

Sequence and Series - Set 1

Daily Practice Problems (DPP)

Instructions for Solving the DPP (Daily Practice Problems)

1. Purpose of the DPP

- This DPP is designed to strengthen concept clarity for both **JEE Main** and **JEE Advanced**.
- Problems are arranged in increasing order of difficulty:
 - **Level-1:** JEE Main oriented
 - **Level-2:** Mixed Main + Advanced
 - **Level-3:** JEE Advanced oriented

2. How to Attempt the DPP

1. Read the theory from your notes before attempting the problems.
2. Do not jump between questions; solve sequentially unless instructed otherwise.
3. For each question, write:
 - Key concept involved
 - Formula used
 - Corrected approach if you made an error
4. Maintain a separate **DPP Mistake Notebook**.

3. Recommended Time Allocation

- Total time per DPP: **45–60 minutes**
- Follow the recommended per-question time:
 - Single Correct / Objective: **1–2 minutes**
 - Numerical Value: **2–3 minutes**
 - Integer Type: **3–4 minutes**
 - Advanced Multi-Correct: **4–6 minutes**
 - Paragraph (Advanced): **6–8 minutes**
- Mark questions exceeding time limit with a star (*) and revisit after finishing the DPP.

4. Best Practices for Scoring Higher

- Focus on accuracy first, then speed.
- Review every calculation step—most mistakes arise from small algebraic slips.
- Solve advanced problems only after finishing Main-level questions for the chapter.
- Revise solved DPPs weekly and note repeating mistake patterns.
- Use short notes for formulas, special results, and commonly used approximations.
- After solving, compare your approach with the official solution or teacher's method.
- Build endurance by solving at least one DPP in exam-like conditions daily.

5. Evaluation Guidelines

- Award yourself:
 - **+4 / -1** for JEE Main pattern questions.
 - **Partial marking** for JEE Advanced style multi-correct.
- Maintain a cumulative score record for every DPP set.
- Track:
 - Chapters with highest accuracy
 - Chapters needing revision
 - Time taken per DPP
 - Common error types

6. Weekly Review Checklist

- Reattempt the unsolved or incorrect problems from the past 5–7 DPPs.
- Update your formula sheet and mistake notebook.
- Solve at least one mixed-topic DPP to test retention.

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Multiple Choice Questions

- If $21(x^2 + y^2 + z^2) = (x + 2y + 4z)^2$ then x, y, z are in:
 - Arithmetic progression (A.P.)
 - Geometric progression (G.P.)
 - Harmonic progression (H.P.)
 - None of these
- If $a_1, a_2, \dots, a_n$ are in H.P. and $f(k) = \sum_{r=1}^n a_r - a_k$, then the sequence $\frac{a_1}{f(1)}, \frac{a_2}{f(2)}, \dots, \frac{a_n}{f(n)}$ is in:
 - A.P.
 - G.P.
 - H.P.
 - None of these
- The coefficient of x^{n-2} in $(x-1)(x-2)\cdots(x-n)$ is:
 - $\frac{n(n^2-1)(3n+2)}{24}$
 - $\frac{n(n-1)(n-2)}{6}$
 - $-\frac{n(n+1)(3n-2)}{24}$
 - $\frac{n(n^2-1)(n+2)}{12}$
- The sum to infinity of the series

$$1 + 2\left(1 - \frac{1}{n}\right) + 3\left(1 - \frac{1}{n}\right)^2 + \dots$$

is:

- n
 - n^2
 - $\frac{n^2}{2}$
 - $\frac{n(n+1)}{2}$
- If $a, a_1, a_2, \dots, a_{2n}, b$ are in A.P. and $g_1, \dots, g_{2n}$ form a G.P. and h is the H.M. of a and b , then

$$\frac{a_1 + a_{2n}}{g_1 g_{2n}} + \frac{a_2 + a_{2n-1}}{g_2 g_{2n-1}} + \dots + \frac{a_n + a_{n+1}}{g_n g_{n+1}}$$

equals:

- $\frac{n}{h}$
 - $\frac{2n}{h}$
 - $\frac{n+1}{h}$
 - $\frac{h}{2n}$
- Let

$$S = \frac{8}{5} + \frac{16}{65} + \frac{32}{2^8 + 1} + \dots + \frac{128}{2^{18} + 1}.$$

Then

- $S = \frac{1088}{545}$
- $S = \frac{544}{545}$

- (c) $S = \frac{1088}{1090}$
 (d) None of these

7. If p th, q th and r th terms of an A.P. are in G.P. with common ratio k , then the root (other than 1) of

$$(q-r)x^2 + (r-p)x + (p-q) = 0$$

is:

- (a) k
 (b) k^2
 (c) $2k$
 (d) None of these

8. If a, b, c, d, e, x are real and

$$(a^2 + b^2 + c^2 + d^2)x^2 - 2(ab + bc + cd + de)x + (b^2 + c^2 + d^2 + e^2) \leq 0,$$

then a, b, c, d, e are in:

- (a) G.P.
 (b) Arithmetic-geometric progression (A.G.P.)
 (c) A.P.
 (d) H.P.

9. If $5^{1+x} + 5^{1-x}, \frac{a}{2}, 25^x + 25^{-x}$ are in A.P., then the set of values of a is:

- (a) $(-\infty, 12)$
 (b) $[12, \infty)$
 (c) $(0, 12)$
 (d) $\{12\}$

10. Consider an infinite G.P. with first term A and common ratio r . Its sum is 4 and the second term is $\frac{3}{4}$. Then (A, r) equals:

- (a) $\left(\frac{3}{4}, \frac{1}{4}\right)$
 (b) $\left(3, \frac{1}{4}\right)$
 (c) $\left(1, \frac{3}{4}\right)$
 (d) $\left(4, \frac{3}{16}\right)$

11. $\sum_{r=1}^n r \cdot (r!)$ equals:

- (a) $(n+1)! - 2$
 (b) $(n+1)! - 1$
 (c) $(2n+1)! - 5$
 (d) $(n+2)! - 1$

12. If $a_1, \dots, a_n$ are positive real numbers with product c , the minimum of

$$a_1 + a_2 + \dots + a_{n-1} + 2a_n$$

is:

- (a) $n(2c)^{1/n}$
 (b) $(n+1)c^{1/n}$

(c) $2nc^{1/n}$

(d) $(n+1)(2c)^{1/n}$

13. If $\alpha \in \left(0, \frac{\pi}{2}\right)$, the expression

$$\sqrt{x^2} + x + \frac{\tan^2 \alpha}{\sqrt{x^2} + x}$$

is always $\geq$:

(a) $2 \tan \alpha$

(b) 1

(c) 2

(d) $\sec^2 \alpha$

Integer Type Questions

1. If ab^2c^3 , $a^2b^3c^4$, $a^3b^4c^5$ are in A.P. ($a, b, c > 0$) then the minimum value of $a + b + c$ is:

2. If $a_i > 0$ for $i = 1, 2, \dots, 50$ and $a_1 + \dots + a_{50} = 50$, then the minimum value of

$$\frac{1}{a_1} + \frac{1}{a_2} + \dots + \frac{1}{a_{50}}$$

is:

3. If $\log_2(a+b) + \log_2(c+d) \geq 4$, then the minimum value of $a + b + c + d$ is:

4. The sum of the products of ten numbers $\pm 1, \pm 2, \pm 3, \pm 4, \pm 5$ taken two at a time is:

5. If the sum of the first $2n$ terms of $2, 5, 8, \dots$ equals the sum of the first n terms of $57, 59, 61, \dots$, then n equals: