ONLINE MATHS CLASS - X - 05 (28 / 06 /2021)

1. ARITHMETIC SEQUENCE - CLASS 3

What did we study in the last class ?

- **Each term of a sequence is related to its position .**
- **The n^{th} term of a sequence is its general form .**
- **The n^{th} term of a sequence is also called its *algebraic form* .**

Activity 1

Consider the following number sequences .

	Number sequence
Natural numbers	1 , 2 , 3 , 4 , . . .
Even numbers	2 , 4 , 6 , 8 , . . .
Multiples of 5	5 , 10 , 15 , 20 , . . .
Natural numbers which leave remainder 2 when division by 3	2 , 5 , 8 , 11 , . . .
Perimeter of the squares with length of the sides go 1 , 2 , 3 , 4 , . . .	4 , 8 , 12 , 16 , . . .

What are the special features of the above number sequences ?

1 , 2 , 3 , 4 , . . .	1 , (1 + 1) , (2 + 1) , (3 + 1) , . . .
2 , 4 , 6 , 8 , . . .	2 , (2 + 2) , (4 + 2) , (6 + 2) , . . .
5 , 10 , 15 , 20 , . . .	5 , (5 + 5) , (10 + 5) , (15 + 5) , . . .
2 , 5 , 8 , 11 , . . .	2 , (2 + 3) , (5 + 3) , (8 + 3) , . . .
4 , 8 , 12 , 16 , . . .	4 , (4 + 4) , (8 + 4) , (12 + 4) , . . .

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Finding

Here each sequence got by starting with a number and adding a fixed number repeatedly

Arithmetic sequences

A sequence got by starting with any number and adding a fixed number repeatedly is called an *arithmetic sequence* .

Activity 2

1. Consider the sequence of sums of the outer angles of polygons .

Polygon	Triangle	Quadrilateral	Pentagon	Hexagon
Sum of outer angles	360^0	360^0	360^0	360^0

and continue like this

Sequence = 360^0 , 360^0 , 360^0 , 360^0 , . . .

Here the sequence start with 360 and adding 0 repeatedly . So this sequence is an arithmetic sequence .

2 . Consider the sequence $1 , 1\frac{1}{2} , 2 , 2\frac{1}{2} , 3 , 3\frac{1}{2} , . . .$

Here the sequence start with 1 and adding $\frac{1}{2}$ **repeatedly . So this sequence is an arithmetic sequence .**

3. Consider the sequence of squares with length of the sides go 1 , 2 , 3 , 4 , ...

Length of the diagonal of a square = $\sqrt{2} \times side$

Sequence of the lengths of the diagonals = $\sqrt{2} , 2\sqrt{2} , 3\sqrt{2} , 4\sqrt{2} , . . .$

Here the sequence start with $\sqrt{2}$ **and adding** $\sqrt{2}$ **repeatedly . So this sequence is an arithmetic sequence .**

3. An object moves along a straight line at 10 metres / second . Applying a constant force in the opposite direction , the speed is reduced by 2 metres / second .

The sequence of the speed is 10 , 8 , 6 , 4 , . . .

Here the terms are got by subtracting 2 repeatedly from 10 . This is also considered an arithmetic sequence . (we can interpret *subtract* 2 as *adding* - 2)

Finding

In an arithmetic sequence , we add the same number to move from a term immediately after it . So if we subtract from any term , the term immediately before it , we get this number .

An arithmetic sequence is a sequence in which we get the same number on subtracting from any term , the term immediately preceding it .

Common difference of an arithmetic sequence

In an arithmetic sequence , 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 .

Note :

Very often , we find out whether a given sequence is an arithmetic sequence by checking whether the difference between the terms is constant .

Note :

Usually the terms in a sequence are written in algebra as

x_1 , x_2 , x_3 , x_4 , x_5 , . . . **or** y_1 , y_2 , y_3 , y_4 , y_5 , . . .

First term	Second term	Third term	Fourth term	. . .
x_1	x_2	x_3	x_4	. . .

Sequence	Distance between two consecutive terms			
	$x_2 - x_1$	$x_3 - x_2$	$x_4 - x_3$	$x_5 - x_4$
1 , 2 , 3 , 4 , 5 , . . .	2 – 1 = 1	3 – 2 = 1	4 – 3 = 1	5 – 4 = 1
2 , 4 , 6 , 8 , 10 , . . .	4 – 2 = 2	6 – 4 = 2	8 – 6 = 2	10 – 8= 2
5 , 10 , 15 , 20 , 25 , . . .	10 – 5 = 5	15 – 10 = 5	20 – 15 = 5	25 – 20 = 5
2 , 5 , 8 , 11 , 14 , . . .	5 – 2 = 3	8 – 5 = 3	11 – 8 = 3	14 – 11 = 3
4 , 8 , 12 , 16 , 20 , . . .	8 – 4 = 4	12 – 8 = 4	16 – 12 = 4	20 – 16 = 4
360 , 360 , 360, 360 ,360 , . . .	360 – 360 = 0	360 – 360 = 0	360 – 360 = 0	360 – 360 = 0
$\sqrt{2}$,$2\sqrt{2}$,$3\sqrt{2}$,$4\sqrt{2}$, $5\sqrt{2}$,...	$2\sqrt{2}-\sqrt{2}=\sqrt{2}$	$3\sqrt{2}-2\sqrt{2}=\sqrt{2}$	$4\sqrt{2}-3\sqrt{2}=\sqrt{2}$	$5\sqrt{2}-4\sqrt{2}=\sqrt{2}$
10 , 8 , 6 , 4 , 2 , . . .	8 – 10 = - 2	6 – 8 = - 2	4 – 6 = - 2	2 – 4 = - 2

Activty 3 (Multiplying natural numbers and the adding / subtracting a fixed number)

	Number sequence
Multiply natural numbers by 6	6 , 12 , 18 , 24 , 30 , . . .
Multiply natural numbers by 6 and then add 1	7 , 13 , 19 , 25 , 31 , . . .
Multiply natural numbers by 6 and then subtract 1	5 , 11 , 17 , 23 , 29 , . . .

Are these arithmetic sequences ?

Sequence	Distance between two consecutive terms			
	$x_2 - x_1$	$x_3 - x_2$	$x_4 - x_3$	$x_5 - x_4$
6 , 12 , 18 , 24 , 30 , . . .	12 – 6 = 6	18 – 12 = 6	24 – 18 = 6	30 – 24 = 6
7 , 13 , 19 , 25 , 31 , . . .	13 – 7 = 6	19 – 13 = 6	25 – 19 = 6	31 – 25 = 6
5 , 11 , 17 , 23 , 29 , . . .	11 – 5 = 6	17 – 11 = 6	23 – 17 = 6	29 – 23 = 6

Since the difference between any term and the term before it is a constant , the above sequences are arithmetic sequences .