Class 10 Mathematics · Chapter 5: Arithmetic Progressions

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. The common difference of the AP 17, 11, 5, −1, . . . is [1]

(a) 11 (b) 6
(c) −6 (d) −1

Answer: (c) $d = a_2 - a_1 = 11 - 17 = -6$. (6 subtracts the wrong way round.)

2. The 12th term of the AP 9, 5, 1, . . . is [1]

(a) 53 (b) −39
(c) −35 (d) −31

Answer: (c) $d = 5 - 9 = -4$, so $a_{12} = 9 + 11 \times (-4) = -35$. (−39 is a + 12d; 53 drops the sign of d.)

3. In the AP a, a + d, a + 2d, . . ., the term a + 19d is the [1]

(a) 19th term (b) 20th term
(c) 21st term (d) 18th term

Answer: (b) The kth term carries (k − 1) lots of d, so k − 1 = 19 and k = 20.

4. Which of the following is enough to write down every term of an AP? [1]

(a) its first term and its common difference (b) its common difference alone
(c) its first term alone (d) the number of its terms

Answer: (a) The terms are a, a + d, a + 2d, . . ., so both a and d are needed; either alone fixes nothing else.

5. The sum of the first 25 terms of the AP −4, −4, −4, . . . is [1]

(a) −4 (b) −100
(c) 0 (d) 100

Answer: (b) Here a = −4 and d = 0, so $S_{25} = 25/2\ [2(-4) + 24 \times 0] = -100$.

6. Find k if k + 9, 2k − 1 and 2k + 7 are consecutive terms of an AP. [2]

The middle term is the mean of the other two: $2(2k - 1) = (k + 9) + (2k + 7)$, so $4k - 2 = 3k + 16$ and k = 18. Check: 27, 35, 43 have d = 8.

- sets up $2(2k - 1) = (k + 9) + (2k + 7)$ (1)
- k = 18 (1)

7. The 4th term of an AP is 11 and its 9th term is 31. Find the AP. [2]

a + 3d = 11 and a + 8d = 31. Subtracting, 5d = 20, so d = 4 and a = 11 − 12 = −1. The AP is −1, 3, 7, 11, . . .

- writes both equations and gets d = 4 (1)
- a = −1 and the AP −1, 3, 7, 11, . . . (1)

8. Show that √20, √45, √80, √125 form an AP, and write its next term. [2]

$\sqrt{20} = 2\sqrt{5}$, $\sqrt{45} = 3\sqrt{5}$, $\sqrt{80} = 4\sqrt{5}$, $\sqrt{125} = 5\sqrt{5}$. Differences: √5, √5, √5, all equal, so the list is an AP with $d = \sqrt{5}$. Next term = $6\sqrt{5} = \sqrt{180}$.

- reduces each surd to a multiple of √5 and shows three equal differences √5 (1)
- next term $6\sqrt{5}$ (= √180) (1)

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9. A power-loom unit in Bhiwandi wove 42,000 metres of cloth in its first 15 days of production. Each day it wove 300 metres more than the day before. Find how much it wove on the first day and on the fifteenth day. [3]

The daily outputs form an AP with d = 300, n = 15, S_{15} = 42000. 15/2 [2a + 14 × 300] = 42000 gives 15(a + 2100) = 42000, a + 2100 = 2800, a = 700. Fifteenth day: 700 + 14 × 300 = 4900 metres.

- sets up 15/2 [2a + 14 × 300] = 42000 (1)
- first day 700 m (1)
- fifteenth day 4900 m (1)

10. Find the sum of all the multiples of 11 that lie between 100 and 400. [3]

The multiples run 110, 121, . . ., 396 (the first after 100, the last before 400). 396 = 110 + (n − 1) × 11 gives n − 1 = 26, n = 27. S = 27/2 (110 + 396) = 27 × 253 = 6831.

- first term 110 and last term 396 (1)
- n = 27 (1)
- sum = 6831 (1)

11. The nth term of a list is $a_n = 11 - 4n$. Show that the list is an AP, find which term is −89, and find the sum of the terms up to and including that term. [3]

$a_{n+1} - a_n = [11 - 4(n + 1)] - (11 - 4n) = -4$, fixed, so it is an AP with a = 7, d = −4. 11 − 4n = −89 gives n = 25. S_{25} = 25/2 (7 + (−89)) = 25/2 × (−82) = −1025.

- shows $a_{n+1} - a_n = -4$, so an AP (1)
- −89 is the 25th term (1)
- S_{25} = −1025 (1)

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