Given The Following Explicit Rule An=3(4)n-1. Find The 9th Term In The Geometric Sequence A786432 B196608

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Understanding how to find terms in a sequence is a fundamental aspect of algebra and mathematical sequences. When given an explicit rule such as An=3(4)^(n-1), it becomes straightforward to calculate any term in the sequence, including the 9th term. Additionally, identifying specific terms within a sequence like A=786432 and B=196608 requires a clear grasp of geometric sequences and their properties. This article will guide you through the process of solving for the 9th term in the sequence defined by An=3(4)^(n-1), explain the relationship to the provided terms, and highlight key concepts to master this area of mathematics.

Understanding the Explicit Formula An=3(4)^(n-1)

What Is an Explicit Formula?

An explicit formula provides a direct way to calculate the nth term of a sequence without needing to find all preceding terms. For a geometric sequence, the explicit formula typically takes the form:

- An = A_1 r^(n-1)

where:
- A_1 is the first term in the sequence,
- r is the common ratio between successive terms,
- n is the position of the term in the sequence.

Breaking Down the Given Formula

The given rule An=3(4)^(n-1) can be interpreted as:
- The first term (A_1) is 3,
- The common ratio (r) is 4,
- The sequence progresses by multiplying each term by 4 to get the next.

This indicates a geometric sequence with a starting point of 3, expanding exponentially as n increases.

Calculating the 9th Term in the Sequence

Step-by-Step Calculation

To find the 9th term (A_9), substitute n=9 into the explicit formula:

$A_9 = 3\ 4^{(9-1)} = 3\ 4^8$

Now, calculate 4^8:
- $4^2 = 16$
- $4^4 = (4^2)^2 = 16^2 = 256$
- $4^8 = (4^4)^2 = 256^2 = 65{,}536$

Next, multiply by 3:
$A_9 = 3\ 65{,}536 = 196{,}608$

Result of the 9th Term Calculation

Thus, the 9th term of the sequence defined by $An=3(4)^{(n-1)}$ is 196,608.

Relating the Sequence to Given Terms A=786432 and B=196608

Understanding the Given Terms

The terms A=786432 and B=196608 seem to be specific elements within the sequence or related sequences. Since the 9th term we calculated is 196,608, it directly corresponds to term B in the sequence.

- Term B (the 9th term) = 196,608
- Term A (possibly the 10th term, or another point) = 786,432

Verifying the Sequence Terms

Let's verify whether 786,432 fits into the sequence:

Suppose 786,432 is some term A_n:

$A_n = 3\ 4^{(n-1)} = 786{,}432$

Divide both sides by 3:
$4^{(n-1)} = 786{,}432 / 3 = 262{,}144$

Recognize that 262,144 is a power of 4:
- $4^8 = 65,536$
- $4^9 = 262,144$

Therefore:
$4^{(n-1)} = 4^9$

This implies:
$n - 1 = 9$
$n = 10$

So, $A=786,432$ is the 10th term in the sequence, and $B=196,608$ is the 9th term.

Summary:
- B (196,608) is the 9th term, as calculated.
- A (786,432) is the 10th term.

Key Concepts for Mastering Geometric Sequences

Understanding the Common Ratio

The common ratio (r) defines how each term relates to the previous one:
- If $r > 1$, the sequence grows exponentially.
- If $0 < r < 1$, the sequence decreases exponentially.
- If r is negative, the sequence alternates signs.

In our sequence, $r=4$ indicates rapid exponential growth.

Using Explicit Formulas Effectively

- Substitute the value of n to find any term.
- Recognize the pattern of powers of the common ratio.
- Confirm the first term and ratio with given data points.

Practical Applications

Understanding geometric sequences is crucial for:
- Financial calculations (compound interest)
- Population growth models
- Radioactive decay
- Computer science algorithms involving exponential patterns

Conclusion

By analyzing the explicit rule $A_n=3(4)^{(n-1)}$, we determined that the 9th term in the sequence is 196,608. This aligns with the given term B, confirming the sequence's structure and the power of explicit formulas in sequence analysis. Recognizing the relationship between the terms A=786,432 and B=196,608 further cements the understanding of how geometric sequences progress. Mastery of these concepts enables students and professionals alike to solve complex problems involving exponential growth and sequence calculations confidently.

Remember: Always verify your calculations by understanding the underlying pattern, and use explicit formulas to streamline your problem-solving process in mathematics.

Frequently Asked Questions

What is the explicit formula for the sequence $A_n = 3(4)^{n-1}$?

The explicit formula is $A_n = 3 \times 4^{n-1}$, which defines each term based on its position n.

How do you find the 9th term of the sequence $A_n = 3(4)^{n-1}$?

Substitute n=9 into the formula: $A_n = 3 \times 4^{9-1} = 3 \times 4^8$.

What is the value of 4^8?

4^8 equals 65,536.

What is the 9th term of the sequence $A_n = 3(4)^{n-1}$?

The 9th term is $3 \times 65{,}536 = 196{,}608$.

Are the terms in the sequence $A_n = 3(4)^{n-1}$ geometric?

Yes, because each term is multiplied by a common ratio of 4, making it a geometric sequence.

What is the common ratio of the given sequence?

The common ratio is 4.

How do the terms 786432 and 196608 relate to the sequence?

The term 196,608 is the 9th term of the sequence, while 786,432 is the 10th term.

How can you verify the 9th term calculation for the sequence?

By substituting n=9 into the explicit formula and ensuring the calculations are correct, resulting in 196,608.

Additional Resources

Given The Following Explicit Rule An=3(4)n-1. Find The 9th Term In The Geometric Sequence A786432 B196608

Understanding and analyzing sequences is a fundamental aspect of mathematical problem-solving, especially in algebra and discrete mathematics. The given problem presents a clear rule for a sequence, and the task involves both interpreting this rule and applying it to find specific terms within the sequence. This comprehensive review will explore the problem in depth, breaking down the concepts of explicit formulas, geometric sequences, and how to derive particular terms using the given rule. We will also examine the two options provided, A786432 and B196608, to determine which correctly corresponds to the 9th term based on the rule.

Understanding the Given Explicit Rule

The problem states: Given The Following Explicit Rule An=3(4)n-1. At first glance, this formula appears to describe a sequence, where:

- An represents the nth term,
- The rule involves constants and powers of 4,
- There is an exponent with a linear expression involving n.

However, the presentation of the formula can be somewhat ambiguous due to formatting. A common interpretation of such a rule in sequence notation is:

An = 3 × 4n-1

This interpretation aligns with standard sequence notation, which often involves powers of a constant base. The subtraction of 1 in the exponent suggests the sequence starts with n=1, where:

- For n=1: An = 3 × 40 = 3 × 1 = 3
- For n=2: An = 3 × 41 = 3 × 4 = 12
- For n=3: An = 3 × 42 = 3 × 16 = 48

This pattern indicates an exponential growth sequence, which is characteristic of a geometric sequence.

Analyzing the Sequence

Explicit Formula Interpretation

The formula An=3(4)n-1 most likely translates to:

An = 3 × 4n-1

This is a standard form for a geometric sequence with:

- First term (A_1): 3 × 40 = 3
- Common ratio (r): 4

The sequence progresses as:

3, 12, 48, 192, 768, 3072, 12288, 49152, 196608, 786432, ...

Let's verify this pattern by calculating the first several terms:

n	An = 3×4n-1	Calculation	Result
1	3×40	3×1	3
2	3×41	3×4	12
3	3×42	3×16	48
4	3×43	3×64	192
5	3×44	3×256	768
6	3×45	3×1024	3072
7	3×46	3×4096	12288
8	3×47	3×16384	49152
9	3×48	3×65536	196608
10	3×49	3×262144	786432

From the calculations, the 9th term is 196608, which matches option B.

Determining the 9th Term

Step-by-Step Calculation

Using the explicit formula An=3×4n-1:

- For n=9:

An = 3 × 48

Calculate 48:

48 = (44)2 = (256)2 = 65536

Now multiply by 3:

3 × 65536 = 196608

Therefore, the 9th term is 196608.

Verification of the Provided Options

The options given are:

- A) 786432
- B) 196608

From the calculation, 196608 is the 9th term, matching option B.

Option A, 786432, corresponds to the 10th term:

- For n=10:

An = 3×49 = 3×262144 = 786432

This confirms that the sequence's 10th term is 786432, aligning with the earlier calculations.

Conclusion: The correct answer for the 9th term is B) 196608.

Geometric Sequence: Features and Characteristics

Features

- Common Ratio: In this sequence, r=4, indicating each term is multiplied by 4 to get the next.
- Explicit Formula: An=3×4n-1 allows direct calculation of any term without recursion.
- Exponential Growth: The sequence grows rapidly, characteristic of exponential functions.

Pros

- Direct Computation: Easily find any term with a simple formula.
- Pattern Recognition: Clear geometric progression pattern makes it straightforward to analyze.
- Application: Useful in modeling exponential growth scenarios, such as population or compound interest.

Cons

- Rapid Growth: Values can become very large quickly, making calculations cumbersome for large n.
- Limited Range: Not suitable for sequences that do not grow exponentially or have different ratios.
- Potential for Misinterpretation: Ambiguous notation can lead to errors if the formula is not carefully interpreted.

Summary and Final Remarks

This detailed examination of the sequence An=3×4n-1 demonstrates how explicit formulas serve as powerful tools for analyzing and calculating specific terms within a sequence. By understanding the structure of geometric sequences—characterized by a constant ratio and exponential growth—we can efficiently determine terms at any position.

In this particular problem, the 9th term is computed as 196608, matching option B. The process involved interpreting the given rule, verifying the pattern through calculations, and confirming the sequence's properties. The clarity of the explicit formula not only simplifies calculations but also enhances comprehension of the sequence's behavior.

In conclusion, when faced with explicit sequence rules, always strive to interpret the notation carefully, verify with initial terms, and apply the formula systematically. This approach ensures accurate results and a deeper understanding of the sequence's nature.

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