

Find The 97th Term Of The Arithmetic Sequence -5, -23, -41, ...

Find The 97th Term Of The Arithmetic Sequence -5, -23, -41, ...

Are you struggling to find the 97th term of the arithmetic sequence starting with -5, -23, -41, ...? Understanding how to work with arithmetic sequences is an essential skill in mathematics, especially for solving problems related to sequences and series. In this article, we will explore step-by-step methods to determine the 97th term, including the fundamental concepts of arithmetic sequences, formulas, and practical examples. By the end, you'll be equipped with the knowledge to find any term in an arithmetic sequence confidently.

Understanding Arithmetic Sequences

What Is an Arithmetic Sequence?

An arithmetic sequence is a list of numbers where each term after the first is obtained by adding a fixed number, called the common difference, to the previous term. The general form of an arithmetic sequence is:

$$\{a_1, a_2, a_3, \dots, a_n\}$$

where:

- a_1 is the first term,
- d is the common difference, and
- a_n is the n th term.

Key Components of an Arithmetic Sequence

- First Term (a_1): The starting number of the sequence.
- Common Difference (d): The consistent amount added to each term to get the next.
- General Term (a_n): The formula to find any term in the sequence based on its position (n).

Identifying the Sequence Parameters

Given the sequence: -5, -23, -41, ...

Let's analyze the sequence to find the key components:

First Term (a_1)

- The first term (a_1) is clearly -5.

Common Difference (d)

- To find (d), subtract the first term from the second:

$$d = a_2 - a_1 = -23 - (-5) = -23 + 5 = -18$$

- Check with the next pair:

$$a_3 - a_2 = -41 - (-23) = -41 + 23 = -18$$

- Since the difference is consistent, the common difference ($d = -18$).

Formulating the General Term

The general term of an arithmetic sequence is given by:

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

Substituting known values:

$$a_n = -5 + (n - 1)(-18)$$

Simplify:

$$a_n = -5 - 18(n - 1)$$

$$a_n = -5 - 18n + 18$$

$$a_n = (-5 + 18) - 18n$$

$$a_n = 13 - 18n$$

This formula allows us to find any term in the sequence based on its position (n).

Calculating the 97th Term

Now, to find the 97th term (a_{97}), substitute ($n = 97$) into the formula:

$$a_{97} = 13 - 18 \times 97$$

Calculate:

$$[18 \times 97 = (18 \times 100) - (18 \times 3) = 1800 - 54 = 1746]$$

Therefore:

$$[a_{97} = 13 - 1746 = -1733]$$

Result: The 97th term of the sequence is -1733.

Step-by-Step Summary to Find Any Term in an Arithmetic Sequence

To generalize the process, follow these steps:

1. Identify the first term (a_1): Look at the sequence's starting number.
2. Calculate the common difference (d): Subtract consecutive terms.
3. Write the general term formula:

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

4. Plug in the desired term number (n): For the 97th term, substitute ($n = 97$).
5. Compute and simplify: Perform the arithmetic to obtain the value.

Additional Tips for Working with Arithmetic Sequences

- Always verify the common difference by checking multiple pairs of consecutive terms.
- When dealing with large (n), be cautious with calculations—consider using a calculator for accuracy.
- Practice with different sequences to get comfortable with the formula.

Examples of Finding Different Terms in Arithmetic Sequences

Example 1: Find the 50th term of the sequence 2, 5, 8, 11, ...

- First term: ($a_1 = 2$)
- Common difference: ($d = 3$)
- General term: ($a_n = 2 + (n - 1) \times 3$)
- For ($n = 50$):

$$[a_{50} = 2 + (50 - 1) \times 3 = 2 + 49 \times 3 = 2 + 147 = 149]$$

Example 2: Find the 10th term of the sequence -10, -4, 2, 8...

- First term: $(a_1 = -10)$
- Common difference: $(d = 6)$
- General term: $(a_n = -10 + (n - 1) \times 6)$
- For $(n = 10)$:

$$[a_{10} = -10 + (10 - 1) \times 6 = -10 + 9 \times 6 = -10 + 54 = 44]$$

Conclusion: Mastering the 97th Term Calculation

Finding the 97th term of an arithmetic sequence involves understanding the sequence's initial term and common difference, then applying the general term formula. In our case, the sequence -5, -23, -41, ... has a first term of -5 and a common difference of -18, leading to the formula:

$$[a_n = 13 - 18n]$$

Substituting $(n = 97)$ yields the 97th term as -1733. Mastering these steps enables you to determine any term in an arithmetic sequence efficiently, whether you're working with small or large values of (n) . Practice makes perfect, so try calculating various terms to strengthen your understanding and problem-solving skills in arithmetic sequences.

Frequently Asked Questions

How do I find the 97th term of the arithmetic sequence -5, -23, -41, ...?

First, identify the common difference (d). Here, $-23 - (-5) = -18$, and $-41 - (-23) = -18$, so $d = -18$. The first term (a_1) is -5. Use the formula for the n th term: $a_n = a_1 + (n - 1) d$. Plugging in $n=97$: $a_{97} = -5 + (97 - 1) (-18) = -5 + 96 (-18) = -5 - 1728 = -1733$. So, the 97th term is -1733.

What is the common difference in the sequence -5, -23, -41, ...?

The common difference is -18, calculated by subtracting the first term from the second: $-23 - (-5) = -18$, which is consistent for the next pair as well.

Can I use the arithmetic sequence formula to find any term? How?

Yes. For any arithmetic sequence, the n th term is given by $a_n = a_1 + (n - 1) d$. Knowing the first term and common difference allows you to find any term by plugging in the value of

n.

What steps should I follow to find the 97th term of the sequence?

Step 1: Find the common difference (d). Step 2: Use the first term (a_1). Step 3: Apply the formula $a_n = a_1 + (n - 1) d$ with $n=97$. Step 4: Calculate the result, which is -1733.

Is the sequence -5, -23, -41, ... increasing or decreasing?

The sequence is decreasing because each subsequent term is less than the previous one, with a common difference of -18.

Additional Resources

Find The 97th Term Of The Arithmetic Sequence -5, -23, -41, ... is a classic problem that exemplifies the fundamental concepts of arithmetic sequences and series. This problem not only tests your understanding of sequence patterns but also enhances your skills in applying formulas systematically to find specific terms within a sequence. In this article, we will explore the step-by-step approach to solving this problem, understand the underlying principles, and discuss related concepts that deepen your comprehension of arithmetic progressions.

Understanding Arithmetic Sequences

What is an Arithmetic Sequence?

An arithmetic sequence is a sequence of numbers in which the difference between any two successive terms is constant. This constant difference is called the common difference (denoted as d). Mathematically, a sequence $(a_1, a_2, a_3, \dots)$ is arithmetic if:

$$\begin{aligned} &[\\ a_n &= a_{n-1} + d \\ &] \end{aligned}$$

for all $(n > 1)$.

Example: The sequence $(-5, -23, -41, \dots)$ is arithmetic because the difference between consecutive terms is constant.

Analyzing the Given Sequence

Sequence Details

Given sequence: $(-5, -23, -41, \dots)$

- First term $(a_1) = (-5)$
- Second term $(a_2) = (-23)$
- Third term $(a_3) = (-41)$

Calculating the Common Difference

To find the common difference (d) :

$$d = a_2 - a_1 = -23 - (-5) = -23 + 5 = -18$$

Check with the next pair:

$$a_3 - a_2 = -41 - (-23) = -41 + 23 = -18$$

Since the difference is consistent, the common difference $(d = -18)$.

Formulating the General Term

The nth Term Formula

The nth term (a_n) of an arithmetic sequence is given by:

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

Substituting the known values:

$$a_n = -5 + (n - 1)(-18)$$

\]

Simplify:

\[

$$a_n = -5 - 18(n - 1)$$

\]

\[

$$a_n = -5 - 18n + 18$$

\]

\[

$$a_n = (-5 + 18) - 18n$$

\]

\[

$$a_n = 13 - 18n$$

\]

Thus, the general term:

\[

$$a_n = 13 - 18n$$

\]

Finding the 97th Term

Applying the Formula

To find the 97th term (a_{97}), substitute $(n = 97)$:

\[

$$a_{97} = 13 - 18 \times 97$$

\]

Calculate:

\[

$$18 \times 97 = (18 \times 100) - (18 \times 3) = 1800 - 54 = 1746$$

\]

Now, compute:

\[

$$a_{97} = 13 - 1746 = -1733$$

\]

Answer: The 97th term of the sequence is (-1733) .

Key Features and Insights

- Pattern Recognition: Recognizing the sequence as arithmetic allows for straightforward application of formulas.
- Formula Utilization: The general term formula simplifies the process of finding any term without listing all previous terms.
- Efficiency: Using algebraic formulas is efficient, especially for large term numbers like 97, eliminating the need to generate all preceding terms.

Related Concepts and Extensions

Sum of the First n Terms

Knowing the n th term is useful, but sometimes we need the sum of the first (n) terms (S_n) .

The formula for the sum:

\[

$$S_n = \frac{n}{2} (a_1 + a_n)$$

\]

Applying this to find the sum of the first 97 terms:

\[

$$S_{97} = \frac{97}{2} (a_1 + a_{97}) = \frac{97}{2} (-5 + (-1733))$$

\]

Calculate:

\[

$$a_1 + a_{97} = -5 - 1733 = -1738$$

\]

So:

$$S_{97} = \frac{97}{2} \times (-1738)$$

Simplify:

$$S_{97} = 48.5 \times (-1738) = -84,533$$

This is the total sum of the first 97 terms.

Visualizing the Sequence

Plotting the sequence or its terms on a number line shows a steady decrease by 18 at each step, illustrating the linear nature of the sequence.

Features:

- The sequence is decreasing because (d) is negative.
- The terms extend into large negative numbers as (n) increases.

Pros and Cons of Using Arithmetic Sequences for Such Problems

Pros:

- Simplicity: The formulas are straightforward once the common difference is known.
- Predictability: Easily find any term in the sequence.
- Efficiency: No need to generate every term sequentially.

Cons:

- Limited to Arithmetic Patterns: Not applicable to sequences that are geometric or irregular.
- Requires Accurate Calculation of (d) : Mistakes in calculating the difference can lead to incorrect results.
- Can be less intuitive for non-linear sequences.

Practice Problems for Further Understanding

- Find the 50th term of the sequence $(-5, -23, -41, \dots)$.
- Determine the sum of the first 50 terms.
- If the sequence was instead increasing by 10 each time, what would the 97th term be?

Conclusion

The problem of finding the 97th term of the sequence $(-5, -23, -41, \dots)$ demonstrates the power of understanding arithmetic sequences and their formulas. By identifying the common difference and applying the n th term formula, we efficiently arrived at the answer (-1733) . Such problems reinforce algebraic skills and deepen understanding of linear patterns in sequences.

Whether you're studying basic algebra or preparing for more advanced mathematics, mastering these concepts provides a solid foundation for tackling a wide array of problems involving sequences and series. Remember, recognizing the pattern and correctly applying the formula are key steps in solving these types of questions efficiently and accurately.

[Find The 97th Term Of The Arithmetic Sequence 5 23 41](#)

Find The 97th Term Of The Arithmetic Sequence 5 23 41

Related Articles

- [Find The Differential Of The Function \$y = \theta^4 \sin\(12\theta\)\$](#)
- [An Important Feature Of Postformal Thought Is Its Nature To Be](#)
- [What Are Some Environmental Advantages Of Building Green? \(Site 1\)](#)

[Back to Home](#)