WANDOOR GANITHAM - S.S.L.C STUDY MATERIAL 2021

1. ARITHMETIC SEQUENCES

Main concepts

- *A set of numbers written as the first , second , third and so on , according to a particular rule is called a number sequence*
- *The numbers in a number sequence are known as its "terms "*
- *The algebraic expression of the relationship between the term and tits position of a number sequence is known as its algebraic form .*
- *Usually n^{th} term of a sequence is considered as its algebraic form .*
- *A sequence got by starting with any number and adding a fixed number repeatedly is called an arithmetic sequence .*
- *An arithmetic sequence is a sequence in which we get the same number on subtracting from any term , the term immediately preceding it . This constant difference is called the common difference of an arithmetic sequence .*

In an arithmetic sequence ,

- *Second term is obtained by adding common difference to the first term .*
- *Third term is obtained by adding two times the common difference to the first term .*
- *Fourth term is obtained by adding three times the common difference to the first term .*
- *Fifth term is obtained by adding four times the common difference to the first term*
- *Sixth term is obtained by adding five times the common difference to the first term*
- *Seventh term is obtained by adding six times the common difference to the first term*
- *Eighth term is obtained by adding seven times the common difference to the first term*
- *Ninth term is obtained by adding eight times the common difference to the first term .*

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- *Tenth term is obtained by adding nine times the common difference to the first term*

If the first term of an arithmetic sequence is f and its common difference is d, then

Second term $= f + d$	16^{th} term $= f + 15d$
Third term $= f + 2d$	21^{th} term $= f + 20d$
Fourth term $= f + 3d$	31^{st} term $= f + 30d$
Fifth term $= f + 4d$	45^{th} term $= f + 44d$
Sixth term $= f + 5d$	51^{st} term $= f + 50d$
Seventh term $= f + 6d$	62^{th} term $= f + 61d$
Eighth term $= f + 7d$	76^{th} term $= f + 75d$
Ninth term $= f + 8d$	84^{th} term $= f + 83d$ s
Tenth term $= f + 9d$	98^{th} term $= f + 97d$

If the first term of an arithmetic sequence is f and its common difference is d, then its

$$n^{th} \text{ term} = d\,n + f - d$$

- *The difference between any two terms of an arithmetic sequence is the product of the common difference and the difference of the position of the terms.*

- *If any two terms of an arithmetic sequence are given,*

$$\text{Common difference} = \frac{\text{Term difference}}{\text{Position difference}}$$

- *The algebraic form of any arithmetic sequence is of the form* $x_n = an + b$ *, where* a *is the common difference and* $b = f - d$ *.*

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- *The sum of any three consecutive terms of an arithmetic sequence is three times the middle term .*
- *The sum of any five consecutive terms of an arithmetic sequence is five times the middle term .*
- *The sum of any seven consecutive terms of an arithmetic sequence is seven times the middle term .*
- *The sum of any nine consecutive terms of an arithmetic sequence is nine times the middle term .*

If n is an odd number ,

the sum of first n terms of an arithmetic sequence = n x middle term

- *In three consecutive terms of any arithmetic sequence , the middle term is half the sum of first and last terms .*
- *In five consecutive terms of any arithmetic sequence , the middle term is half the sum of first and last terms .*
- *In seven consecutive terms of any arithmetic sequence , the middle term is half the sum of first and last terms .*
- *In nine consecutive terms of any arithmetic sequence , the middle term is half the sum of first and last terms .*

In an arithmetic sequence , if the sum of positions of two pairs of terms are equal , then the sums of the pairs of the terms are equal

- *If we take four consecutive terms of an arithmetic sequence ,*

$$x_1 + x_4 = x_2 + x_3$$

- *If we take five consecutive terms of an arithmetic sequence ,*

$$x_1 + x_5 = x_2 + x_4$$

- *If we take six consecutive terms of an arithmetic sequence ,*

$$x_1 + x_6 = x_2 + x_5 = x_3 + x_4$$

- *If we take seven consecutive terms of an arithmetic sequence ,*

$$x_1 + x_7 = x_2 + x_6 = x_3 + x_5$$

- *If we take eight consecutive terms of an arithmetic sequence ,*

$$x_1 + x_8 = x_2 + x_7 = x_3 + x_6 = x_4 + x_5$$

- *If we take nine consecutive terms of an arithmetic sequence ,*

$$x_1 + x_9 = x_2 + x_8 = x_3 + x_7 = x_4 + x_6$$

- *If we take ten consecutive terms of an arithmetic sequence ,*

$$x_1 + x_{10} = x_2 + x_9 = x_3 + x_8 = x_4 + x_7 = x_5 + x_6$$

The sum of any consecutive number of natural numbers , starting with one , is half of the product of the last number and the next natural number .

- $1 + 2 + 3 + 4 + 5 = \frac{5 \times 6}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + 8 = \frac{8 \times 9}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + 10 = \frac{10 \times 11}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + 15 = \frac{15 \times 16}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + 20 = \frac{20 \times 21}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + 100 = \frac{100 \times 101}{2}$
- $1 + 2 + 3 + \ldots\ldots\ldots\ldots + n = \frac{n(n+1)}{2}$

The sum of any consecutive number of terms of an arithmetic sequence is half the product of the number of terms and the sum of the first and last terms .

$$S_n = \frac{n}{2}(x_1 + x_n)$$

NUMBER PATTERN – 1

Look at the number pattern given below .

1

2 3

4 5 6

7 8 9 10

....

....

Here the numbers are arranged as first row contains one number , second row contains 2 numbers , third row contains 3 numbers , fourth row contains 4 numbers and so on .

The n^{th} row will contain n numbers .

There are $1 + 2 + 3 + \dots\dots\dots + n = \frac{n(n+1)}{2}$ *numbers in n rows in total .*

Also ,

Last number in the first row = 1

Last number in the second row = 3 = 1 + 2

Last number in the third row = 6 = 1 + 2 + 3

Last number in the fourth row = 10 = 1 + 2 + 3 + 4

....

....

....

Last number in the n^{th} row $= 1 + 2 + 3 + \dots\dots\dots + n = \frac{n(n+1)}{2}$

Last number in the n^{th} row $= \frac{n(n+1)}{2}$

1

2 3

4 5 6

7 8 9 10

....

....

.... $\frac{n(n+1)}{2}$

NUMBER PATTERN – 2

Look at the number pattern given below .

1

2 3 4

5 6 7 8 9

10 11 12 13 14 15 16

....

....

Here the numbers are arranged as first row contains one number , second row contains 3 numbers , third row contains 5 numbers , fourth row contains 7 numbers and so on .

The n^{th} row will contain (2 n - 1) numbers .

Also ,

Last number in the first row = 1 = 1^2

Last number in the second t row = 4 = 2^2

Last number in the third row = 9 = 3^2

Last number in the fourth row = 16 = 4^2

....

....

Last number in the n^{th} row = n^2

Last number in the n^{th} row = n^2

1

2 3 4

5 6 7 8 9

10 11 12 13 14 15 16

....

.... n^2

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