19 − 2) × 3

Now, 2nd column and 1st row, 60 = (23 − 3) × 3

Now, 3rd column and 1st row, 75 = (29 − 4) × 3

Now, 4th column and 1st row, 84 ≠ (31 − 5) × 3

Now, 5th column and 1st row, 93 = (37 − 6) × 3

Now, 6th column and 1st row, 102 = (41 − 7) × 3

Hence, 84 is wrongly placed and it should be replaced by (31 − 5) × 3 i.e., 78.

## Series Based on Prime Numbers

In a prime number series, the sequence involves operations like addition, subtraction, multiplication, or division using prime numbers. This series can be a bit more complex as it involves either performing arithmetic operations on prime numbers themselves or using prime numbers as the basis for operations on other numbers. **For example,** a series might progress by adding consecutive prime numbers (like 2, 3, 5, 7, etc.) to a starting number. Alternatively, the series might be the prime numbers themselves being multiplied or divided in some pattern. Understanding these prime number-based patterns is essential, especially in exams where quickly deciphering such sequences can make a significant difference.

### SOLVED EXAMPLES

**E5.** **What is the value of X in the given series:**

**7, 14, 42, 210, 1470, X**

(*a*)  16170

(*b*)  13230

(*c*)  10290

(*d*)  19110

**Ans:** (*a*)

**Explanation:**

Here, 1st term = 7

2nd term = 7 × 2 = 14

3rd term = 14 × 3 = 42

4th term = 42 × 5 = 210

5th term = 210 × 7 = 1470

You can observe that 2, 3, 5, 7 are the consecutive prime numbers and the next prime number is 11.

Therefore, 6th term = X = 1470 × 11 = 16170.

**E6.** **Find the odd one out in the following series:**

**27, 38, 51, 66, 87, 110**

(*a*)  38

(*b*)  66

(*c*)  51

(*d*)  87

**Ans:** (*b*)

**Explanation:**

Here, 1st term = 27

2nd term = 27 + 11 (prime) = 38

3rd term = 38 + 13 (next prime) = 51

Hence next term should be 51 + 17 (next prime) = 68, but in the given series the 4th term is 66.

Also, the next term is 68 + 19 = 87 and the last term = 87 + 23 = 110.

Hence, 66 is the odd one out.

**Note:**

Don't get confused by the 1st four terms as they are at a difference of 11, 13, and 15, respectively, and the next difference is 21, so 87 is an odd one. Check all the terms of the series.

## Series Based on Addition/Subtraction of Squares or Cubes of Numbers

In a series based on squares or cubes of numbers, we create each term by adding or subtracting the square or cube of a number, following a specific pattern. **For example,** if we start with a number and keep adding the square of another number (like 1, 2, 3, 4) to it, the series might look like 3 $(2+1^2)$, 7 $(3+2^2)$, 16 $(7+3^2)$, 30 $(14+4^2)$, and so on. Or, if we subtract the cube of a number each time from a starting number, the series could be something like 101, 100 $(101-1^3)$, 92 $(100-2^3)$, 65 $(92-3^3)$, and so on. This kind of series is a bit more complex but becomes easier once we understand how the squares or cubes are being used in the pattern. It's a useful concept for solving problems in exams, where

spotting and understanding such patterns can be very helpful.

**E7.** **What is the missing term in the given series:**

 **3, 4, 8, 17, 33, ?,**

(a)  55　　　　　　　　(b)  58

(c)  64　　　　　　　　(d)  56

**Ans:** (b)

**Explanation:**

Here, $1^{st}$ term = 3

$2^{nd}$ term = $3 + 1^2 = 3 + 1 = 4$

$3^{rd}$ term = $4 + 2^2 = 4 + 4 = 8$

$4^{th}$ term = $8 + 3^2 = 8 + 9 = 17$

$5^{th}$ term = $17 + 4^2 = 17 + 16 = 33$.

Hence, the next term or 6th term

= $33 + 5^2 = 33 + 25 = 58$

**E8.** **What is the next term in the given series?**

**226, 101, 37, 10, 2, ?**

(a)  –2　　　　　　　　(b)  1

(c)  –1　　　　　　　　(d)  0

**Ans:** (b)

**Explanation:**

Here $1^{st}$ term = 226

$2^{nd}$ term = $226 – 5^3 = 226 - 125 = 101$

$3^{rd}$ term = $101 – 4^3 = 101 - 64 = 37$

$4^{th}$ term = $37 – 3^3 = 37 – 27 = 10$

$5^{th}$ term = $10 – 2^3 = 10 – 8 = 2$.

Hence the next term should be $2 – 1^3 = 2 – 1 = 1$

**E9.** **What is X in the sequence**

**4, 196, 16, 144, 36, 100, 64, X?**

(a)  48　　　　　　　　(b)  64

(c)  125　　　　　　　(d)  256

**Ans:** (b)

**Explanation:**

We can observe from the given series: 4, 196, 16, 144, 36, 100, 64, X

| Odd Number Place | Even Number Place |
| --- | --- |
| 4 = 2² | 196 = 14² |
| 16 = 4² | 144 = 12² |
| 36 = 6² | 100 = 10² |
| 64 = 8² | X = 8² = 64 |

## Miscellaneous Series

Mixture/Miscellaneous series refers to a sequence of elements that follows a specific, but often complex, pattern. The challenge in these types of questions is to identify the underlying patterns that govern the series.

**E10.** **What is the value of X in the given series?**

**5, 11, 30, 87, X, 601**

(a)  226　　　　　　　(b)  228

(c)  238　　　　　　　(d)  240

**Ans:** (c)

**Explanation:**

The given series is 5, 11, 30, 87, X, 601

We observe the following pattern,

$11 = 5 \times 2 + 1^3$

$30 = 11 \times 2 + 2^3$

$87 = 30 \times 2 + 3^3$

Similarly, $X = 87 \times 2 + 4^3 = 238$

$601 = 238 \times 2 + 5^3$

**E11.** **What is the wrong number in the given series:**

**14, 6, 5, 6.5, 12, 28, 86**

(a)  5　　　　　　　　(b)  86

(c)  6.5　　　　　　　(d)  28

**Ans:** (d)

**Explanation:**

We observe the following pattern,

$1^{st}$ term of the series = 14

$2^{nd}$ term of the series = $14 \times 0.5 – 1 = 6$

$3^{rd}$ term of the series = $6 \times 1 – 1 = 5$

$4^{th}$ term of the series = $5 \times 1.5 – 1 = 6.5$

$5^{th}$ term of the series = $6.5 \times 2 – 1 = 12$

Similarly, the 6th term of the series

= $12 \times 2.5 – 1 = 29$, but in the series it is 28.

**E12.** **Find the wrong term in the given series.**

**2000, 976, 720, 656, 640, 637, 635**

(a)  976　　　　　　　(b)  656

(c)  637　　　　　　　(d)  635

**Ans:** (c)

**Explanation:**

By observing the following series,

$2000 – 976 = 1024 = 4^5$

$976 – 720 = 256 = 4^4$

$720 – 656 = 64 = 4^3$

$656 – 640 = 16 = 4^2$

Similarly, the next term should be

$640 – 4^1 = 640 – 4 = 636$ and not 637

$636 – 635 = 1 = 4^0$

So, the wrong term in the series is 637.

## II. ALPHABETICAL SERIES

These types of series are formed with the help of the English alphabet. These sequences can be created using different rules or patterns, such as:

- **Skipping Letters:** This series is formed by skipping a set number of letters between each element in the sequence. **For example,** if you skip one letter, you get a series like A, C, E, G, I, and so on, where B, D, F, H are skipped.

- **Pair of Opposite Letters:** This involves pairing letters that are on opposite ends of the alphabet. **For example,** A is paired with Z, B with Y, C with X, and so on, like this:

| A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Z | Y | X | W | V | U | T | S | R | Q | P | O | N |

- **Continuous Sequence of Letters:** This is the simplest type, where you just use the letters of the alphabet in their regular order, like A, B, C, D, E, all the way up to Z. There's no skipping or jumping; each letter follows the next in the usual way.

### SOLVED EXAMPLES

**E13. Find the next term of the series: B, E, H, K, ?**

   (a) K          (b) L

   (c) M         (d) N

**Ans:** (d)

**Explanation:**

Pattern of the above series is shown in the figure:

B , E , H , K , $\boxed{N}$
  +3   +3   +3   +3

The next letter is "N".

**E14. Find the missing term in the following series: MQCP, NPEN, OOGL, PNIJ,?**

   (a) QMKH      (b) QKKH

   (c) QMJK      (d) QMKI

**Ans:** (a)

**Explanation:**

Consider the 1st letter of each term as shown in figure:

MQCP , NPEN , OOGL , PNIJ , Q....
  +1   +1   +1   +1

Hence, 1st letter of missing term will be P + 1 = Q

Now, 2nd letter of each term is as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QM....
  −1   −1   −1   −1

Hence the 2nd letter of the missing term will be N − 1 = M. (option (b) eliminated)

Now, 3rd letter of each term is as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QMK....
  +2   +2   +2   +2

Hence the 3rd letter of missing term will be I + 2 = K (option c eliminated)

Now, consider the 4th letter of the each term as shown in figure:

MQCP , NPEN , OOGL , PNIJ , QMKH
  −2   −2   −2   −2

4th letter of 4th term = L − 2 = J

Hence, 4th letter of of missing term = J − 2 = H

**Hence the missing term is QMKH**

## Finding the missing terms in Continuous Series

In this kind of series, we typically use lowercase letters from the alphabet to create a group of letters, which is then repeated. The task for us is to figure out which group of letters should fill in the empty spaces in the series, following a specific pattern. The following questions will help us understand the concept.

> **Note:**
>
> In continuous series, firstly count the total given letters and try to divide the series into equal parts to find the possible patterns in the given series. **For example,** a series with 15 letters can be divided into smaller part of 3 or 5 letters to find the pattern in the series.

### SOLVED EXAMPLES

**E15. Consider the sequence *a_c e_ _b c_d a b_e d* that follows a certain pattern. Which of the following completes the sequence?**

   (a) bddab      (b) cdebe

   (c) bdaec      (d) eacbd

**Ans:** (c)

**Explanation:**

The given sequence: *a_c e_ _b c_d a b_e d*

There are total 15 letters in the sequence

Let's break this sequence into three sets of 5 alphabets each: *a_c e_/ _b c_d/ a b_e d*

we can observe that the sequence is a repetition of **abced**.

The complete sequence is *abced/abced/abced*

*bdaec* is the correct answer.

**E16.** **What is the middle term of the sequence – A, B, B, C, C, C, D, D, D, D, ... Z?**

(*a*)  Q                    (*b*)  R

(*c*)  S                    (*d*)  T

**Ans:** (*c*)

**Explanation:**

The given sequence is: A, B, B, C, C, C, D, D, D, D, ... Z

The number of terms in the given sequence will be

= 1 + 2 + 3 + 4 + ...+ 26

sum of 1$^{st}$ 26 natural numbers = $\dfrac{26(26 + 1)}{2}$ = 13 × 27 = 351

So the middle term will be 352/2 = 176$^{th}$ term

Now, sum of 1st 18 natural numbers

= $\dfrac{18(18 + 1)}{2}$ = 9 × 19 = 171

And the 18$^{th}$ letter of English alphabet is R and 19$^{th}$ is S

Clearly, the 171th term is R and S will come

from 172nd to 190th term.

So 176th term (middle term) is "S"

**E17.** **In the series AABABCABCDABCDE..., which letter appears at the 150$^{th}$ place?**

(*a*)  M                    (*b*)  N

(*c*)  O                    (*d*)  P

**Ans:** (*b*)

**Explanation:**

The given series is AABABCABCDABCDE...

We can observe the pattern here as A, AB, ABC, ABCD, ABCDE ...

This means 1 term has 1 letter, 2nd term has 2 letters and so on.

If the given series has 17 terms, then the sum of letters = (1 + 2 + 3 +...+17) = $\dfrac{17 \times 18}{2}$ = 153

So, the term having 17 letters will have the 150th letter of the series.

This term will start from 137th letter and end at 153rd letter. The term is ABCDEFGHIJKLMNOPQ.

So, the 150$^{th}$ term is N.

## III. ALPHANUMERIC SERIES

This type of series is a combination of alphabetical series and numerical series and can follow any of the patterns we have discussed earlier in this chapter.

Remembering the alphabetical sequence and their position number can help us solve problems on this topic quickly.

This type of series combines both alphabetical and numerical elements, and it can follow any of the patterns discussed earlier in this chapter. It's helpful to remember the order of the alphabet and the corresponding position numbers of each letter. This knowledge can significantly speed up solving these mixed series problems.

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

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

Examples will help us to understand the series in a better way.

### SOLVED EXAMPLES

**E18.** **What is the missing term of the series 9, P, 25, Q, 8, H, 16, ?, 18?**

(*a*)  A                    (*b*)  B

(*c*)  R                    (*d*)  I

**Ans:** (*b*)

**Explanation:**

The given series is 9, P, 25, Q, 8, H, 16, ?, 18

We observe that in the given series, each alphabet corresponds to the difference between numbers around that alphabet as shown in given table:

| 25 – 9 = 16 | P |
|---|---|
| 25 – 8 = 17 | Q |
| 16 – 8 = 8 | H |
| 18 – 16 = 2 | B |

So, B is the missing term in the series

**E19.** **Find the correct term of the given series in place of "?"**

**15F, 29K, 56K, 108I, ?**

(*a*)  216N                (*b*)  208J

(*c*)  188N                (*d*)  224J

**Ans:** (*b*)

**Explanation:**

1$^{st}$ consider the number series:

15, 29, 56, 108 we can observe that

1$^{st}$ term = 15

2$^{nd}$ term = 15 × 2 – 2$^0$ = 29

3$^{rd}$ term = 29 × 2 – 2$^1$ = 56

4$^{th}$ term = 56 × 2 – 2$^2$ = 108

Hence 5$^{th}$ term should be 108 × 2 – 2$^3$ = 208

Now observe the alphabetical series:

F is at 6th place in alphabets 6 = 1 + 5

K is at 11th place in alphabets 11 = 5 + 6

Hence we can observe that sum of digits of no. associated with the alphabet is place value of alphabet.

Hence alphabet associated with 208 is *J* because 2 + 0 + 8 = 10.

**E20. Consider the following alphanumeric series:**

**K 4 M P H & T * 6 8 7# B 9 K L @ 6 % U & * 2**

**How many numbers are there in the above series which are immediately followed by symbols and immediately preceded by alphabets?**

(*a*)  None
(*b*)  One
(*c*)  Two
(*d*)  Three

**Ans:** (*a*)

**Explanation:**

Given series is:

K 4 M P H & T * 6 8 7# B 9 K L @ 6 % U & * 2

We need to check numbers in the above series which are immediately followed by symbols and immediately preceded by alphabets.

Number 4 is eliminated because it is followed and preceded by letters.

Similarly, 6, 8 and 7 are eliminated because these are either preceded or followed by a number.

9 is followed and preceded by letters hence eliminated.

6 is surrounded by symbols hence eliminated.

Hence, there is no number that is immediately followed by symbols and immediately preceded by alphabets.

1. **What should come in place of question mark (?) in the following number series?**

   **132, 156, ?, 210, 240, 272**  (BPSC 2023)

   (*a*)  196
   (*b*)  182
   (*c*)  199
   (*d*)  204

   **Ans:** (*b*)

   **Explanation:**

   The given series follow the pattern as:

   132 + 24 = 156

   **156 + 26 = 182**

   182 + 28 = 210

   210 + 30 = 240

   240 + 32 = 272

2. **Select the missing number from the given alternatives:**  (BPSC 2023)

   | 44 | 49 | 37 |
   |----|----|----|
   | 52 | ?  | 41 |
   | 58 | 35 | 53 |

   (*a*)  56
   (*b*)  77
   (*c*)  66
   (*d*)  63

   **Ans:** (*b*)

   **Explanation:**

   **For row 1:** (44 – 37) × 7 = 7 × 7 = 49

   **For row 3:** (58 – 53) × 7 = 5 × 7 = 35

   Thus, for row 2:

   ? = (52 – 41) × 7 = 11 × 7 = 77

3. **Select the missing number from the given alternatives:**  (BPSC 2022)

   | 44 | 49 | 37 |
   |----|----|----|
   | 52 | ?  | 41 |
   | 58 | 35 | 53 |

   (*a*)  66
   (*b*)  56
   (*c*)  77
   (*d*)  More than one of the above
   (*e*)  None of the above

   **Ans:** (*c*)

   **Explanation:**

   **For row 1:** (44 – 37) × 7 = 7 × 7 = 49

   **For row 3:** (58 – 53) × 7 = 5 × 7 = 35

   Thus, for row 2:

   ? = (52 – 41) × 7 = 11 × 7 = 77

4. **Find the missing number in the given series following the same pattern:**  (BPSC 2022)

   **15, 20, 32, 62, 118, 248, ?**

   (*a*)  428
   (*b*)  322
   (*c*)  368
   (*d*)  More than one of the above
   (*e*)  None of the above

   **Ans:** (*c*)

   **Explanation:**

   The series follows the pattern as:

   Number + (consecutive prime numbers starting from 2)$^2$ + (Consecutive odd numbers starting from 1)

   15 + (2$^2$ + 1) = 20

   20 + (3$^2$ + 3) = 32

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$32 + (5^2 + 5) = 62$

$62 + (7^2 + 7) = 118$

$118 + (11^2 + 9) = 248$

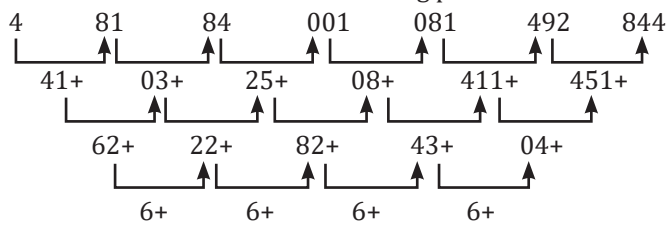**$248 + (13^2 + 11) = 428$**

5. **The missing number in the sequence**

   **4, 18, 48, 100, ?, 294, 448** **(BPSC 2020)**

   (a) 94 (b) 164

   (c) 180 (d) 192

   (e) None of the above/More than one of the above

**Ans:** (c)

**Explanation:**

The series follows the following pattern:



6. **The next term in the sequence**

   **1, 3, 9, 15, 25, 35, 49, ...**

   **will be** **(BPSC 2019)**

   (a) 80 (b) 64

   (c) 81 (d) 63

   (e) None of the above/More than one of the above

**Ans:** (d)

**Explanation:**

The sequence follow the pattern as:

$1^2 - 0 = 1$

$2^2 - 1 = 3$

$3^2 - 0 = 9$

$4^2 - 1 = 15$

$5^2 - 0 = 25$

$6^2 - 1 = 35$

$7^2 - 0 = 49$

**$8^2 - 1 = 63$**

## PRACTICE QUESTIONS

1. **What is the next alphabet in the given sequence: B, E, J, Q,?**

   (a) W (b) X

   (c) Y (d) Z

2. **Choose the group which is different from the others:**

   (a) A, E, G, I (b) B, D, F, H

   (c) I, M, Q, S (d) Q, W, Y, C

3. **Find the next term in the given series: TUV, NOP, HIJ, DEF,?**

   (a) ZAB (b) YZA

   (c) XYZ (d) CAB

4. **What is the value of X in the given series: 23, 30, 44, 65, 93, X?**

   (a) 120 (b) 128

   (c) 118 (d) 108

5. **Terms of given series follow a certain pattern, by observing that pattern find the term which will replace "X" in the given series: 8, 4, 6, 15, X, 236.25**

   (a) 46.5 (b) 48.5

   (c) 50.5 (d) 52.5

6. **Find the number which replace "X" in the given sequence: 30, 42, X, 72, 90**

   (a) 52 (b) 50

   (c) 54 (d) 56

7. **Consider the following matrix:**

   | 4 | 7 | 9 | 2 | ? | 1 |
   |---|---|---|---|---|---|
   | 12 | 42 | 72 | 2 | 30 | 0 |

   **What is the missing number in the matrix?**

   (a) 5 (b) 6

   (c) 8 (d) 0

8. **Consider the following matrix:**

   | 35 | 5 | 0 |
   |---|---|---|
   | 19 | 7 | 5 |
   | 47 | 8 | ? |

   **What is the missing number at? in the matrix?**

   (a) 7 (b) 5

   (c) 3 (d) 1

9. **What is the wrong number in the given series:**

   **14, 6, 5, 6.5, 12, 28, 86**

   (a) 5 (b) 86

   (c) 6.5 (d) 28

10. **Find the wrong term in the given series**

    **2000, 976, 720, 656, 640, 638, 635**

    (a) 976 (b) 656

    (c) 638 (d) 635

11. **What is the next term of the series:**

    **KAL, KEL, KIL, KOL, ?**

    (a) KSL (b) KUL

    (c) KVL (d) KXL

12. **Find the correct term of the given series in place of "?": 16G, 31D, 60F, 116H,?**

    (a) 216N (b) 224H

    (c) 188N (d) 224J

**13.** Consider the sequence of words given below.
SAND CARE RUIN MOON NICE

If in each of the given words, every consonant is changed to its previous letter and every vowel is changed to its next letter according to the English alphabetical series, then in how many words, thus formed, at least one vowel will appear?

(a) One      (b) Two
(c) Three      (d) None

**14.** Consider the sequence PQR_ _PQR_SPQQRS_PQRS that follows a certain pattern. Which of the following completes the sequence?

(a) SPRQ      (b) RSPQ
(c) SRRP      (d) SSRP

## ANSWERS

| 1. | (d) | 2. | (b) | 3. | (a) | 4. | (b) | 5. | (d) | 6. | (d) | 7. | (b) | 8. | (a) | 9. | (d) | 10. | (c) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11. | (b) | 12. | (b) | 13. | (d) | 14. | (d) | | | | | | | | | | | | |

## EXPLANATIONS

**1.** (d)

**Explanation:**

The given series is: B, E, J, Q, ?

The numbers corresponding to these alphabets are:

| B | 2 | $1^2 + 1$ |
|---|---|---|
| E | 5 | $2^2 + 1$ |
| J | 10 | $3^2 + 1$ |
| Q | 17 | $4^2 + 1$ |

So, the next term should be $5^2 + 1 = 26^{th}$ alphabet i.e., Z.

**2.** (b)

**Explanation:**

By observing the given options,

| Option A | | Option B | | Option C | | Option D | |
|---|---|---|---|---|---|---|---|
| A | 1 | B | 2 | I | 9 | Q | 17 |
| E | 5 | D | 4 | M | 13 | W | 23 |
| G | 7 | F | 6 | Q | 17 | Y | 25 |
| I | 9 | H | 8 | S | 19 | C | 3 |

The number corresponding to each alphabet is odd except in case of option (b), where each alphabet corresponds to an even number.

**3.** (a)

**Explanation:**

Observe the middle letter of each term, it is a vowel. Right most letters are the next letter to vowel and leftmost is the previous letter.

Now in $1^{st}$ term middle letter is "U", in $2^{nd}$ term "O", in $3^{rd}$ term "I", in $4^{th}$ term it is "E"

So the middle letter of next term will be "A"

And the rightmost letter will be "B" and the leftmost letter will be "Z".

Hence the next term of the series will be ZAB.

**4.** (b)

**Explanation:**

The given series is 23, 30, 44, 65, 93, X

By observing,

$1^{st}$ term of the series = $a_1$ = 23

$2^{nd}$ term of the series = $a_2$ = 30 = 23 + 7

$3^{rd}$ term of the series = $a_3$ = 44 = 30 + 14

$4^{th}$ term of the series = $a_4$ = 65 = 44 + 21

$5^{th}$ term of the series = $a_5$ = 93 = 65 + 28

So, the next term of the series should be $a_6$ = X = 93 + 35 = 128

**5.** (d)

**Explanation:**

The given series is 8, 4, 6, 15, X, 236.25

By observing the above series,

$1^{st}$ term of the series = $a_1$ = 8

$2^{nd}$ term of the series = $a_2$ = 4 = 8 × 0.5

$3^{rd}$ term of the series = $a_3$ = 6 = 4 × 1.5

$4^{th}$ term of the series = $a_4$ = 15 = 6 × 2.5

$5^{th}$ term of the series = $a_5$ = X = 15 × 3.5 = 52.5

$6^{th}$ term of the series = $a_6$ = 236.25 = 52.5 × 4.5

So, X = 52.5

**6.** (d)

**Explanation:** The given series is: 30, 42, X, 72, 90, and we need to find the value of X

By observing the given sequence

$1^{st}$ term of sequence = $a_1$ = 30 = (5 × 5) + 5

$2^{nd}$ term of sequence = $a_2$ = 42 = (6 × 6) + 6

$3^{rd}$ term of sequence = $a_3$ = X = (7 × 7) + 7 = 56

$4^{th}$ term of sequence = $a_4$ = 72 = (8 × 8) + 8

$5^{th}$ term of sequence = $a_5$ = 90 = (9 × 9) + 9

So, the value of X in the given series is 56.

**7.** (b)

**Explanation:**

We can clearly observe the following pattern,

In Column 1, 4 × (4 – 1) = 12

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