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ARITHMETIC PROGRESSION

- **Sequence (Progression):** A group of numbers forming a pattern
- **Arithmetic Progression** (A.P.)**:** A progression in which each term, except the first, is obtained by adding a constant to the previous term. Its terms are denoted by $t_1, t_2, t_3,...t_n$, or $a_1, a_2, a_3, ...a_n$.

  A squence is called an arithmetic progression, if there exists a constant d such that $a_2 - a_1 = d$, $a_3 - a_2 = d$, $a_4 - a_3 = d$, ... $a_{n+1} - a_n = d$ and so on. d is called the common difference.
- **Formation of A.P. or General form of A.P.:** If 'a' is the first term and 'd' is the common difference of an A.P., then A.P. is a, a + d, a + 2d, a + 3d, a + 4d, ...
- **'n' th term of A.P.:** The nth term of the A.P. a, a + d, a + 2d, ... is given by $t_n = a + (n - 1) d$. Sometimes nth term is also denoted by a_n.
- **Sum of first n terms of an A.P. :** The sum of first n terms of an A.P. is $S_n = \frac{n}{2}(a + l)$, where l (last term) = a + (n – 1) d, a = first term, d = common difference , n = no. of terms

  $\therefore s_n = \frac{n}{2}[2a + (n - 1)d]$
- **n^{th} term in terms of s_n :** If s_n is the sum of the first n terms of an A.P., then the nth term is given by $t_n = s_n - s_{n-1}$.
- **Various terms of an A.P.:** 3 consecutive terms are a – d, a, a + d and common difference is d.

  4 consecutive terms are a – 3d, a – d, a + d, a + 3d and common difference is 2 d .

CHECK YOUR PROGRESS:

1. Which of the following progression is an A.P.?

   (A) 1, 4, 9, 16 ..... (B) 1, 3, 9, 27 (C) -2, 0, 2, 4, 6, ... (D) 1, 2, 4, 8, ...

2. The common difference of the A.P. 3, 1, -1, -3, ... is

   (A) -2 (B) 2 (C) –3 (D) 3

3. How many two digit numbers are divisible by 3?

   (A) 31 (B) 30 (C) 29 (D) 11

4. If the first term and common difference of an A.P are 2 and 4 respectively, then the sum of its first 40 terms is :

   (A) 3200 (B) 2800 (C) 1600 (D) 200

5. The sum of the first 10 terms of the A.P. 3, 4, 5, 6, ... is

   (A) 65 (B) 75 (C) 85 (D) 110

6. Find the sum of the A.P, 7 + 12 + 17 + 22 + ... +1002.

7. Find the middle term of the A.P. -11, -7, -3, ..., 53.
8. Which term of the A.P. 9, 14, 19, ... is 124?
9. The 7^{th} and 13^{th} terms of an A.P are 32 and 62 respectively. Find the A.P.
10. Find the 8^{th} term from the end of the A.P. 7, 10, 13, ..., 184.
11. Find the sum of First 25 terms of an A.P. whose nth term is given by $a_n = 2 - 3n$.
12. If 2x, x + 10, 3x + 2 are in A.P. , find the value of x.
13. Which term of the A.P. 3, 15, 27, 39, ... will be 120 more than its 21st term?
14. The sum of 4^{th} and 8^{th} terms of an A.P is 24 and the sum of 6^{th} and 10^{th} terms is 44. Find the A.P.
15. How many terms of the A.P. -10, -7, -4, -1, ... are needed to get the sum 104?

STRETCH YOURSELF:

1. The sum of first n terms of an A.P. is given by $s_n = 3n^2 + 5n$. Find the common difference and 1^{st} term of the A.P.
2. If the 9th term of an A.P is 449 and 449^{th} term is 9, then which term of the A.P. is zero?
3. Which term of the A.P 114, 109, 104, ... is the first negative term?
4. If 7 times the 7^{th} term of an A.P is equal to 11 times the 11^{th} term. show that the 18^{th} term of the A.P. is zero.
5. If p^{th}, q^{th} and r^{th} terms of an A.P. are a, b, c respectively then show that $a(q-r) + b(r-p) + c(p-q) = 0$.

ANSWERS

CHECK YOUR PROGRESS:

1.	C	2. A	3. B	4. A
5.	B	6. 100900	7. 21	8. 25
9.	2, 7, 12, 17....		10. 163	
11.	–925	12. 6	13. 31st	
14.	–13, –8, –3.		15. 13	

STRETCH YOURSELF :

1. 6, 8
2. 558^{th}
3. 24^{th}