Arithmetic 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.

Arithmetic sequences

An **arithemic sequence** can be thought of a sequence of numbers where the next number, or term, in the sequence, is the previous value or term plus a fixed value, d, say. Let's consider a few examples to see this idea explicitly.

$$\begin{aligned} S_1 &= 1, 3, 5, 7, 9, 11, 13, 15, \ldots \\ S_2 &= 2, 7, 12, 17, 22, 27, 32, 37, \ldots \\ S_3 &= 6, 3, 0, -3, -6, -9, -12, -15, \ldots \end{aligned}$$

If we look at the three arithmetic sequences above in greater detail we see that for,
sequence S_1, the sequence starts at 1 and each term is increasing by 2;
sequecne S_2, the sequence starts at 2 and each term is increasing by 5;
sequence S_3, the sequence starts at 6 and each term is decreasing by -3.
We call the value that the sequence starts at a and the amount that the sequence changes by d. The *general term* for an arithmetic sequence is given by,

$$t_n = a + (n-1)d$$

The *recursive* formula for an arithmetic sequence is given by,

$$t_n = t_{n-1} + d$$

Exercises

Given a and d below, write out the first 6 terms of the arithmetic sequences.

a) $a = 0,\ d = 2$

b) $a = 3,\ d = 3$

c) $a = -2,\ d = -4$

d) $a = 1,\ d = -1$

e) $a = -1,\ d = 1$

f) $a = -3,\ d = 1/2$

g) $= -a = 2,\ d = 2/3$

h) $a = 4,\ d = -3/4$

i) $a = 1/2,\ d = 6$

j) $a = 3/4,\ d = -10$