Hi, my name is Anthony Varela. And today, we're going to introduce arithmetic sequences. So first I'm going to talk about what a sequence is. Then we'll talk about an arithmetic sequence. And then we'll be using a formula for arithmetic sequences to solve some problems.

So what is a sequence? Well, here's an example of what a sequence looks like in mathematics, and it is a set of numbers in a specific order. So this sequence happens to be what we call a "finite sequence" because there are a limited number of terms. There are only five terms in this sequence.

We also have what we call "infinite sequences." And this has an unlimited number of terms. So here we notice that this sequence is all of our perfect squares-- 1, 4, 9, 16 25. And there are, of course, many, many, many more, 36, 49, and so on and so forth. There are an infinite number of terms in this sequence. So sequences can be finite, with a limited number of terms, or infinite, having an unlimited number of terms.

So what's an "arithmetic sequence" then? Well. Here's an example of an arithmetic sequence. And an arithmetic sequence is a set of numbers in numerical order with a common difference between each term. So you've heard me say "term" before. And a "term" when we're talking about sequences refers to the place, or the order of a number in a sequence, such as first, second, third, et cetera. So the number 1 is the first term in this sequence. The number 4 is the second term in this sequence. The number 7 is the third term in this sequence, so on and so forth.

And then you heard me talk about "common difference." What is "common difference"? Well, taking a look at the values in our arithmetic sequence, to get from one term to the next, I have to add 3. So to get from 4 to 7, I add 3. To get from 7 to 10, I add three. And to get from 10 to 13, I add 3.

So the common difference is the numerical distance between any two consecutive terms in an arithmetic sequence. And it's a constant value. You see, in this case, the common difference is always three from one term to the next. So with arithmetic sequences, we have that common difference. That's important to know.

So how can I use then this common difference to find, let's say, the next two terms in this sequence? Well, I would just add 3 to 13, and then add 3 again. So the next two terms of the sequence would be 16 and 19.

Now, what if I want to find, for example, the 63rd term in this sequence? What's the value of the 63rd term? Well, it wouldn't be very much fun to continuously add 3 and keep track of how many times I'm doing that until I get to the 63rd term. So we use a formula to do this.

So here's the formula to find the value of a term in an arithmetic sequence. So let's break down these components. a sub n equals the value of the nth term. So that means a sub one would be the value of the first term because that it would be when n equals 1. d is the common difference. And n is the term number. So first, second, third, et cetera. So we're going to write that down. That's an important formula to know.

So let's take a look at an arithmetic sequence and develop the formula defined the nth term, or the value of the nth term. So here is our formula. a sub n equals a sub 1 plus d multiplied by the quantity n minus 1. So right off the bat, I'm going to go ahead and identify the first term, that is 7, so I can make that replacement right there.

Now let's figure out the common difference. So what's the common difference? I can choose any two consecutive terms in my sequence. So I'm just going to choose 11 and 15. And I notice that the common difference then is a positive 4 because I have to add 4 to get from 11 to 15. So d equals 4. And that's it. There is my formula-- a sub n equals 7 plus 4 times n minus 1.

Let's do another example, a different sequence here. And it's easy to identify a sub 1. That's just the first term here in the sequence. So that's 19.

Now let's find the common difference. So, once again, I can choose any two consecutive terms. And to get from 19 to 14, I have to subtract 5. So you can see here the common difference can be negative. So our d then is a negative 5. So I'm going to write in 19 minus 5 times n minus 1. So that is the formula to find the value of the nth term with this particular sequence.

All right. So now let's use this formula. So here we're given the formula to find the nth term of a sequence. We want to find the 11th term. That's what a sub 11 means. So what I'm going to do then is just replace n with 11. So a sub 11 equals 3 plus 2 times 11 minus 1.

Well, that would be 3 plus 2 times 10. We can just multiply it by 2. So it'd be 3 plus 20. So a sub 11 then equals 23. Now, what this means is that for the arithmetic sequence described by this formula, of the 11th term is 23.

Let's use the formula to find something else. Here we want to find n. So that would be the number of the term. So this statement here says that 53 is the value of the nth term to a sequence and we want to find out that value for n.

So this is very much like just solving a multi-step equation that you're probably familiar with. So the first thing we want to do is distribute that 2 into both n and negative 1. So distributing the 2, I have 53 equals 3 plus 2n minus 2.

Well, now I have some like-terms I can combine. So 53 equals 2n plus 1. Now I'm going to subtract 1 from both sides of my equation to have 52 equals 2n. And, finally, I divide both sides of my equation by 2 so that n equals 26. So this tells me that the value of the 26th term is 53.

So let's review our introduction to arithmetic sequences. A sequence is a set of numbers in a specific order. And there can be finite sequences or infinite sequences, limited or unlimited number of terms in that sequence. And we talked about arithmetic sequences today, which have a common difference between one term and the next. And we introduced a formula to find the value of the nth term in a sequence.

So thanks for watching this tutorial on an introduction to arithmetic sequences. Hope to see you next time.