

2. SEQUENCES AND SERIES OF REAL NUMBERS

Example problems

- Write the first three terms in a sequence whose n^{th} term is given by $C_n = \frac{n(n+1)(2n+1)}{6} \quad \forall n \in \mathbb{N}$
- Write the first five terms of each of the following sequences.
 - $a_1 = -1 \quad a_n = \frac{a_{n-1}}{n+2} \quad n > 1 \text{ and } \forall n \in \mathbb{N}$
 - $F_1 = F_2 = 1 \text{ and } F_n = F_{n-1} + F_{n-2}, n = 3, 4, \dots$
- Which of the following sequences are in an A.P? (i) $2/3, 4/5, 6/7 \dots$ (ii) $3m-1, 3m-3, 3m-5 \dots$
- Find the first term and common difference of the A.P (i) $5, 2, -1, -4 \dots$ (ii) $1/2, 5/6, 7/6, 3/2, \dots, 17/6$
- Find smallest positive integer n such that t_n of the arithmetic sequence $20, 19\frac{1}{4}, 18\frac{1}{2} \dots$ is negative?
- In a flower garden, there are 23 rose plants in the first row, 21 in the second row and 19 in the third row and so on. There are 5 rose plants in the last row. How many rows are there in the flower garden?
- If a person joins his work in 2010 with an annual salary of Rs.30, 000 and receives an annual increment of 600 every year, in which year, will his annual salary be Rs.39, 000?
- Three numbers are in the ratio 2: 5: 7. If 7 are subtracted from the second, the resulting numbers form an arithmetic sequence. Determine the numbers.
- Which of the following sequences are geometric sequences
 - 5, 10, 15, 20...
 - 0.15, 0.015, 0.0015....
 - $\sqrt{7}, \sqrt{21}, 3\sqrt{7}, 3\sqrt{21}, \dots$
- Find the common ratio and the general term of the following geometric sequences.
 - $2/5, 6/25, 18/125 \dots$
 - 0.02, 0.006, 0.0018 ...
- The 4th term of a geometric sequence is $2/3$ and the seventh term is $16/81$ Find the geometric sequence.
- The number of bacteria in a certain culture doubles every hour. If there were 30 bacteria present in the culture initially, how many bacteria will be present at the end of 14th hour?
- An amount Rs. 500 is deposited in a bank which pays annual interest at the rate of 10% Compounded annually. What will be the value of this deposit at the end of 10th year?
- The sum of first three terms of a geometric sequence is $13/12$ and their product is 1. Find the common ratio and the terms.

15. If a, b, c, d are in geometric sequence, then prove that $(b-c)^2 + (c-a)^2 + (d-b)^2 = (a-d)^2$
16. Find the sum of the arithmetic series $5 + 11 + 17 + \dots + 95$.
17. Find the sum of the first $2n$ terms of the following series. $1^2 - 2^2 + 3^2 - 4^2 + \dots$
18. In an arithmetic series, the sum of first 14 terms is -203 and the sum of the next 11 terms is -572 . Find the arithmetic series.
19. How many terms of the arithmetic series $24 + 21 + 18 + 15 + \dots$ be taken continuously so that their sum is -351 .
20. Find the sum of all 3 digit natural numbers, which are divisible by 8.
21. The measures of the interior angles taken in order of a polygon form an arithmetic sequence. The least measurement in the sequence is 85° . The greatest measurement is 215° . Find the number of sides in the given polygon.
22. Find the sum of the first 25 terms of the geometric series $16 - 48 + 144 - 432 + \dots$
23. Find S_n for each of the geometric series described below:
 i) $a = 2, t_6 = 486, n = 6$ (ii) $a = 2400, r = -3, n = 5$
24. In the geometric series $2 + 4 + 8 + \dots$, starting from the first term how many consecutive terms are needed to yield the sum 1022?
25. The first term of a geometric series is 375 and the fourth term is 192. Find the common ratio and the sum of the first 14 terms.
26. A geometric series consists of four terms and has a positive common ratio. The sum of the first two terms is 8 and the sum of the last two terms is 72. Find the series.
27. Find the sum to n terms of the series $6 + 66 + 666 + \dots$
28. An organization plans to plant saplings in 25 streets in a town in such a way that one sapling for the first street, two for the second, four for the third, eight for the fourth street and so on. How many saplings are needed to complete the work?
29. Find the sum of the following series
 $26 + 27 + 28 + \dots + 60$ (ii) $1 + 3 + 5 + \dots$ to 25 terms (ii) $31 + 33 + \dots + 53$.
30. Find the sum of the following series (i) $1^2 + 2^2 + 3^2 + \dots + 25^2$ (ii) $12^2 + 13^2 + 14^2 + \dots + 35^2$
 (iii) $1^2 + 3^2 + 5^2 + \dots + 51^2$
31. Find the sum of series (i) $1^3 + 2^3 + 3^3 + \dots + 20^3$ (ii) $11^3 + 12^3 + 13^3 + \dots + 28^3$
32. Find the value of k , if $1^3 + 2^3 + 3^3 + \dots + k^3 = 4356$
33. (i) if $1 + 2 + 3 + \dots + n = 120$, find $1^3 + 2^3 + 3^3 + \dots + n^3$ (ii) if $1^3 + 2^3 + 3^3 + \dots + n^3 = 36100$ then find $1 + 2 + 3 + \dots + n$.
34. Find the total area of 14 squares whose sides are 11 cm, 12 cm, -----, 24 cm, respectively.