

Sequences and Series — Assignment 2

Class 11 Maths · Higher-difficulty challenge set + integrated problems · Answer key included · Narayan Gurukul Academy

Instructions: (1) Attempt all questions; start with the topic-wise challenge set, then attempt the integrated (multi-topic) problems.
(2) Give all answers with correct SI units. $g = 10 \text{ m/s}^2$ unless stated.
(3) A final answer key is provided at the end — try the full set before checking it.

Part A — Topic-wise challenge questions

Sequences and Series — Basics

1. Write the first four terms of the sequence $a_n = 2n + 1$.
2. Find the sum of the first three terms of the sequence $a_n = n^2$.
3. Find the first five terms of the sequence defined by $a_n = (-1)^n 2^n$.

Arithmetic Progression (AP)

1. Find the 10th term of the AP 2, 5, 8, ...
2. Find the sum of the first 20 terms of the AP 1, 3, 5, ...
3. Find the sum of all natural numbers between 100 and 500 which are divisible by 7.

Geometric Progression (GP)

1. Find the 6th term of the GP 3, 6, 12, ...
2. Find the sum of the first 5 terms of the GP 1, 2, 4, ...
3. The 3rd term of a GP is 24 and the 6th term is 192. Find the GP and its 8th term.

Arithmetic Mean and Geometric Mean

1. Find the AM and GM of 4 and 9.
2. Insert two arithmetic means between 3 and 15.
3. Prove that $AM \geq GM$ for two positive numbers a and b .

Sum of Special Series

1. Find the sum of the first 10 natural numbers.
2. Find the sum of the squares of the first 10 natural numbers.
3. Find the sum of the series $1^2 + 2^2 + 3^2 + \dots + 20^2$.

Properties of AP and GP

1. If 2, x , 8 are in AP, find x .
2. If 2, x , 8 are in GP, find x .
3. Show that if each term of a GP is multiplied by a non-zero constant, the result is still a GP with the same common ratio.

Part B — Integrated problems (multi-topic)

1. Find the 10th term of the AP 2, 5, 8, ...
2. Find the sum of the first 20 terms of the AP 1, 3, 5, ...
3. The 3rd term of a GP is 24 and the 6th term is 192. Find the GP and its 8th term.
4. Find the AM and GM of 4 and 9.
5. Find the sum of the series $1^2 + 2^2 + 3^2 + \dots + 20^2$.

Answer Key

Sequences and Series — Basics

$a_n = 2n + 1$: 3, 5, 7, 9. Sum of first three of n^2 : $1 + 4 + 9 = 14$. $a_n = (-1)^n 2^n$: -2, 4, -8, 16, -32.

Arithmetic Progression (AP)

10th term = $2 + 9 \times 3 = 29$. Sum of first 20 of 1, 3, 5, ... = $20/2[2 + 19 \times 2] = 400$. Numbers 105 to 497 divisible by 7: $n = 57$, sum = $57/2[105 + 497] = 17157$.

Geometric Progression (GP)

6th term = $3 \times 2^5 = 96$. Sum of first 5 of 1, 2, 4, ... = 31. GP: 3rd term $ar^2 = 24$, 6th term $ar^5 = 192$ $\Rightarrow r^3 = 8$, $r = 2$, $a = 6$; 8th term = $6 \times 2^7 = 768$.

Arithmetic Mean and Geometric Mean

AM = $(4 + 9)/2 = 6.5$, GM = $\sqrt{36} = 6$. Two AMs between 3 and 15: 7 and 11. AM $\geq$ GM follows from $(\sqrt{a} - \sqrt{b})^2 \geq 0$.

Sum of Special Series

$\sum n = 55$. $\sum n^2 = 385$. $1^2 + \dots + 20^2 = 20 \times 21 \times 41/6 = 2870$.

Properties of AP and GP

AP: $2x = 2 + 8 \Rightarrow x = 5$. GP: $x^2 = 16 \Rightarrow x = 4$ (positive). A constant multiple of a GP is a GP with the same ratio.

Integrated problems

1: 29. 2: 400. 3: GP 6, 12, 24, ...; 8th term 768. 4: AM = 6.5, GM = 6. 5: 2870.