# Basics of Number Series

A number series is nothing but a sequence of numbers arranged in some logical way. This topic basically consists of a set of numbers connected by a specific pattern and you need to identify the pattern and answer the missing number or you may be asked to identify the number that doesn't fit the pattern.
Numbers can have interesting patterns.

Here we list the most common patterns and how they are made:-

**1. Arithmetic (Difference/Sum based): An arithmetic series is obtained by adding or subtracting the same value each time. These types of series will have a fixed difference between the two consecutive terms.**

Example: 1, 4, 7, 10, 13, 16, 19, 22, 25, ...

This sequence has a difference of 3 between each number. The pattern is continued by **adding 3** to the last number each time. Hence, the next term will be 25+3 = 28 The value-added each time is called the **"common difference".**

**2. Geometric (Multiplication/Division based): The pattern will be identified by multiplying or dividing the term by some number to obtain the next term.**

Example: 1, 3, 9, 27, 81, 243, ...

If you closely observe the next term can be obtained by multiplying by 3. 3= 1*3 , 9 = 3*3, 81= 27*3, similarly 243 = 81*3. Hence next term will be 243*3 = 729. The value multiplied or divided each time is called **"common ratio".**

**3. Exponential Series: These series as the name suggest will be of form a^n. These could be perfect squares or perfect cubes etc.**

Example: 4, 16, 64, 256, 1024...

If you closely observe the numbers are increasing at a very fast rate. This is the basic characteristic to identify if a series can be done by exponents. In this case we can see 16 = 2^4 , 64 = 2^6 , 256= 2^8 , 1024 = 2^10. Clearly, the next term will be 2^12 = 4096

**4. Alternating Series: Every alternate term forms a part of the series. Here you need to look for the pattern among the alternate numbers.**

Example: 3, 9, 5, 15, 11, 33, 29, ?
**Now for the given series the pattern that follows is -**
**3 * 3 = 9**
**9 - 4 = 5**
**5 * 3 = 15**

**15 - 4 = 11**
**11 * 3 = 33**
**33 - 4 = 29**
**So, the next term is - 29 * 3 = 87**
**An easy way to identify such series is that the numbers might not increase consistently. They usually increase and decrease continuously.**

**5. Special Number Series -**

**(a) Prime Numbers**: Prime numbers are special numbers who are divisible only by 1 and itself, which means it is not possible to factorize the prime numbers.
**(b) Fibonacci Series**: Fibonacci series are special series where the current value is determined by adding previous two values.

Consider the series 1, 1, 2, 3, 5, 8, 13, ...

13 = 8+5, 8 = 5+3, 5 = 3+2. Hence next term = 13+8 = 21

**6. Mixed Series -**

**These series basically involve different arithmetic operations together. This series may be applicable when you cannot spot any common difference or ratio or the alternate arrangement in the series.**
**Example - 5, 12, 27, 58, 121, ?**
**Now if you closely look, no particular pattern in the difference can be spotted.**
**The series that follows is -**
**5 * 2 + 2 = 12**
**12 * 2 + 3 = 27**
**27 * 2 + 4 = 58**
**58 * 2 + 5 = 121**
**So, the next term should be - 121 * 2 + 6 = 2**

The patterns provided here are the most common type of patterns on which the series may be based. However, a lot many more patterns may be possible by varying the parameters provided above.

**Points to remember**

1. Identifying patterns solely depends on how quickly you can categorize the series. This needs practice and after a while solving series questions becomes instinctive. Try to identify how the series grows, this should help you categorize your series.
2. If you fail to categorize a series into some category consider finding the special series in them. We have mentioned Prime and Fibonacci numbers. There can be other types of number like Armstrong numbers etc.

3. Do not give much time to series, If you are not able to establish relations between terms in a minute, it's better to leave the question as a new kind of series can consume a lot of time that can be used elsewhere.