

Linear Sequences - PDF Copy

The presentation contains the slides below with the objective of showing how to: a. Find terms in a sequence for a given n^{th} term rule b. Find the n^{th} term rule for a linear sequence. There are animated explanations and problems with answers,

Finding the n^{th} Term Rule for a Linear Sequence

Objectives:
Find terms in a sequence for a given n^{th} term rule
Find the n^{th} term rule for a linear sequence

Level D/C Topic

The n^{th} term rule enables us to find the value of a term from its position in a sequence.

Here is an example

We would write this as $2n + 1$

The n^{th} term rule is: $2 \times \text{position} + 1$

The word **position** is replaced by n in the rule

For these positions, the rule gives these terms

Position	1	2	3	4	5	40
Term	3	5	7	9	11	81

So if, for example, we were told that the n^{th} term rule for a sequence was $3n + 2$ and were asked to find the first five terms and the 20th term, we would find these like this:

1st term $3 \times 1 + 2 = 5$

2nd term $3 \times 2 + 2 = 8$

3rd term $3 \times 3 + 2 = 11$

4th term $3 \times 4 + 2 = 14$

5th term $3 \times 5 + 2 = 17$

20th term $3 \times 20 + 2 = 62$

The first five terms and the 20th term for the n^{th} term rule $3n + 2$

Find the first five terms and the 20th term for the n^{th} term rule $5n + 2$ which means $5 \times n + 2$

1st term $5 \times 1 + 2 = 7$

2nd term $5 \times 2 + 2 = 12$

3rd term $5 \times 3 + 2 = 17$

4th term $5 \times 4 + 2 = 22$

5th term $5 \times 5 + 2 = 27$

20th term $5 \times 20 + 2 = 102$

The first five terms and the 20th term for the n^{th} term rule $5n + 2$

Find the first five terms and the 20th term for these n^{th} term rules:

- $2n + 3$
- $3n + 1$
- $4n + 3$
- $3n - 1$
- $5n - 4$
- $3n - 5$
- $10 - n$
- $7 - 2n$

☆ 1 ☆ 2 ☆ 3 ☆ 4 ☆ 5

Find the first five terms and the 20th term for these n^{th} term rules:

- $2n + 3$ 5, 7, 9, 11, 13... ..43
- $3n + 1$ 4, 7, 10, 13, 16... ..61
- $4n + 3$ 7, 11, 15, 19, 23... ..83
- $3n - 1$ 2, 5, 8, 11, 14... ..59
- $5n - 4$ 1, 6, 11, 16, 21... ..96
- $3n - 5$ -2, 1, 4, 7, 10,55
- $10 - n$ 9, 8, 7, 6, 5... ..10
- $7 - 2n$ 5, 3, 1, -1, -3... ..-33

Finding the n^{th} Term for a Linear Sequence

Level 6 maths requires you to have the ability to find the n^{th} term rule and describe this in words. The sequences that you can be asked to find the n^{th} term rule for, however, can only be linear sequences.

A linear sequence is one where the term-to-term rule is constantly adding or subtracting the same number. Here are two examples

3, 7, 11, 15...
+4 +4 +4

10, 7, 4, 1...
-3 -3 -3

Here are the first five terms of a linear sequence.
5, 9, 13, 17, 21...

If we were asked to find the 50th term, we could continue the sequence, but it would be much better to find the n^{th} term rule and then use this to calculate the value of the 50th term.

The rule will be a number times n plus or minus some other number like this: $n \times n$

We need to find these two numbers

Here are the first five terms of a linear sequence.
5, 9, 13, 17, 21...

First find the difference between the terms
 $9 - 5 = 4$
 $13 - 9 = 4$
 $17 - 13 = 4$
etc

Next, subtract the difference from the first term
 $5 - 4 = 1$

The difference is the number that multiplies n so the number is 4

The n^{th} rule is $4n + 1$

Check that the rule works

This answer is the other number

We don't need to write in the x sign

It can seem a bit tricky to start with so here is another example of how to find the n^{th} term rule

8, 13, 18, 23, 28

The number is the difference between the terms.
 $13 - 8 = 5$
 $18 - 13 = 5$
 $23 - 18 = 5$
 $28 - 23 = 5$

The number is first term minus the difference
 $8 - 5 = 3$

The n^{th} rule is $5n + 3$

We don't need to write in the x sign

In words: The n^{th} rule is 5 times n plus 3

Check that the rule works

☆ 6 ☆ 7 ☆ 8 ☆ 9 ☆ 10

Here is another example of how to find the n^{th} term rule when the second number is negative

2, 5, 8, 11, 14...

This number is the difference between the terms.
 $5 - 2 = 3$
etc

The number is the first term minus the difference
 $2 - 3 = -1$

The n^{th} rule is $3n - 1$

We don't need to write in the x sign

In words: The n^{th} rule is 3 times n subtract 1

Check that the rule works

Find the n^{th} term rule for each sequence

3, 5, 7, 9, 11... $2n + 1$
+2 +2 +2 +2 The n^{th} term rule is $2 \times n + 1$

5, 8, 11, 14, 17... $3n + 2$
+3 +3 +3 The n^{th} term rule is $3 \times n + 2$

3, 7, 11, 15, 19... $4n - 1$
+4 +4 +4 The n^{th} term rule is $4 \times n - 1$

Find the n^{th} term rule for of these linear sequences and then use it to find the 20th term

Sequence	n^{th} term rule	20 th term
1. 7, 12, 17, 22, 27...		
2. 5, 7, 9, 11, 13...		
3. 7, 13, 19, 25, 31...		
4. 9, 16, 23, 30, 37...		
5. 2, 5, 8, 11, 14...		
6. 3, 8, 13, 18, 23...		
7. 2, 8, 14, 20, 26...		
8. 7, 17, 27, 37, 47...		

Find the n^{th} term rule for of these linear sequences and then use it to find the 20th term

Sequence	n^{th} term rule	20 th term
1. 7, 12, 17, 22, 27...	$5n + 2$	102
2. 5, 7, 9, 11, 13...	$2n + 3$	43
3. 7, 13, 19, 25, 31...	$6n + 1$	121
4. 9, 16, 23, 30, 37...	$7n + 2$	142
5. 2, 5, 8, 11, 14...	$3n - 1$	59
6. 3, 8, 13, 18, 23...	$5n - 2$	98
7. 2, 8, 14, 20, 26...	$6n - 4$	116
8. 7, 17, 27, 37, 47...	$10n - 3$	197

☆ 11 ☆ 12 ☆ 13 ☆ 14