

ARITHMETIC PROGRESSIONS

PPT-3

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 05
CHAPTER NAME : ARITHMETIC PROGRESSIONS

CHANGING YOUR TOMORROW

Website: www.odmegroup.org
Email: info@odmps.org

Toll Free: **1800 120 2316**
Sishu Vihar, Infocity Road, Patia, Bhubaneswar- 751024

PREVIOUS KNOWLEDGE TEST

- An **arithmetic progression** is a list of numbers in which each term is obtained by adding a fixed number to the preceding term except the first term.
- This fixed number is called the common difference of the AP. It can be positive, negative or zero.
- Let us denote the first term of an AP by a_1 , second term by a_2 , . . . , n th term by a_n and the common difference by d . Then the AP becomes $a_1, a_2, a_3, \dots, a_n$ So, $a_2 - a_1 = a_3 - a_2 = \dots = a_n - a_{n-1} = d$.
- The general form of an arithmetic progression is given by $a, a + d, a + 2d, a + 3d, \dots$ where a is the first term and d the common difference.

n th term $a_n = a + (n - 1) d$.

So, the n th term of the AP with first term a and common difference d is given by

- a_n is also called the general term of the AP.

LEARNING OUTCOME

1. Students will be able to find n th term from the end of the AP.
2. Students will be able to apply the concept learnt in solving problems.
3. Students will be able to solve real life situations involving AP.

1. How many three-digit numbers are divisible by 7.

How many three-digit numbers are divisible by 7?

Sol. The three-digit numbers which are divisible by 7 are
105, 112, 119, 994

Here, $a = 105, d = 7, a_n = 994$

$$\therefore a + (n - 1) d = 994$$

$$\Rightarrow 105 + (n - 1) 7 = 994$$

$$\Rightarrow (n - 1) 7 = 994 - 105$$

$$\Rightarrow 7 (n - 1) = 889$$

$$\Rightarrow n - 1 = \frac{889}{7} = 127$$

$$\Rightarrow n = 127 + 1 = 128$$

2. Find the 20th term from the last term (towards the first term) of the AP : 3, 8, 13, ..., 253.
(nth term of an AP from the end = $l - (n - 1)d$)

**Find the 20th term from the last term of the AP:
3, 8, 13, ... , 253.**

Sol. Given, AP is 3, 8, 13,, 253

Here, $a = 3, d = 8 - 3 = 5$

First term from the last = 253 then $d = -5$

$$\begin{aligned}a_{20} &= a + 19d \\ &= 253 + 19(-5) \\ &= 253 - 95 = 158\end{aligned}$$

3. The sum of the 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th terms is 44. Find the first three terms of the AP.

The sum of the 4th and 8th terms of an AP is 24 and the sum of the 6th and 10th terms is 44. Find the first three terms of the AP.

Sol. Given, $a_4 + a_8 = 24$ and $a_6 + a_{10} = 44$

$$\Rightarrow a + 3d + a + 7d = 24$$

$$\text{and } a + 5d + a + 9d = 44$$

$$\Rightarrow 2a + 10d = 24 \text{ and } 2a + 14d = 44$$

$$2a + 14d - 2a - 10d = 44 - 24$$

$$\Rightarrow 4d = 20 \Rightarrow d = \frac{20}{4} = 5$$

$$\text{Now, } 2a + 10d = 24$$

$$\Rightarrow 2a + 10 \times 5 = 24$$

$$\Rightarrow 2a = 24 - 50$$

$$\Rightarrow a = \frac{-26}{2} = -13$$

4. Which term of the AP : 3, 15, 27, 39, . . . will be 132 more than its 54th term

Which term of the AP: 3, 15, 27, 39, . . . will be 132 more than its 54th term?

Sol. 3, 15, 27, 39, ...

Here, $a = 3, d = 15 - 3 = 12$

Let $a_n = 132 + a_{54}$

$$\Rightarrow a_n - a_{54} = 132$$

$$\Rightarrow (n - 54)12 = 132$$

$$[\because a_n - a_k = (n - k) d]$$

$$\Rightarrow n - 54 = \frac{132}{12}$$

$$\Rightarrow n - 54 = 11$$

$$\Rightarrow n = 11 + 54 = 65 \quad \therefore a_n = 65$$

5. Subba Rao started work in 1995 at an annual salary of Rs 5000 and received an increment of Rs 200 each year. In which year did his income reach Rs 7000.

Subba Rao started work in 1995 at an annual salary of ₹ 5000 and received an increment of ₹ 200 each year. In which year did his income reach ₹ 7000?

Sol. Here, $a = ₹ 5000$, $d = ₹ 200$

Let $a_n = ₹ 7000$

We have, $a + (n - 1) d = 7000$

$$\Rightarrow 5000 + (n - 1) 200 = 7000$$

$$\Rightarrow (n - 1) 200 = 7000 - 5000$$

$$\Rightarrow (n - 1) 200 = 2000$$

$$\Rightarrow (n - 1) = \frac{2000}{200}$$

$$\Rightarrow n - 1 = 10$$

$$\Rightarrow n = 11$$

$$\Rightarrow 1995 + 11 = 2006$$

Hence, in 2006, Subba Rao's income will reach ₹ 7000.

6. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12

Determine the AP whose 3rd term is 16 and 7th term exceeds the 5th term by 12.

Sol. Given,

$$a_3 = 16$$

$$\Rightarrow a + 2d = 16 \text{ and } a_7 - a_5 = 12$$

$$\Rightarrow a + 6d - a - 4d = 12$$

$$\Rightarrow 2d = 12 \Rightarrow d = 6$$

Since $a + 2d = 16$

$$\Rightarrow a + 2(6) = 16 \Rightarrow a + 12 = 16$$

$$\Rightarrow a = 16 - 12 = 4$$

\therefore The required AP is 4, 4 + 6, 10 + 6, 16 + 6
= 4, 10, 16, 22, ...

HOME ASSIGNMENT Ex. 5.2 Q: No 11 to Q20

AHA

1. Two APs have the same common difference. The difference between their 1000th terms is 1000, what is the difference between their 10000th terms?

THANKING YOU
ODM EDUCATIONAL GROUP