# Find The 7th Term Of The Arithmetic Sequence 4x + 5, 11x + 9,18x + 13, ...

**Find The 7th Term Of The Arithmetic Sequence 4x + 5, 11x + 9, 18x + 13, ...**
Understanding how to find specific terms in an arithmetic sequence is a fundamental aspect of algebra and mathematical sequences. In this article, we will explore the process step-by-step to determine the 7th term of the given sequence: 4x + 5, 11x + 9, 18x + 13, ... We will analyze the pattern, derive the general term, and then calculate the 7th term, all while providing clear explanations to enhance your comprehension of arithmetic sequences.

## What Is an Arithmetic Sequence?

Before diving into the specific sequence, it's essential to understand what an arithmetic sequence is.

### Definition of an Arithmetic Sequence

An arithmetic sequence is a list of numbers in which each term after the first is obtained by adding a fixed number, called the common difference, to the previous term.
Mathematically, an arithmetic sequence can be expressed as:
$$ a_n = a_1 + (n - 1)d $$
where:
- $ a_n $ is the nth term,
- $ a_1 $ is the first term,
- $ d $ is the common difference,
- $ n $ is the position of the term in the sequence.

## Analyzing the Given Sequence

The sequence provided is:
$$ 4x + 5, \quad 11x + 9, \quad 18x + 13, \quad ... $$

Let's analyze the pattern to identify the common difference and the general term.

### Step 1: Identify the First Few Terms

- First term: $ a_1 = 4x + 5 $
- Second term: $ a_2 = 11x + 9 $
- Third term: $ a_3 = 18x + 13 $

### Step 2: Find the Differences Between Terms

Calculate the difference between consecutive terms:
$$ a_2 - a_1 = (11x + 9) - (4x + 5) = (11x - 4x) + (9 - 5) = 7x + 4 $$
$$ a_3 - a_2 = (18x + 13) - (11x + 9) = (18x - 11x) + (13 - 9) = 7x + 4 $$

Since the differences are equal, the sequence is indeed arithmetic with common difference:
$$ d = 7x + 4 $$

## Deriving the General Term

Now that we've identified the first term and the common difference, we can formulate the general term $ a_n $.

### Step 1: Recall the Arithmetic Sequence Formula

$$ a_n = a_1 + (n - 1)d $$

### Step 2: Substitute Known Values

$$ a_n = (4x + 5) + (n - 1)(7x + 4) $$

### Step 3: Simplify the Expression

Expand the expression:
$$ a_n = 4x + 5 + (7x + 4)(n - 1) $$
$$ a_n = 4x + 5 + (7x + 4)n - (7x + 4) $$

Combine like terms:
$$ a_n = (4x - 7x - 4) + (7x + 4)n + 5 $$
$$ a_n = (-3x - 4) + (7x + 4)n + 5 $$

Simplify further:
$$ a_n = (7x + 4)n + (-3x - 4 + 5) $$
$$ a_n = (7x + 4)n + (-3x + 1) $$

Thus, the general term of the sequence is:
$$ \boxed{a_n = (7x + 4)n - 3x + 1} $$

## Calculating the 7th Term

With the general formula in hand, we can now find the 7th term $ a_7 $.

### Step 1: Substitute $n = 7$ into the formula

$$a_7 = (7x + 4) \times 7 - 3x + 1$$

### Step 2: Expand and Simplify

Compute:
$$a_7 = 7 \times (7x + 4) - 3x + 1$$
$$a_7 = 49x + 28 - 3x + 1$$

Combine like terms:
$$a_7 = (49x - 3x) + (28 + 1)$$
$$a_7 = 46x + 29$$

Therefore, the 7th term of the sequence is:
$$\boxed{a_7 = 46x + 29}$$

## Special Cases and Additional Considerations

Depending on the value of $x$, the sequence's behavior varies. Let's explore some scenarios.

### When $x$ is a specific value

- For example, if $x = 1$:
$$a_7 = 46(1) + 29 = 46 + 29 = 75$$
- If $x = 0$:
$$a_7 = 46(0) + 29 = 29$$
- If $x = -1$:
$$a_7 = 46(-1) + 29 = -46 + 29 = -17$$

### Implications of Different $x$ Values

The sequence's terms depend linearly on $x$, highlighting the importance of understanding the variable's role. When $x$ is known, the exact 7th term can be calculated directly; otherwise, the expression remains in terms of $x$.

## Summary and Key Takeaways

- The sequence $4x + 5, 11x + 9, 18x + 13, \ldots$ is arithmetic with a common difference $d = 7x + 4$.
- The general term of the sequence is $a_n = (7x + 4)n - 3x + 1$.
- The 7th term is $a_7 = 46x + 29$.
- The value of $a_7$ depends on the variable $x$, emphasizing the importance of knowing $x$ for exact calculations.

# Practical Applications of Finding Specific Terms in Arithmetic Sequences

Understanding how to find specific terms is useful in various real-world contexts:

- **Financial Planning:** Calculating future savings or payments based on fixed increments.
- **Scheduling:** Determining future events occurring at regular intervals.
- **Science and Engineering:** Modeling phenomena that progress linearly over time or space.

Mastering the process of deriving terms in an arithmetic sequence enhances problem-solving skills and prepares you for more complex mathematical concepts.

# Conclusion

Finding the 7th term of the sequence $4x + 5, 11x + 9, 18x + 13, \ldots$ involves recognizing the sequence's arithmetic nature, deriving the general term, and substituting the specific position. The key steps include identifying the common difference, formulating the general term, and evaluating it at $n=7$. This systematic approach not only helps in solving this particular problem but also provides a foundation for tackling similar sequence-related questions in mathematics. Remember, understanding the underlying pattern is crucial in working with sequences, and with practice, these calculations become straightforward and intuitive.

# Frequently Asked Questions

## What is the common difference in the arithmetic sequence 4x + 5, 11x + 9, 18x + 13, ...?

The common difference is (11x + 9) - (4x + 5) = 7x + 4.

## How do I find the 7th term of the given arithmetic sequence?

Use the formula for the nth term of an arithmetic sequence: a_n = a_1 + (n - 1)d. Find the first term and common difference, then substitute n=7.

## What is the first term of the sequence 4x + 5, 11x + 9, 18x + 13, ...?

The first term is 4x + 5.

## What is the explicit formula for the nth term of this sequence?

The nth term is a_n = (4x + 5) + (n - 1)(7x + 4).

## How can I simplify the expression for the 7th term of the sequence?

Substitute n=7 into the formula: a_7 = (4x + 5) + 6(7x + 4) = 4x + 5 + 42x + 24 = (4x + 42x) + (5 + 24) = 46x + 29.

## Does the value of x affect the 7th term in this sequence?

Yes, since the terms depend on x, the 7th term varies based on the value of x.

## If x=2, what is the 7th term of the sequence?

For x=2, the 7th term is 46(2) + 29 = 92 + 29 = 121.

## Can this sequence be considered arithmetic for all values of x?

Yes, for any real value of x, the sequence has a constant difference of 7x + 4, so it is arithmetic.

## What is the importance of finding the 7th term in an arithmetic sequence?

Finding specific terms helps understand the pattern, predict future terms, and solve problems related to the sequence's behavior.

# Additional Resources

Find The 7th Term Of The Arithmetic Sequence 4x + 5, 11x + 9, 18x + 13, ... is a common problem faced by students and math enthusiasts alike when exploring the properties of arithmetic sequences. Determining specific terms within a sequence not only tests your understanding of algebraic expressions but also reinforces foundational concepts such as common difference, general

term formulas, and the importance of pattern recognition. In this guide, we will thoroughly analyze the sequence, derive the necessary formulas, and walk through the step-by-step process to find the 7th term, ensuring you grasp each concept along the way.

---

Understanding the Sequence: An Introduction

Before diving into calculations, it’s essential to understand what an arithmetic sequence is. An arithmetic sequence is a sequence of numbers where each term after the first is obtained by adding a constant difference to the previous term. This constant is known as the common difference (d).

In the sequence provided:
4x + 5, 11x + 9, 18x + 13, ...,
each term appears to be expressed as a linear function of the variable x. The challenge here is that the sequence's terms are not fixed numbers but algebraic expressions involving x.

---

Step 1: Confirming the Sequence is Arithmetic

To confirm whether the sequence is arithmetic, we need to check if the difference between consecutive terms is constant.

Calculate the difference between the second and the first term:
Term 2 – Term 1:
(11x + 9) – (4x + 5) = (11x – 4x) + (9 – 5) = 7x + 4

Calculate the difference between the third and the second term:
(18x + 13) – (11x + 9) = (18x – 11x) + (13 – 9) = 7x + 4

Since both differences are equal to 7x + 4, the sequence is confirmed to be arithmetic for any fixed x. This shared difference serves as the common difference of the sequence.

Key Point:
The sequence is arithmetic for any value of x because the difference between subsequent terms is the same expression, 7x + 4.

---

Step 2: Deriving the General Term Formula

In an arithmetic sequence, the n-th term, denoted as $a_n$, can be written as:
$$ a_n = a_1 + (n - 1)d $$

Where:
- $a_1$ is the first term

- d is the common difference

From the sequence,
$a_1 = 4x + 5$
and
$d = 7x + 4$

Thus, the general term:
$$ a_n = (4x + 5) + (n - 1)(7x + 4) $$

This formula allows us to find the nth term for any value of n, given x.

---

Step 3: Simplifying the General Term

Let's expand and simplify the expression:
$$ a_n = 4x + 5 + (n - 1)(7x + 4) $$

Distribute:
$$ a_n = 4x + 5 + (n - 1) \times 7x + (n - 1) \times 4 $$

$$ a_n = 4x + 5 + 7x(n - 1) + 4(n - 1) $$

Now, expand:
$$ a_n = 4x + 5 + 7x\, n - 7x + 4\, n - 4 $$

Combine like terms:
- For the x-terms: $4x - 7x = -3x$
- For the constants: $5 - 4 = 1$

So, the nth term simplifies to:
$$ a_n = 7x\, n - 3x + 4\, n + 1 $$

Alternatively, written more neatly:
$$ a_n = (7x\, n + 4\, n) - 3x + 1 $$
$$ a_n = n\,(7x + 4) - 3x + 1 $$

This is a compact and versatile formula for the nth term of the sequence.

---

Step 4: Finding the 7th Term

To find the 7th term ($a_7$), substitute n = 7 into the simplified formula:
$$ a_7 = 7\,(7x + 4) - 3x + 1 $$

Calculate step-by-step:

1. Multiply:
$$ 7 \times (7x + 4) = 7 \times 7x + 7 \times 4 = 49x + 28 $$

2. Substitute back:
$$ a_7 = 49x + 28 - 3x + 1 $$

3. Combine like terms:
$$ (49x - 3x) + (28 + 1) = 46x + 29 $$

Result:
The 7th term of the sequence is:
$$ \boxed{a_7 = 46x + 29} $$

This expression depends on the variable x, meaning that the specific value of the 7th term varies with x.

---

Additional Insights

Impact of Variable x

Since the sequence’s terms are algebraic expressions involving x, the actual numerical value of the 7th term depends on the value chosen for x. For instance:

- If x = 1, then
$$ a_7 = 46(1) + 29 = 46 + 29 = 75 $$
- If x = 0, then
$$ a_7 = 46(0) + 29 = 29 $$
- If x = 2, then
$$ a_7 = 46(2) + 29 = 92 + 29 = 121 $$

Understanding this dependency is crucial because it illustrates the sequence's behavior across different x-values.

---

Special Cases

- When x = 0, the sequence reduces to:
$a_1 = 5$, $a_2 = 9$, $a_3 = 13$, ...
which forms an arithmetic sequence with a common difference of 4.
The 7th term in this case:
$$ a_7 = 46(0) + 29 = 29 $$

- When x = 1, the sequence becomes:
$a_1 = 4(1) + 5 = 9$, $a_2 = 11(1) + 9 = 20$, $a_3 = 18(1) + 13 = 31$, ...
with a common difference of $7(1) + 4 = 11$.
The 7th term:
$$ a_7 = 46(1) + 29 = 75 $$

---

Summary

- The sequence provided is arithmetic for any fixed value of x, with common difference 7x + 4.
- The general term of the sequence is:
$$a_n = n(7x + 4) - 3x + 1$$
- The 7th term specifically is:
$$a_7 = 46x + 29$$
- The value of $a_7$ depends on the chosen value of x.

---

Final Thoughts: Practical Applications and Practice

Understanding how to derive the general term and evaluate specific terms in algebraic sequences is a fundamental skill in mathematics. This particular problem demonstrates the importance of recognizing pattern structures, manipulating algebraic expressions, and understanding the influence of variables within sequences.

Practice exercises to reinforce these skills include:

- Find the 10th term for different values of x.
- Determine the value of x when the 7th term equals a specific number.
- Analyze how the sequence behaves as x varies over real numbers.

Mastering these concepts enhances problem-solving capabilities, critical thinking, and prepares you for more advanced topics like sequences, series, and algebraic modeling in real-world contexts.

## Find The 7th Term Of The Arithmetic Sequence 4x 5 11x 9 18x 13

Find The 7th Term Of The Arithmetic Sequence 4x 5 11x 9 18x 13

## Related Articles


- Find The Possible Values Of X For Each Of The Following(X-2)(3x-1)=0
- Differential Diagnosis Based On Carbon Monoxide Diffusing Capacity Of Lung
- How Does Lobbying The Executive Branch Differ From Lobbying Congress?

Back to Home