

1. Calculate the first five terms of each sequence.

(a) $a_n = \frac{n(n+1)}{2}$

(b) $a_n = \frac{2^n}{n!}$

(c) $a_n = (-1)^n$

(d) $a_n = \left(1 + \frac{1}{n}\right)^n$

2. Give a formula for the general term a_n of each sequence:

(a) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \dots$

Solution: $a_n = \frac{1}{2n}, n = 1, 2, 3, \dots$

(b) $1, -\frac{1}{2}, \frac{1}{3}, -\frac{1}{4}, \frac{1}{5}, -\frac{1}{6}, \dots$

Solution: $a_n = \frac{(-1)^{n+1}}{n}, n = 1, 2, 3, \dots$

(c) $1, 3, 9, 27, 81, \dots$

Solution: $a_n = 3^n, n = 0, 1, 2, 3, \dots$

3. Use a calculator to compute the first 10 terms of the sequence $a_0 = 0, a_{n+1} = a_n^2 + \frac{1}{4}$

4. Define the Collatz sequence by $C_{n+1} = \begin{cases} \frac{1}{2}C_n & \text{if } C_n \text{ is even} \\ 3C_n + 1 & \text{if } C_n \text{ is odd} \end{cases}$

Investigate the behavior of this sequence for various starting values C_0 .