



Equations for Sequences

Arithmetic Sequences

The equation for an arithmetic sequence is: $t(n) = mn + b$ or $a_n = mn + a_0$ where n is the term number, m is the sequence generator (the common difference), and b or a_0 is the zeroth term. Compare these equations to a continuous linear function $f(x) = mx + b$ where m is the growth (slope) and b is the starting value (y-intercept).

For example, the arithmetic sequence 4, 7, 10, 13, ... could be represented by $t(n) = 3n + 1$ or by $a_n = 3n + 1$. (Note that “4” is the first term of this sequence, so “1” is the zeroth term.)

Another way to write the equation of an arithmetic sequence is by using the first term in the equation, as in $a_n = m(n - 1) + a_1$, where a_1 is the first term. The sequence in the example could be represented by $a_n = 3(n - 1) + 4$.

You could even write an equation using any other term in the sequence. The equation using the fourth term in the example would be $a_n = 3(n - 4) + 13$.

Geometric Sequences

The equation for a geometric sequence is: $t(n) = ab^n$ or $a_n = a_0 \cdot b^n$ where n is the term number, b is the sequence generator (the multiplier or common ratio), and a or a_0 is the zeroth term. Compare these equations to a continuous exponential function $f(x) = ab^x$ where b is the growth (multiplier) and a is the starting value (y-intercept).

For example, the geometric sequence 6, 18, 54, ... could be represented by $t(n) = 2 \cdot 3^n$ or by $a_n = 2 \cdot 3^n$.

You can write a first term form of the equation for a geometric sequence as well: $a_n = a_1 \cdot b^{n-1}$. For the example, first term form would be $a_n = 6 \cdot 3^{n-1}$.