Online Class – X – 05 28 / 06 / 2021

1. Arithmetic Sequence – Class 2

To view class

Arithmetic Sequences

Consider following sequences :

- Sequence of natural numbers is

  1, 2, 3, 4, 5, 6, ... Here the sequence start with 1 and add 1 repeatedly.

- Sequence of even natural numbers is

  2, 4, 6, 8, 10, ...Here the sequence start with 2 and add 2 repeatedly.

- Sequence of multiples of 5 is

  5, 10, 15, 20, ... Here the sequence start with 5 and add 5 repeatedly.

- Sequence of natural numbers which leave remainder 2 on division by 3 is

  2, 5, 8, 11, 14, ... Here the sequence start with 2 and add 3 repeatedly.

- Sequence of perimeters of squares with the length of a side 1, 2, 3, 4, ...is

  4, 8, 12, 16, ... Here the sequence start with 4 and add 4 repeatedly.

- Sequence of perimeters of squares with the length of a side 1, $1\frac{1}{2}$,2 , $2\frac{1}{2}$. . . . . .is

4, 6, 8, 10, ... **Here the sequence start with 4 and add 2 repeatedly.**

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

Consider the given sequences :

- **Sequence of sums of outer angles of regular polygons is**

  360^0 , 360^0 , 360^0 , 360^0 , ...

  Here the sequence start with 360 and add 0 repeatedly.

  So this is an arithmetic sequence .

- **Sequence of squares with the length of the sides**

  1, 1½ ,2 , 2½, ...

  Here the sequence start with 1 and add ½ repeatedly.

  So this is an arithmetic sequence .

- **Sequence of length diagonals of squares having side 1, 2, 3, 4 . . . . .is**

  $\sqrt{2}$, $2\sqrt{2}$, $3\sqrt{2}$, ...

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

  Here the sequence start with $\sqrt{2}$ and add $\sqrt{2}$ repeatedly.

  So this is an arithmetic sequence .

- **Consider an object moving along a straight line at 10m/s .**

  By applying a constant force in the opposite direction the speed is reduced every second by 2 m/s

  Sequence of speed is

  10 , 8 , 6 , ...

  Here the sequence start with 10 and subtract 2 repeatedly or we can say add –2 repeatedly.

  So this is 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.

The constant difference got by subtracting from any term the just previous term, is called the common difference of an arithmetic sequence.
Common difference usually denoted using the letter 'd'

- **Consider sequence of natural numbers**
  1, 2, 3, 4, 5, ...
  This is an arithmetic sequence with common difference 1.

- **Multiply each term of the above sequence by 6**
  Sequence is 6, 12, 18, 24, ...
  This is an arithmetic sequence with common difference 6.

- **Add one to each term of the above sequence**
  Sequence is 7, 13, 19, 25, ...
  This is an arithmetic sequence with common difference 6.

- **Subtract two from each term of the above sequence**
  Sequence is 5, 11, 17, 23, ...
  This is an arithmetic sequence with common difference 6.

- **Consider sequence of powers of two**
  Sequence is 2, 4, 8, 16 . . . .
  Since there is no common difference , this is not an arithmetic sequence .

$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$

- **Consider sequence of prime numbers**

  Sequence is 3 , 5, 7, 11, 13, ...

  Since there is no common difference , this is not an arithmetic sequence .

Assignment

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(1) Check whether each of the sequences given below is an arithmetic sequence. Give reasons. For the arithmetic sequences, write the common difference also.

i) Sequence of odd numbers

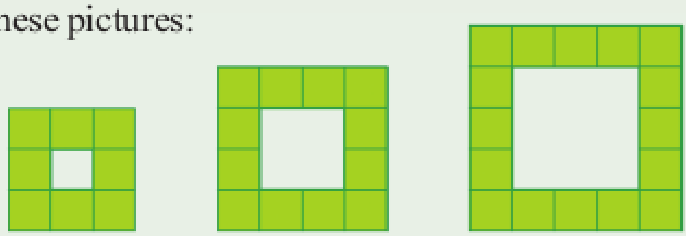
ii) Sequence of even numbers

iii) Sequence of fractions got as half the odd numbers

iv) Sequence of powers of 2

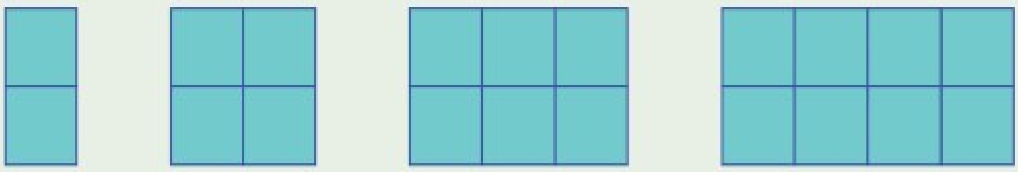
v) Sequence of reciprocals of natural numbers

(2) Look at these pictures:



If the pattern is continued, do the numbers of coloured squares form an arithmetic sequence? Give reasons.

(3) See the pictures below:



i) How many small squares are there in each rectangle?

ii) How many large squares?

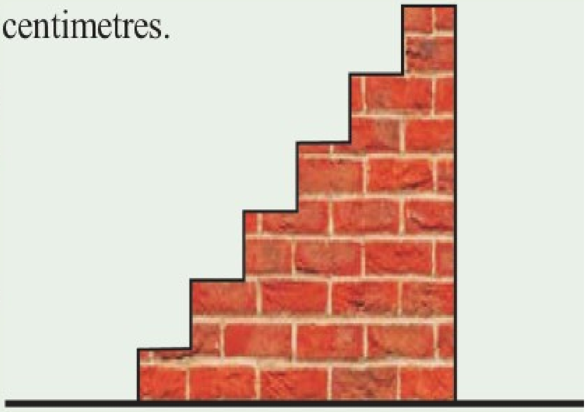
iii) How many squares in all?

Continuing this pattern, is each such sequence of numbers, an arithmetic sequence?

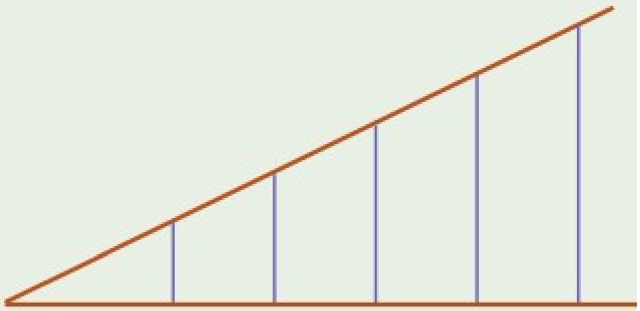
(4) In the staircase shown here the height of the first step is 10 centimetres and the height of each step after it is 17.5 centimetres.

i) How high from the ground would be someone climbing up, after each step?

ii) Write these numbers as a sequence.



(5) In this picture, the perpendiculars to the bottom line are equally spaced. Prove that, continuing like this, the lengths of perpendiculars form an arithmetic sequence.



(6) The algebraic expression of a sequence is

$$x_n = n^3 - 6n^2 + 13n - 7$$

Is it an arithmetic sequence?