

ARITHMETIC PROGRESSION

1. The 6th term of an Arithmetic Progression (AP) is -10 and its 10th term is -26 . Determine the 15th term of the A.P. (CBSE 2005-06, 3 marks)
2. If the sum to first n terms of an A.P. is given by $S_n = n(n+1)$, find the 20th term of the A.P. (CBSE 2006-07, 3 marks)
3. The first term of an A.P. is p and its common difference is q . Find its 10th term. (CBSE 2007-08, 1 mark)
4. For what value of n are the n^{th} terms of two A.P.'s $63, 65, 67, \dots$ and $3, 10, 17, \dots$ equal? (CBSE 2007-08, 3 marks)
5. If m times the m^{th} term of an A.P. is equal to n times its n^{th} term, find the $(m+n)^{\text{th}}$ term of the A.P. (CBSE 2007-08, 3 marks)
6. In an A.P. the first term is 8 , n^{th} term is 33 and sum to first n terms is 123 . Find number of terms and the common difference. (CBSE 2007-08, 3 marks)
7. For what value of p , are $2p-1$, 7 and $3p$ three consecutive terms of an A.P.? (CBSE 2008-09, 1 mark)
8. If S_n the sum of first n terms of an A.P. is given by $S_n = 3n^2 - 4n$, then find its n^{th} term (CBSE 2008-09, 2 marks)
9. The sum of 4th and 8th terms of an A.P. is 24 and sum of 6th and 10th terms is 44 . Find A.P. (CBSE 2008-09, 3 marks)
10. Which term the A.P. $21, 42, 63, 84, \dots$ is 210 ? (CBSE 2011-12, 1 mark)
 (A) 9th (B) 10th
 (C) 11th (D) 12th
11. The n^{th} term of an A.P. is $7 - 4n$ Find its common difference. (CBSE 2011-12, 2 marks)
12. The common difference of the AP $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \dots$ is: (CBSE 2012-13, 1 mark)
 (A) p (B) -1
 (C) $-p$ (D) 1
13. Find the number of terms of the AP $18, 15\frac{1}{2}, 13, \dots, -49\frac{1}{2}$ and find the sum of all its terms. (CBSE 2012-13, 3 marks)
14. If the sum of first 7 terms of an AP is 49 and that of first 17 terms is 289 , find the sum of its first n terms. (CBSE 2012-13, 4 marks)
15. Find the middle term of the A.P. $6, 13, 20, \dots, 216$. (CBSE 2014-15, 2 marks)
16. Find the middle term of the AP $213, 205, 197, \dots, 37$. (CBSE 2014-15, 2 marks)
17. If the sum of first n terms of an A.P. is $\frac{1}{2}(3n^2 + 7n)$, then find its n^{th} term. Hence write its 20th term. (CBSE 2014-15, 3 marks)

18. If S_n denotes the sum of first n terms of an A.P., prove that $S_{30} = 3[S_{20} - S_{10}]$
(CBSE 2014-15, 3 marks)
19. If S_n , denotes the sum of first n terms of an A.P., prove that $S_{12} = 3(S_8 - S_4)$.
(CBSE 2014-15, 3 marks)
20. Find the 9th term from the end (towards the first term) of the A.P. 5, 9, 13,.....,185.
(CBSE 2015-16, 1 mark)
21. How many terms of the A.P. 27, 24, 21,.....should be taken so that their sum is zero?
(CBSE 2015-16, 2 marks)
22. How many terms of the A.P. 65, 60, 55,.....be taken so that their sum is zero?
(CBSE 2015-16, 2 marks)
23. If the sum of first 7 terms of an A.P. is 49 and that of its first 17 terms is 289. find the sum of first n terms of the A.P.
(CBSE 2015-16, 3 marks)
24. The sum of the three numbers in A.P. is 12 and sum of their cubes is 288. Find the numbers.
(CBSE 2015-16, 4 marks)
25. How many terms of the A.P. 18, 16, 14,.....be taken so that their sum is zero?
(CBSE 2015-16, 2 marks)
26. If m^{th} term of an A.P. is $\frac{1}{n}$ and n^{th} term is $\frac{1}{m}$, then find the sum of its first mn terms.
(CBSE 2016-17, 3 marks)
27. Find the sum of n terms of the series $\left(4 - \frac{1}{n}\right) + \left(4 - \frac{2}{n}\right) + \left(4 - \frac{3}{n}\right) + \dots$
(CBSE 2016-17, 3 marks)
28. If the p^{th} term of an A.P. is q and q^{th} term is p , prove that its n^{th} term is $(p + q - n)$.
(CBSE 2016-17, 3 marks)
29. The ratio of the sums of first m and first n terms of an A.P. is $m^2 : n^2$. Show that the ratio of its m^{th} and n^{th} terms is $(2m - 1) : (2n - 1)$.
(CBSE 2016-17, 4 marks)
30. If the sum of first m terms of an A.P. is the same as the sum of its first n terms, shows that the sum of its first $(m + n)$ terms is zero.
(CBSE 2016-17, 4 marks)
31. If the p^{th} term of an A.P. is $\frac{1}{q}$ and q^{th} term is $\frac{1}{p}$, prove that the sum of first pq terms of the A.P. is $\left(\frac{pq+1}{2}\right)$
(CBSE 2016-17, 4 marks)
32. In an A.P. if the common difference $(d) = -4$, and the seventh term (a_7) is 4, then find the first term.
(CBSE 2017-18, 1 mark)
33. The sum of four consecutive numbers in an AP is 32 and the ratio of the product of the first and the last term to the product of two middle terms is 7 : 15. Find the numbers.
(CBSE 2017-18, 4 marks)

34. Which term of the AP 3, 15, 27, 39 _____ will be 120 more than its 21st term?
OR
If S_n the sum of first n terms of an A.P. is given by $S_n = 3n^2 - 4n$, then find its n^{th} term
(CBSE 2018-19, 2 marks)
35. How many two digits natural numbers are divisible by 7
OR
If the sum of first and n terms of an AP is n^2 , then find its 10th term. (CBSE 2018-19, 2 marks)
36. If m times the m^{th} term of an A.P. is equal to n times its n^{th} term, find the $(m + n)^{\text{th}}$ term of the A.P.
OR
The sum of first 3 numbers in an Arithmetic Progression is 18. If the product of first and the third term is 5 times the common difference, find the three number. (CBSE 2018-19, 4 marks)
37. If the sum of first four terms of an AP is 40 and that of first 14 terms is 280. Find the sum of its first n terms. (CBSE 2018-19, 4 marks)
38. The first term of an AP is 3, the last term is 83 and the sum of all its terms is 903. Find the number of terms and common difference of the AP. (CBSE 2018-19, 4 marks)
39. The value of x for which $2x, (x + 10)$ and $(3x + 2)$ are the three consecutive terms of an A.P., is
(A) 6 (B) -6
(C) 18 (D) -18
(CBSE 2019-20, 1 mark)
40. The first term of an AP is p and the common difference is q , then its 10th term is
(A) $q + 9p$ (B) $p - 9q$
(C) $p + 9q$ (D) $2p + 9q$
(CBSE 2019-20, 1 mark)
41. Show that $(a - b)^2, (a^2 + b^2)$ and $(a + b)^2$ are in AP. (CBSE 2019-20, 2 marks)
42. The sum of four consecutive numbers in AP is 32 and the ratio of product of the first and last terms to the product of two middle terms is 7 : 15. Find the numbers. (CBSE 2019-20, 4 marks)
43. Solve: $1 + 4 + 7 + 10 + \dots + x = 287$ (CBSE 2019-20, 4 marks)
44. (a) Find the sum of first 30 terms of AP; -30, -24, -18,.....
(b) In an AP if $S_n = n(4n + 1)$, then find the A.P. (CBSE 2020-21, Term – II, 2 mark)
45. (a) In an AP, if $a = 50$, $d = -4$ and $S_n = 0$, then find the value of n .
OR
(b) Find the sum of the first twelve 2 – digit multiples of 7, using an AP. (CBSE 2020-21, Term – II, 2 mark)
46. (a) Which term of the A.P. 3, 8, 13, 18,.....is 78?
OR
(b) Find the common difference of an A.P. whose n^{th} term is given by $a_n = 6n - 5$. (CBSE 2020-21, Term – II, 2 mark)

47. Find the sum of the first fifteen multiples of 8. (CBSE 2020-21, Term – II, 2 mark)
48. For an AP with common difference 6, the sum of first ten terms is same as four times the sum of first five terms. Determine the first term of the A.P. (CBSE 2020-21, Term – II, 2 mark)
49. Which term of AP : $\frac{11}{4}, \frac{7}{2}, \frac{17}{4}, \dots$ is $\frac{53}{4}$? (CBSE 2020-21, Term – II, 2 mark)
50. (a) Determine the 36th term of the A.P. whose first two terms are –3 and 4 respectively.
OR
(b) Write the next two terms of the A.P.
 $\sqrt{27}, \sqrt{48}, \sqrt{75}, \dots$ (CBSE 2021-22 TERM-II, 2 mark)
51. (a) Which term of the A.P. $-\frac{11}{2}, -3, -\frac{1}{2}, \dots$ is $\frac{49}{2}$?
OR
(b) Find a and b so that the numbers a, 7, b, 23 are in A.P. (CBSE 2021-22 TERM-II, 2 mark)
52. Find the sum of first 20 terms of an A.P. whose nth term is given as $a_n = 5 - 2n$. (CBSE 2021-22 TERM-II, 2 mark)
53. How many natural numbers are there between 1 and 1000 which are divisible by 5 but not by 2? (CBSE 2021-22, TERM-II, 2 mark)
54. Find the sum of first 20 terms of an AP in which $d = 5$ and $a_{20} = 135$. (CBSE 2021-22, TERM-II, 2 mark)
55. For what value of 'n', are the nth terms of the APs : 9, 7, 5, and 15, 12, 9, the same? (CBSE 2021-22, TERM-II, 2 mark)
56. Find the sum of first 16 terms of the A.P. whose nth term is given by $a_n = 5n - 3$. (CBSE 2021-22 TERM-II, 3 mark)
57. If the last term of an A.P. of 30 terms is 119 and the 8th term from the end (towards the first term) is 91, then find the common difference of the A.P. Hence, find the sum of all the terms of the A.P. (CBSE 2021-22, TERM-II, 3 mark)
58. In Mathematics, relations can be expressed in various ways. The matchstick patterns are based on linear relations. Different strategies can be used to calculate the number of matchsticks used in different figures.
One such pattern is shown below. Observe the pattern and answer the following questions using Arithmetic Progression:



Figure 1

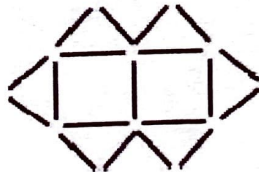


Figure 2

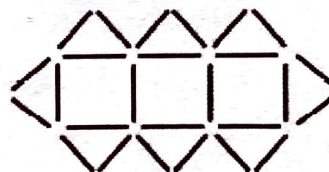


Figure 3

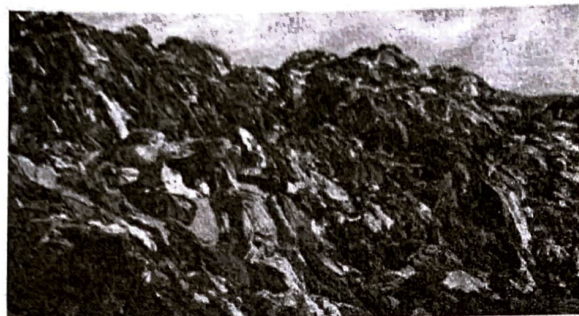
.....

- (a) Write the AP for the number of triangles used in the figures. Also, write the nth term of this A.P. (CBSE 2020-21, Term – II, 4 mark)
- (b) Which figure has 61 matchsticks?



59. Do you know old clothes which are thrown as waste not only fill the landfill site but also produce very harmful greenhouse gas. So, it is very important that we reuse old clothes in whatever way we can.

The picture given below on the right, shows a footmate (rug) made out of old t-shirts yarn. Observing the picture, you will notice that a number of stitches in circular rows are making a pattern: 6, 12, 18, 24,.....



- (a) Check whether the given pattern forms an AP. If yes, find the common difference and the next term of the AP.

- (b) Write the n^{th} term of the AP. Hence, find the number of stitches in the 10th circular row.

(CBSE 2020-21, Term – II, 4 mark)

60. If the sum of the first n terms of an A.P. be $3n^2 + n$ and its common difference is 6, then its first term is

(CBSE 2022-23, 1 mark)

- (A) 2 (B) 3
(C) 1 (D) 4

61. If a, b, c form an A.P. with common difference d , then the value of $a - 2b - c$ is equal to ____.

(CBSE 2022-23, 1 mark)

- (A) $2a + 4d$ (B) 0
(C) $-2a - 4d$ (D) $-2a - 3d$

62. The next term of the A.P.: $\sqrt{6}, \sqrt{24}, \sqrt{54}$ is:

(CBSE 2022-23, 1 mark)

- (A) $\sqrt{60}$ (B) $\sqrt{96}$
(C) $\sqrt{72}$ (D) $\sqrt{216}$

63. How many terms are there in the A.P. given below?

14, 19, 24, 29, ..., 119

(CBSE 2022-23, 1 mark)

- (A) 18 (B) 14
(C) 22 (D) 21

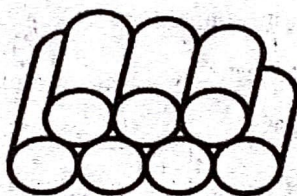
64. **Assertion (A):** a, b, c are in A.P. if and only if $2b = a + c$

Reason (R): The sum of first n odd natural numbers is n^2 .

(CBSE 2022-23, 1 mark)

- (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 and 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. 19.

65. How many terms are there in an A.P. whose first and fifth terms are -14 and 2 , respectively and the last term is 62 .
(CBSE 2022-23, 3 marks)
66. Which term of the A.P.: $65, 61, 57, 53$, is the first negative term?
(CBSE 2022-23, 3 marks)
67. The ratio of the 11^{th} term to the 18^{th} term of an A.P. is $2 : 3$. Find the ratio of the 5^{th} term to the 21^{st} term. Also, find the ratio of the sum of first 5 terms to the sum of first 21 terms.
(CBSE 2022-23, 5 marks)
68. If the sum of first 6 terms of an A.P. is 36 and that of the first 16 terms is 256 , find the sum of first 10 terms.
(CBSE 2022-23, 5 marks)
69. The ratio of the 11^{th} term to 17^{th} term of an A.P. is $3 : 4$. Find the ratio of 5^{th} term to 21^{st} term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms.
(CBSE 2022-23, 5 marks)
70. 250 logs are stacked in the following manner:
 22 logs in the bottom row, 21 in the next row, 20 in the row next to it and so on (as shown by an example). In how many rows, are the 250 logs placed and how many logs are there in the top row?



(Example)

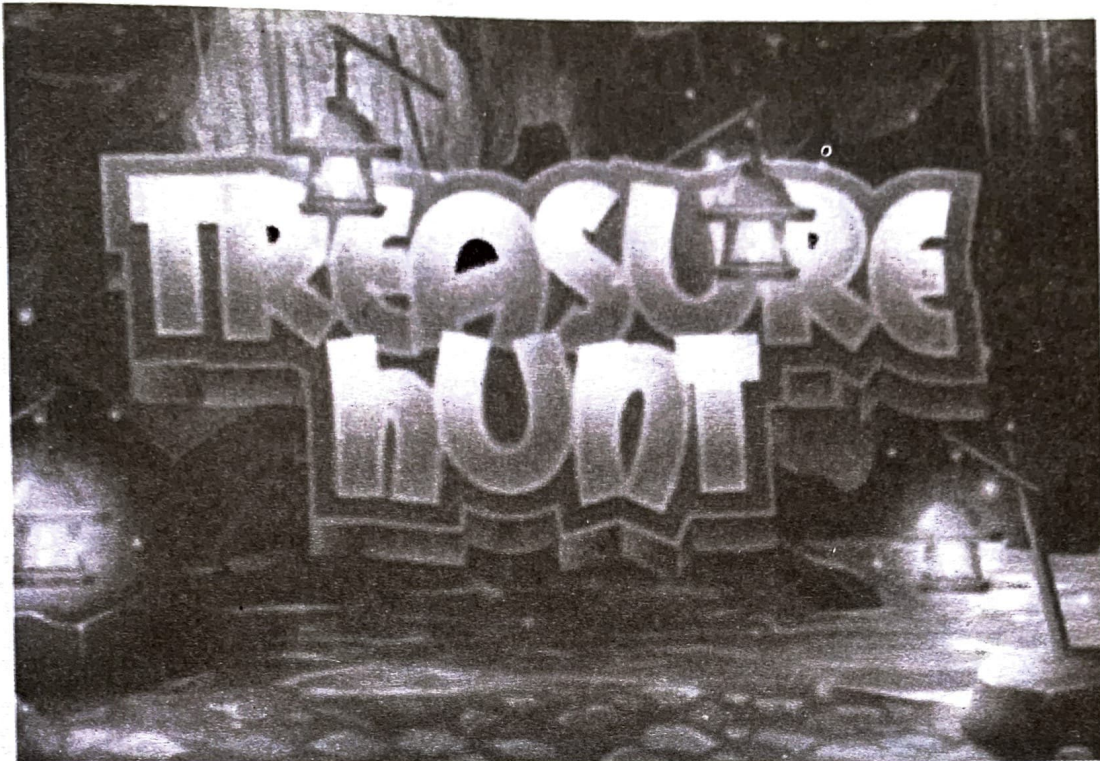
- (CBSE 2022-23, 5 marks)
71. The sum of the first 8 terms of an A.P. is 100 and the sum of its first 19 terms is 551 . Find the sum of its first ' n ' terms.
(CBSE 2022-23, 5 marks)
72. If the sum of the first p terms of an A.P. is the same as the sum of its first q terms, ($p \neq q$), then show that the sum of its first $(p + q)$ terms is zero.
(CBSE 2022-23, 5 marks)
73. In A.P., if the first term $a = 7$, n^{th} term $a_n = 84$ and the sum of first n terms $S_n = \frac{2093}{2}$, then n is equal to:
(A) 22 (B) 24
(C) 23 (D) 26
(CBSE 2023-24, 1 Mark)
74. The common difference of an A.P. in which $a_{15} - a_{11} = 48$ is:
(A) 12 (B) 16
(C) -12 (D) -16
(CBSE 2023-24, 1 Mark)
75. Which term of the A.P. $-29, -26, -23, \dots, 61$ is 16 ?
(A) 11^{th} (B) 16^{th}
(C) 10^{th} (D) 31^{st}
(CBSE 2023-24, 1 Mark)



76. The common difference of the A.P. $\frac{1}{2x}, \frac{1-4x}{2x}, \frac{1-8x}{2x}, \dots$ is: (CBSE 2023-24, 1 Mark)
(A) $-2x$ (B) -2
(C) 2 (D) $2x$
77. Three numbers in A.P. have the sum 30. What is its middle term? (CBSE 2023-24, 1 Mark)
(A) 4 (B) 10
(C) 16 (D) 8
78. The next (4^{th}) term of the A.P. $\sqrt{18}, \sqrt{50}, \sqrt{98}, \dots$ is: (CBSE 2023-24, 1 Mark)
(A) $\sqrt{128}$ (B) $\sqrt{140}$
(C) $\sqrt{162}$ (D) $\sqrt{200}$
79. The number of terms in the A.P. 3, 6, 9, 12, ..., 111 is: (CBSE 2023-24, 1 Mark)
(A) 36 (B) 40
(C) 37 (D) 30
80. (a) If the sum of the first 14 terms of an A.P. is 1050 and the first term is 10, then find the 20^{th} term and the n^{th} term. (CBSE 2023-24, 3 Marks)
OR
(b) The first term of an A.P. is 5, the last term is 45 and the sum of all the terms is 400. Find the number of terms and the common difference of A.P.
81. (a) If the sum of first m terms of an A.P. is same as sum of its first n terms ($m \neq n$), then show that the sum of its first $(m + n)$ terms is zero. (CBSE 2023-24, 3 Marks)
OR
(b) In an A.P., the sum of three consecutive terms is 24 and the sum of their squares is 194. Find the numbers.
82. (a) If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of its first 20 terms. (CBSE 2023-24, 3 Marks)
OR
(b) The ratio of the 10^{th} term to its 30^{th} term of an A.P. is 1 : 3 and the sum of its first six terms is 42. Find the first term and the common difference of A.P.
83. (a) The sum of first and eighth terms of an A.P. is 32 and their product is 60. Find the first term and common difference of the A.P. Hence, also find the sum of its first 20 terms. (CBSE 2023-24, 5 Marks)
OR
(b) In an A.P. of 40 terms, the sum of first 9 terms is 153 and the sum of last 6 terms is 687. Determine the first term and common difference of A.P. Also, find the sum of all the terms of A.P.

Case study

84. Treasure Hunt is an exciting and adventurous game where participants follow a series of clues/numbers/maps to discover hidden treasures. Players engage in thrilling quest, solving puzzles and riddles to unveil the location of the coveted prize. While playing a treasure hunt game, some clues (numbers) are hidden in various spots collectively forming an A.P. If the number on the n^{th} spot is $20 + 4n$, then answer the following questions to help the players in spotting the clues: (CBSE 2023-24, 4 Marks)



- (i) Which number is on first spot?
- (ii) (a) Which spot is numbered as 112?
OR
(b) What is the sum of all the numbers on the first 10 spots?
- (iii) Which number is on the $(n - 2)^{\text{th}}$ spot?