

Name: _____

Class: _____

Recursive Sequences

General Form: $t_n = t_1 r^{n-1}$

Common Ratio: $r = \frac{t_i}{t_{i-1}} \quad i > 1$

1. For each of the following sequences, write the first 5 terms:

(a) $a_1 = 4$ and $a_n = n + a_{n-1} + 6$

(d) $a_1 = 5$ and $a_n = n^2 - a_{n-1}$

(b) $a_1 = 0$ and $a_n = a_{n-1} - n^2$

(e) $a_1 = 4, a_2 = 2$ and $a_n = a_{n-1} - a_{n-2}$

(c) $a_1 = 2$ and $a_n = (a_{n-1})^2 + 2$

(f) $a_1 = 1, a_2 = 3$ and $a_n = a_{n-1} \times a_{n-2}$

2. For each of the following sequences:

i write as an explicit rule

ii write as a recursive rule

iii find the 43^{rd} term

(a) $9, 1, -7, -15, \dots$

(c) $\frac{\pi}{4}, \pi, \frac{7\pi}{4}, \frac{5\pi}{2}, \dots$

(e) Geometric: $a_1 = \sqrt[3]{4}, r = \sqrt[3]{2}$

(b) $40, -20, 10, -5, \dots$

(d) Geometric: $a_1 = 2, r = 10$

(f) Arithmetic: $a_1 = 14, d = \frac{1}{2}$

3. Write the equation of the general term of an arithmetic sequence $t_n = t_1 + (n - 1)d$ as a recursive rule.

4. Write the equation of the general term of a geometric sequence $t_n = t_1 r^{n-1}$ as a recursive rule.

5. You have just bought a new swimming pool and need to add chlorine to the water. You add 750mL of chlorine the first week and 350mL every week thereafter. Each week 40% of the chlorine in the pool evaporates.
- (a) Write a recursive rule for the amount of chlorine in the pool each week. How much chlorine is in the pool at the beginning of the sixth week?

(b) What happens to the amount of chlorine after an extended period of time?

6. Give an example of a sequence in which each term after the third term is a function of the three terms preceding it. Write a recursive rule for the sequence and find the first 8 terms.

7. You can define a sequence using a piece-wise rule. The following is an example of a piece-wise defined sequence:

$$a_n = \begin{cases} 7 & \text{if } n = 1 \\ \frac{a_{n-1}}{2} & \text{if } a_{n-1} \text{ is even} \\ 3a_{n-1} + 1 & \text{if } a_{n-1} \text{ is odd} \end{cases}$$

(a) Write the first ten terms of the sequence.

(b) Choose three different values for a_1 (other than $a_1 = 7$). For each value of a_1 , find the first ten terms of the sequence. What conclusions can you make about the behavior of this sequence?

8. How many sequences of 0s and 1s of length 19 are there that begin with a 0, end with a 0, contain no two consecutive 0s, and contain no three consecutive 1s? (2019 AMC 10B Problems/Problem 25)(try to solve using a recursive rule)

(A) 55 (B) 60 (C) 65 (D) 70 (E) 75