

# Sequences and Series: Patterns That Add Up

Grade 11 – Algebra 2 math · Test Answer Key · Standards: A-SSE.B.4, F-BF.A.2, F-IF.A.3

Each answer lists the formula, the substitution and a scoring guide. Give partial credit for a correct method with an arithmetic error, and add the points for a total out of 20.

**Standards:** A-SSE.B.4, F-BF.A.2, F-IF.A.3 · **Level:** Grade 11 Algebra 2

## Question 1 Classify and write a rule (2 points)

- a. Each term is half the previous one: **geometric,  $r = 1/2$ .**
- b.  $d = 5$ , so  $a_n = 8 + 5(n - 1) = \mathbf{5n + 3}$ .

*Scoring: 1 point per part.*

## Question 2 Arithmetic sequence analysis (3 points)

- a.  $a_n = -8 + 5.5(n - 1) = \mathbf{5.5n - 13.5}$ .
- b.  $a_{40} = 5.5(40) - 13.5 = \mathbf{206.5}$ .
- c.  $5.5n - 13.5 = 47$  gives  $5.5n = 60.5$ , so  $\mathbf{n = 11}$ .

*Scoring: 1 point per part.*

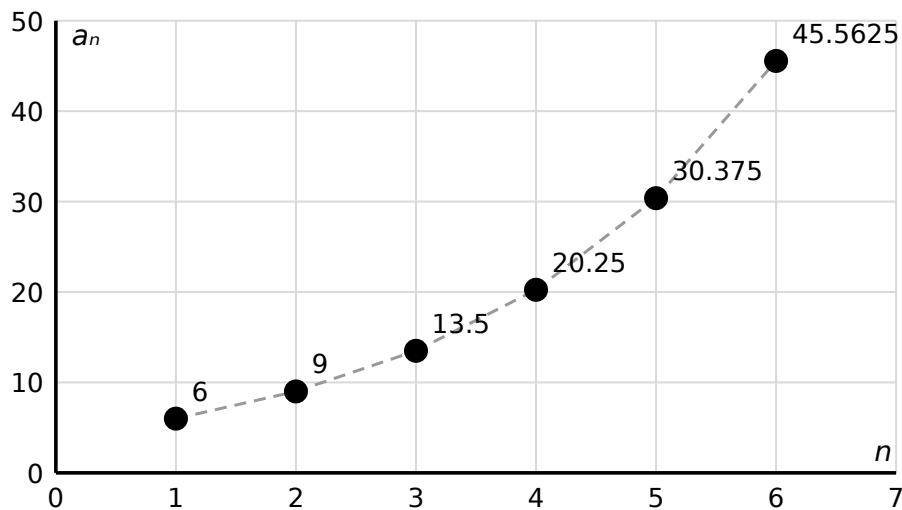
## Question 3 Recursive terms (2 points)

$a_2 = 3(5) - 4 = 11$ ,  $a_3 = 3(11) - 4 = 29$ ,  $a_4 = 3(29) - 4 = 83$ . **5, 11, 29, 83.**

*Scoring: 1 point for two correct terms, 1 point for all four.*

## Question 4 Geometric sequence from a graph (3 points)

- a.  $9 \div 6 = \mathbf{1.5}$ .
- b.  $\mathbf{a_n = 6(1.5)^{n-1}}$ .
- c.  $a_6 = 6(1.5)^5 = 6 \cdot 7.59375 = \mathbf{45.5625}$ .



The sequence continues to  $a_6 = 45.5625$ .

Scoring: 1 point per part.

#### Question 5 Arithmetic series (2 points)

$a_n = 15 + 4(n - 1) = 95$  gives  $4(n - 1) = 80$ , so  $n = 21$ .  $S_{21} = 21(15 + 95)/2 = 21 \cdot 55 = \mathbf{1155}$ .

Scoring: 1 point for  $n$ , 1 point for the sum.

#### Question 6 Geometric sigma sum (2 points)

$a_1 = 5$ ,  $r = 0.4$ ,  $n = 6$ .  $S_6 = 5(1 - 0.4^6)/0.6 = 5(0.995904)/0.6 = 8.2992$ .  $\approx \mathbf{8.30}$ .

Scoring: 1 point for the setup, 1 point for the value.

#### Question 7 Write and evaluate a sigma sum (2 points)

The rule is  $4k + 1$ , and  $4k + 1 = 57$  gives  $k = 14$ . Notation:  $\sum_{k=1}^{14} (4k + 1)$ . Sum =  $14(5 + 57)/2 = \mathbf{434}$ .

Scoring: 1 point for the notation, 1 point for the sum.

#### Question 8 Savings plan (2 points)

$S = 150(1.004^{30} - 1)/0.004 = 150 \cdot 31.8068$ .  $\approx \mathbf{\$4,771.01}$ .

Scoring: 1 point for the formula, 1 point for the value.

#### Question 9 Stacked pipes (2 points)

The rows form an arithmetic series: 20, 18, ..., 6 with  $n = 8$ .  $S_8 = 8(20 + 6)/2 = \mathbf{104}$  pipes.

*Scoring: 1 point for the formula, 1 point for the total.*