Unit 5 · Sequence and Series

WORKSHEET

Full marks 42

Name _____ Class _____ Roll no. _____ Date _____ Marks _____ / 42

1 Key words [4]

Fill in the blanks with words from the box. Two words in the box are not needed. Each blank carries 0.5 mark.

arithmetic mean	**common difference**	**common ratio**	**converges**	**general term**
geometric mean	**harmonic**	**harmonic mean**	**sequence**	**series**

A list of numbers in a definite order is a _____; the sum of its terms is a _____. In an AP, any term minus the one before is the _____; in a GP, any term divided by the one before is the _____. A sequence whose reciprocals are in AP is _____. For positive a and b, $\sqrt{ab}$ is their _____ and $\frac{a+b}{2}$ their _____. An infinite GP with $|r|<1$ _____ to $\frac{a}{1-r}$.

2 True or false [3]

Write ✓ for a true statement and ✗ for a false one. Correct the false ones.

i. For any series, $t_n = S_n - S_{n-1}$ when $n \geq 2$. ☐

ii. 2, 6, 18, 54 is an arithmetic sequence. ☐

iii. $1 - 1 + 1 - 1 + \cdots = \frac{1}{1-(-1)} = \frac{1}{2}$. ☐

iv. For two unequal positive numbers, $A > G > H$. ☐

v. A bus that goes 40 km/h one way and 60 km/h back averages 50 km/h. ☐

vi. If a, b, c are in HP, then $2b = a + c$. ☐

3 Multiple choice [6]

Choose the correct option for each of the following questions.

i. The harmonic mean of two positive numbers a and b is: [1]

a. $\frac{a+b}{2}$ **b.** $\sqrt{ab}$

c. $\frac{2ab}{a+b}$ **d.** $\frac{a+b}{2ab}$

ii. The 10th term of the AP 7, 4, 1, … is: [1]

a. -23 **b.** -20

c. -17 **d.** 20

iii. The common ratio of the GP $\sqrt{2}, 2, 2\sqrt{2}, \ldots$ and its 7th term are: [1]

a. 2 and 64 **b.** $\sqrt{2}$ and $8\sqrt{2}$

c. $\sqrt{2}$ and 16 **d.** 2 and $8\sqrt{2}$

iv. How many terms of the AP 3, 7, 11, ... must be added to make 300? [1]

a. 10 **b.** 12

c. 15 **d.** 75

v. The A.M. of two positive numbers is 10 and their G.M. is 8. The numbers are: [1]

a. 16 and 4 **b.** 12 and 8

c. 18 and 2 **d.** 10 and 8

vi. The sum of $1 + \frac{2}{3} + \frac{4}{9} + \cdots$ to infinity is S, and the sum of its terms in even places, $\frac{2}{3} + \frac{8}{27} + \cdots$, is E. Then E is: [1]

a. $\frac{S}{2}$ **b.** $\frac{6}{5}$

c. $\frac{9}{5}$ **d.** 3

4 Short answers [13]

Write short answers to the following questions.

a. Insert three harmonic means between $\frac{1}{2}$ and $\frac{1}{10}$. [2]

b. Pratik writes: "$1 + \frac{3}{2} + \frac{9}{4} + \cdots = \frac{1}{1 - \frac{3}{2}} = -2$." Explain what is wrong, in two ways. [3]

c. Express $1.2\overline{34}$ (that is, 1.23434...) as a fraction in its lowest terms. [3]

d. For two positive numbers a and b, show that $G^2 = AH$. **[2]**

e. The G.M. of two positive numbers is 6 and their H.M. is $\frac{36}{7}$. Find the numbers. **[3]**

5 Structured question **[5]**

Answer all the parts.

The sum of the first n terms of a series is $S_n = 3n^2 + 2n$.

a. Show that it is an AP, and find its first term and common difference. [3]

b. Find the sum of its 11th to 20th terms. [2]

6 Long question **[8]**

Write a long answer to the following question.

A patient takes 500 mg of a medicine every 8 hours. By the time of the next dose, a quarter of the medicine in the body is left; the rest has been removed.

a. Find the amount in the body just after the 1st, 2nd and 3rd doses. [2]

b. Show that just after the nth dose it is $\frac{2000}{3}\left(1 - \frac{1}{4^n}\right)$ mg. [3]

c. What amount does it settle at, just after each dose, over a long treatment? What dose would make that level 800 mg? [3]

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https://science-playground.com/learn/grade-11-math/sequence-and-series

7 Think [3]

A family borrows Rs 20,00,000 at 10% a year, charged each month at a twelfth of that, and repays Rs 21,492 at the end of each month for 15 years. How much of the first installment is interest, and how much repays the loan? How much interest does the family pay in all? Why does paying a little extra in the first years save so much?

8 Activity: Recurring decimals as geometric series (not marked)

For each decimal, write the repeating part as a GP, then add it up.

Decimal	First term a	Ratio r	Fraction
$0.\overline{7}$			
$0.\overline{36}$			
$0.4\overline{5}$			
$0.\overline{142857}$			

How does the length of the repeating block decide the ratio? Check each fraction on a calculator.