Geometric Sequences

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Sequences

There are two types of sequences we will consider, *arithmetic* and *geometric*. Regardless of the type of sequence, we will call the general term of the sequence t_n and the first term, $t_1 = a$. The value n is the *position* of the term in the sequence. When writing the term of a sequence, there are two ways: A formula for the *general term* t_n in terms of n and a *recursive* formula for t_n that involves the previous, t_{n-1} term. Let's start with arithmetic sequences.

Geometric sequences

A *geometric sequence* can be thought of a sequence of numbers where the next number, or term, in the sequence, is the previous value or term multiplied by a fixed value, r, say. Let's consider a few examples to see this idea explicitly.

$$\begin{aligned} S_1 &= 3, 6, 12, 24, 48, 96, \ldots \\ S_2 &= 2, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, \ldots \\ S_3 &= 2, -2, 2, -2, 2, -2, 2, -2 \ldots \end{aligned}$$

If we look at the three geometric sequences above in greater detail we see that for,
sequence S_1, the sequence starts at 3 and each term is multiplied by 2;
sequecne S_2, the sequence starts at 2 and each term is multiplied by $1/2$;
sequence S_3, the sequence starts at 2 and each term is multiplied by $-$‘.
We call the value that the sequence starts at a and the factor that the sequence changes by r. The *general term* for a geometric sequence is given by,

$$t_n = ar^{n-1}$$

The *recursive* formula for a geometric sequence is given by,

$$t_n = t_{n-1}r$$

Exercises

Given a and r, write out the first 6 terms of the geometric sequences.

a) $a = 6,\ r = 1/3$

b) $a = -2,\ r = -1$

c) $a = 3,\ r = 5$

d) $a = 4,\ r = 1/2$

e) $a = 3,\ r = 1/5$

f) $a = -2,\ r = -3$

g) $a = 1/2,\ r = 2$

h) $a = 3,\ r = 3/4$

i) $a = 1/3,\ r = 2/3$