

PROGRESSIONS – HARMONIC PROGRESSION (FOUNDATION → PLACEMENT LEVEL)

1. WHAT IS A HARMONIC PROGRESSION (HP)?

A Harmonic Progression (HP) is a sequence of numbers whose reciprocals form an Arithmetic Progression (AP). HP questions are generally direct and easy to score in placement exams if the concept is clear.

2. KEY RULE (MOST IMPORTANT)

- There is NO direct formula for n^{th} term or sum of HP
- Always convert HP into AP by taking reciprocals
- Solve the AP, then take reciprocal again

3. THREE TERMS IN HP (VERY IMPORTANT)

If a, b, c are three terms in HP, then the middle term b is given by: $b = 2ac / (a + c)$

4. SOLVED EXAMPLES

- Example 1: Find next term of HP: $1, \frac{1}{2}, \frac{1}{3} \rightarrow$ Next term = $\frac{1}{4}$
- Example 2: Find middle term of HP: $2, ?, 8 \rightarrow$ Middle term = $\frac{16}{5}$
- Example 3: Find middle term between 4 and 12 in HP \rightarrow Middle term = 6
- Example 4: Find next term of HP: $1, \frac{1}{3}, \frac{1}{5} \rightarrow$ Next term = $\frac{1}{7}$

5. PRACTICE QUESTIONS (HOMEWORK)

- 1. Find the next term of HP: $1, \frac{1}{4}, \frac{1}{7}, \dots$
- 2. Find the middle term of HP: $6, ?, 24$
- 3. Find the middle term between 10 and 40 in HP
- 4. If $a, b, 20$ are in HP, find b
- 5. Find the next term of HP: $1, \frac{1}{5}, \frac{1}{9}, \dots$

6. ANSWERS (FOR SELF-CHECK)

- 1. $\frac{1}{10}$
- 2. 9.6
- 3. 16
- 4. $\frac{40}{3}$
- 5. $\frac{1}{13}$