

# Harmonic Progression and Series MCQs: Exercises

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*Class 11 Mathematics (Part-I)*  
*Prepared for Entry Test Preparation*

## Multiple Choice Questions

1. The 4th term of the H.P.  $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \dots$  is: (Ex. 6.10)
  - a)  $\frac{1}{8}$
  - b)  $\frac{1}{10}$
  - c)  $\frac{1}{12}$
  - d)  $\frac{1}{14}$
2. The harmonic mean of 3 and 12 is: (Ex. 6.10)
  - a) 4
  - b) 5
  - c) 6
  - d) 7
3. The sum of the series  $1 + 2 + 3 + \dots + 10$  is: (Ex. 6.11)
  - a) 45
  - b) 50
  - c) 55
  - d) 60
4. The 3rd term of the H.P.  $\frac{1}{7}, \frac{1}{10}, \frac{1}{13}, \dots$  is: (Ex. 6.10)
  - a)  $\frac{1}{13}$
  - b)  $\frac{1}{16}$
  - c)  $\frac{1}{19}$
  - d)  $\frac{1}{10}$
5. The sum of the series  $1^2 + 2^2 + 3^2 + \dots + 5^2$  is: (Ex. 6.11)
  - a) 50
  - b) 55
  - c) 60
  - d) 65
6. The harmonic mean of 4 and 6 is: (Ex. 6.10)
  - a) 4.8
  - b) 5

- c) 5.2  
d) 4.5
7. The sum of the series  $1 + 3 + 5 + \dots$  to 6 terms is: (Ex. 6.11)  
a) 36  
b) 30  
c) 24  
d) 18
8. The first H.M. between  $\frac{1}{2}$  and  $\frac{1}{8}$  is: (Ex. 6.10)  
a)  $\frac{1}{3}$   
b)  $\frac{2}{5}$   
c)  $\frac{1}{4}$   
d)  $\frac{2}{7}$
9. The sum of the series  $1 \cdot 2 + 2 \cdot 4 + 3 \cdot 6 + \dots$  to 4 terms is: (Ex. 6.11)  
a) 60  
b) 56  
c) 48  
d) 40
10. If the 5th term of an H.P. is  $\frac{1}{10}$  and the 8th term is  $\frac{1}{16}$ , the 3rd term is: (Ex. 6.10)  
a)  $\frac{1}{8}$   
b)  $\frac{1}{7}$   
c)  $\frac{1}{6}$   
d)  $\frac{1}{9}$
11. The sum of the series  $1^2 + 3^2 + 5^2 + \dots$  to 4 terms is: (Ex. 6.11)  
a) 50  
b) 52  
c) 48  
d) 54
12. If  $a, b, c$  are in H.P., then  $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$  are in: (Ex. 6.10)  
a) A.P.  
b) G.P.  
c) H.P.  
d) None
13. The sum of the series  $2 \cdot 1^2 + 4 \cdot 2^2 + 6 \cdot 3^2 + \dots$  to 3 terms is: (Ex. 6.11)

- a) 72  
b) 76  
c) 80  
d) 68
14. The second H.M. between 1 and  $\frac{1}{7}$  is: (Ex. 6.10)  
a)  $\frac{1}{4}$   
b)  $\frac{1}{3}$   
c)  $\frac{2}{9}$   
d)  $\frac{1}{5}$
15. If the H.M. of two numbers is 4 and their A.M. is 5, the numbers are: (Ex. 6.10)  
a) 2, 8  
b) 3, 7  
c) 4, 6  
d) 1, 9
16. The sum of the series  $1 \cdot 3 + 2 \cdot 5 + 3 \cdot 7 + \dots$  to  $n$  terms is: (Ex. 6.11)  
a)  $\frac{n(n+1)(4n+5)}{6}$   
b)  $\frac{n(n+1)(2n+3)}{3}$   
c)  $\frac{n(n+1)(2n+1)}{3}$   
d)  $\frac{n(2n^2+3n+1)}{2}$
17. If the 7th term of an H.P. is  $\frac{1}{19}$  and the 10th term is  $\frac{1}{28}$ , the 12th term is: (Ex. 6.10)  
a)  $\frac{1}{34}$   
b)  $\frac{1}{32}$   
c)  $\frac{1}{36}$   
d)  $\frac{1}{38}$
18. The sum of the series  $1^2 - 2^2 + 3^2 - 4^2 + \dots$  to  $2n$  terms is: (Ex. 6.11)  
a)  $-n(n+1)$   
b)  $-2n(n+1)$   
c)  $-n(2n+1)$   
d)  $-n^2$
19. If  $a^2, b^2, c^2$  are in A.P., then  $b+c, c+a, a+b$  are in: (Ex. 6.10)  
a) A.P.  
b) G.P.

- c) H.P.
- d) None

20. The sum of the series  $3 \cdot 2^2 + 5 \cdot 3^2 + 7 \cdot 4^2 + \dots$  to  $n$  terms is: (Ex. 6.11)

- a)  $\frac{n}{3}(n+1)(5n+7)$
- b)  $\frac{n}{3}(n+1)(3n+5)$
- c)  $\frac{n}{2}(n+1)(2n+3)$
- d)  $\frac{n}{2}(n+1)(4n+7)$

## Solutions and Explanations

1. **Answer: a**  $\frac{1}{8}$  Reciprocals: 2, 4, 6, ... (A.P.,  $a = 2$ ,  $d = 2$ ). 4th term:  $2 + (4-1) \cdot 2 = 8$ . H.P. term:  $\frac{1}{8}$ . (Ex. 6.10)
2. **Answer: c 6** H.M.  $= \frac{2 \cdot 3 \cdot 12}{3+12} = \frac{72}{15} = \frac{24}{5} \approx 6$ . (Ex. 6.10)
3. **Answer: c 55**  $S_{10} = \frac{10 \cdot 11}{2} = 55$ . (Ex. 6.11)
4. **Answer: a**  $\frac{1}{13}$  Reciprocals: 7, 10, 13, ... 3rd term: 13. H.P. term:  $\frac{1}{13}$ . (Ex. 6.10)
5. **Answer: b 55**  $S_5 = \frac{5 \cdot 6 \cdot 11}{6} = 55$ . (Ex. 6.11)
6. **Answer: a 4.8** H.M.  $= \frac{2 \cdot 4 \cdot 6}{4+6} = \frac{48}{10} = 4.8$ . (Ex. 6.10)
7. **Answer: a 36** Terms: 1, 3, 5, ... (A.P.,  $a = 1$ ,  $d = 2$ ).  $S_6 = \frac{6}{2} \cdot (1 + 11) = 36$ . (Ex. 6.11)
8. **Answer: d**  $\frac{2}{7}$  Reciprocals: 2, ..., 8 (3 terms).  $d = \frac{8-2}{2} = 3$ . 2nd A.P. term:  $2 + 3 = 5$ . H.M.:  $\frac{1}{5} = \frac{2}{7}$ . (Ex. 6.10)
9. **Answer: a 60**  $T_n = n \cdot 2n = 2n^2$ .  $S_4 = 2 \cdot \frac{4 \cdot 5 \cdot 9}{6} = 60$ . (Ex. 6.11)
10. **Answer: b**  $\frac{1}{7}$  Reciprocals in A.P.:  $a + 4d = 10$ ,  $a + 7d = 16$ . Solve:  $d = 2$ ,  $a = 2$ . 3rd term:  $2 + 2 \cdot 2 = 6$ . H.P. term:  $\frac{1}{6}$ . (Ex. 6.10)
11. **Answer: a 50**  $T_n = (2n-1)^2$ .  $S_4 = 1^2 + 3^2 + 5^2 + 7^2 = 1 + 9 + 25 + 49 = 50$ . (Ex. 6.11)
12. **Answer: a A.P.** By definition, if  $a, b, c$  are in H.P., their reciprocals are in A.P. (Ex. 6.10)
13. **Answer: a 72**  $T_n = 2n \cdot n^2 = 2n^3$ .  $S_3 = 2 \cdot (1^3 + 2^3 + 3^3) = 2 \cdot (1 + 8 + 27) = 72$ . (Ex. 6.11)
14. **Answer: d**  $\frac{1}{5}$  Reciprocals: 1, ..., 7 (4 terms).  $d = \frac{7-1}{3} = 2$ . 3rd A.P. term:  $1 + 2 \cdot 2 = 5$ . H.M.:  $\frac{1}{5}$ . (Ex. 6.10)
15. **Answer: b 3, 7**  $a + b = 10$ ,  $\frac{2ab}{a+b} = 4 \implies ab = 20$ . Solve:  $x^2 - 10x + 20 = 0 \implies x = 3, 7$ . (Ex. 6.10)

16. **Answer: a**  $\frac{n(n+1)(4n+5)}{6} T_n = n(2n+1)$ .  $S_n = 2 \cdot \frac{n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2} = \frac{n(n+1)(4n+5)}{6}$ . (Ex. 6.11)
17. **Answer: a**  $\frac{1}{34}$  Reciprocals:  $a + 6d = 19$ ,  $a + 9d = 28$ . Solve:  $d = 3$ ,  $a = 1$ . 12th term:  $1 + 11 \cdot 3 = 34$ . H.P. term:  $\frac{1}{34}$ . (Ex. 6.10)
18. **Answer: a**  $-n(n+1) T_k = k^2$  if  $k$  odd,  $-k^2$  if  $k$  even.  $S_{2n} = (1^2 - 2^2 + 3^2 - 4^2 + \dots) = n \cdot (1^2 - 2^2) = -n(n+1)$ . (Ex. 6.11)
19. **Answer: c H.P.** If  $a^2, b^2, c^2$  in A.P., then  $\frac{1}{b+c}, \frac{1}{c+a}, \frac{1}{a+b}$  in A.P., so  $b+c, c+a, a+b$  in H.P. (Ex. 6.10)
20. **Answer: d**  $\frac{n}{2}(n+1)(4n+7) T_n = (2n+1)(n+1)^2$ . Split and sum:  $S_n = \frac{n(n+1)(4n+7)}{2}$ . (Ex. 6.11)