Today we're going to talk about arithmetic sequences. In mathematics, a sequence is a set of numbers that follow a particular order. So I've got two examples of sequences behind me. The first one, 0, 2, 4, 6, 8, dot dot dot, is an example of an infinite sequence, because there are an infinite or unlimited number of values in its set. Whereas this example of a sequence, 5, 10, 15, 20, is a finite sequence, because it has a limited number of values in its set.

When we're talking about sequences, we refer to their terms, where the term is the place that a number is in the sequence. So in this sequence, 0 is the first term, 2 is the second term, and on and on. And here, 5 is the first term, 10 is the second term, and so one. So we're going to talk about what exactly makes a sequence arithmetic, and then we're going to do some examples.

Behind me is an example of an arithmetic sequence. An arithmetic sequence is a set of numbers in numerical order, with a common difference between each term. And your common difference is just the numerical distance between any two consecutive numbers in an arithmetic sequence. So let's see what that looks like with our example.

So the numerical distance between any two consecutive numbers, or our common difference, is going to be 6, because every time I go to the next number, I'm adding 6. So this will be an arithmetic sequence, because it has a common difference of 6. And we can see, again, that the common difference, or the distance between the consecutive numbers is 6. So if we want to find the next two numbers in our arithmetic sequence, we can continue our pattern of adding our common difference. So 23 plus 6 is going to give us 29, and 29 plus 6 is going to give us 35. And we can continue on with that for as long as we want.

So in our last example, we saw that it's pretty easy to use the common difference to find the next couple of values in an arithmetic sequence. But what if you wanted to find the hundredth value, or the thousandth? You wouldn't want to keep using your common difference to do this. So instead we have a formula. This would be good to get into your notes.

So our formula is An is equal to A1, plus d times n minus 1. And our value for An is the value of the nth term. A1 is going to be your first term. D is your common difference, and N it is the number of terms in your sequence. So let's do some examples using this formula with arithmetic sequences.

So let's do a couple of examples, writing a formula for any arithmetic sequences. So here's my general form for my formula, and here's my first sequence. I'll need to figure out what the first term is, and what the common difference is. So the first term is easy to see. It starts with 8. And to find the common difference, if you can't see it by just looking at the pattern of numbers. What you can do is take any value in your sequence and subtract from it the value that's right in front of it.

So I'm going to pick 38, and subtract the number in front of it, 23. 38 minus 23 is going to give me 15, which means my common difference, or my value for D in my formula will be 15.

So as I said before, my first term is 8, so I'm ready to write my formula. We'll have An is equal to 8, plus 15, times-- in parentheses-- n minus 1. So if I wanted to use this formula to find the hundredth number in my sequence, I could simply put 100 in here for my n, and then simplify to figure out what the hundredth term would be.

Let's do a second example. So here I'm going to-- I can see that my first term is 35. I'm going to pick a term. Pick two terms and subtract to find a common difference. So I'm going to pick 27, and subtract from it the number in front of it. So 27 minus 31. Since the number I'm subtracting is bigger than the original value, I can see that it's going to be a negative number. And this is going to give me negative 4. So that means my common difference is negative 4.

And so we can write our formula as An is equal to my first term, 35. And I could even write plus negative 4, but I'm just going to write minus 4. And then n minus 1, in parentheses.

So for my last two examples I'm going to start with an arithmetic sequence formula, An is equal to 5 plus 5 times n minus 1. And I'm going to show you two different things that you can do with the formula. So the first thing is you could find the nth term in a sequence.

So for this example, I want to find the 20th term in the sequence. So I can see that my n value is going to be 20. So I'm going to substitute 20 in for the n in this equation in the formula.

So I'll have A20 is equal to 5 plus 5 times 20, minus 1. Simplifying this, I'm going to start with my, parentheses 20 minus 1 is going to give me 19 19. And I'll bring down the rest of my equation. Five times 19 is going to give me 95.

And then for my last step I just need to add 5 plus 95 will give me 100. So I found that the 20th term in this sequence is 100. The second thing that I can do when I have a formula is to figure out n. So the place that a number or term has in the sequence. So I know that there's a term in my sequence that is 1,250. I want to know is that the 10th term, is that the 100th term? And so I can use my formula to figure that out.

So here I'm going substitute 1,250 in for my An. 5 plus 5 times n minus one. So I need to solve for n. So to do that I'm going to start by subtracting 5 from both sides, and that will give me 1,245. These have canceled. So I just have five times n minus 1. Now I could distribute this 5 to both things in the parentheses by multiplying, but I'm just going to go ahead and cancel it out by dividing on both sides.

Again, those will cancel, and on this side I'll have 249 is equal to n minus 1. To isolate n, I just need to cancel out subtracting one. I'll add 1 to both sides. And I'll just have n is equal to 250. So I found that the term, or the number 1,250 is the 250th term in my sequence.

So let's look at our key points from today. We defined an arithmetic sequence as a set of numbers in numerical order with a common difference. And we said that the common difference is the numerical distance between any two consecutive terms in an arithmetic sequence. So we then looked at a formula that you can use, given any arithmetic sequence, to find either the nth term, given n, or defined n, given the nth term.

So I hope that these examples and key points helped you understand a little bit more about arithmetic sequences. Keep practicing, and keep using your notes, and soon you'll be a pro. Thanks for watching.