

Question Paper

Class X – Mathematics (Arithmetic Progression)

Time: 35 Minutes | Maximum Marks: 15

A. Choose the correct option:

1. The sum of the first n terms of an AP is given by $S_n = 2n^2 + 3n$. The common difference of the AP is
(a) 2 (b) 3 (c) 5 (d) 4
2. In an AP, the sum of the first 7 terms is 49 and the sum of the first 17 terms is 289. The common difference is
(a) 1 (b) 2 (c) 3 (d) 4
3. The ratio of the sums of the first n terms of two APs is $(7n + 1) : (4n + 27)$. The ratio of their 11th terms is
(a) 4 : 3 (b) 3 : 4 (c) 7 : 4 (d) 27 : 4

Instructions for Questions 4 & 5:

For each Assertion-Reason Based problem, select the appropriate code:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

4. **Assertion (A):** If the first term of an AP is 2 and the common difference is 3, then its 10th term is 29.

Reason (R): The n^{th} term of an AP is given by $a_n = a + (n - 1)d$.

5. **Assertion (A):** The common difference of the AP $\frac{1}{x}, \frac{1-x}{x}, \frac{1-2x}{x}, \dots$ is 1.

Reason (R): The common difference of an Arithmetic Progression $a_1, a_2, a_3, \dots$ is given by $d = a_2 - a_1$.

B. Subjective Questions:

6. If 7 times the 7th term of an A.P. is equal to 11 times its 11th term, then find its 18th term. (CBSE 2017) (2 marks)

7. A cloud computing company is monitoring the data load on its main server. During its first week of operation, the server processed 50,000 data requests. As the app's user base grew, the number of weekly requests increased by a constant amount each week. By the end of the 10th week, the *total cumulative* number of requests processed over all 10 weeks reached exactly 1,400,000.

The server's hardware is designed to safely handle a maximum of 215,000 requests in any single week. If the weekly load exceeds this threshold, the server will crash.

- (i) Find the weekly increase in data requests.
- (ii) Determine mathematically if the server will crash within the first 12 weeks. If yes, in which exact week will the crash occur first? Justify your answer using AP formulas.

(3 marks)

8. In an arithmetic progression, the sum of the first p terms is equal to q , and the sum of the first q terms is equal to p (where $p \neq q$).

Using the properties of Arithmetic Progressions, prove that the sum of the first $(p + q)$ terms is equal to $-(p + q)$.

(5 marks)