

If $B=p+5$ And $A=p^2+10p+1$ Find An Expression That Equals $2b+3a$ In Standard Form

If $B=p+5$ And $A=p^2+10p+1$ Find An Expression That Equals $2b+3a$ In Standard Form is a common problem in algebra that challenges students to manipulate and combine algebraic expressions. Understanding how to find a simplified, standard form of an expression like $2b + 3a$, given the relationships $B=p+5$ and $A=p^2+10p+1$, is fundamental to mastering algebraic concepts. This article will guide you step-by-step through the process of substituting the given expressions for A and B into $2b + 3a$, simplifying the expression, and presenting it in standard form. Whether you're studying for an exam or looking to strengthen your algebra skills, this comprehensive guide will help clarify the process.

Understanding the Given Expressions

Before diving into the algebraic manipulation, it's important to understand the given relationships:

- $B = p + 5$
- $A = p^2 + 10p + 1$

Your goal is to find an expression that equals $2b + 3a$ in standard form, using these relationships.

What is Standard Form?

Standard form in algebra typically means writing a polynomial in descending powers of the variable, with the leading coefficient positive, and combining like terms. For linear and quadratic expressions, standard form helps clarify the structure and simplifies further calculations.

Step-by-Step Solution Approach

The process involves substituting the given expressions into $2b + 3a$, simplifying, and arranging the result in standard polynomial form.

Step 1: Write Down the Expression to Simplify

The expression we are asked to find is:

$$2b + 3a$$

Given:

$$B = p + 5$$

$$A = p^2 + 10p + 1$$

However, note that the variables are B and A, while our expression involves b and a. To avoid confusion, ensure the variables are consistent.

Important clarification: Since the problem provides B and A, but asks for an expression involving b and a, it's likely that the lowercase variables b and a are intended to correspond to the uppercase B and A, respectively.

Assuming that:

$$b = B = p + 5$$

$$a = A = p^2 + 10p + 1$$

This is a common notation in algebra problems where uppercase variables are given and lowercase variables are used as placeholders.

Step 2: Substitute the Expressions for b and a

Replace b and a in $2b + 3a$ with their expressions:

$$2b + 3a = 2(p + 5) + 3(p^2 + 10p + 1)$$

Step 3: Expand the Expression

Distribute the coefficients:

$$2(p + 5) = 2p + 10$$

$$3(p^2 + 10p + 1) = 3p^2 + 30p + 3$$

Now, the expression becomes:

$$2p + 10 + 3p^2 + 30p + 3$$

Step 4: Combine Like Terms

Group terms according to powers of p:

$$\backslash[3p^2 + (2p + 30p) + (10 + 3) \backslash]$$

Simplify:

$$\backslash[3p^2 + 32p + 13 \backslash]$$

This is the simplified form of the expression.

Expressing in Standard Polynomial Form

The expression:

$$\backslash[3p^2 + 32p + 13 \backslash]$$

is already in standard polynomial form, with terms arranged in decreasing powers of p.

Final Expression in Standard Form:

$$\backslash\boxed{2b + 3a = 3p^2 + 32p + 13}\backslash$$

This expression can be used for further calculations or graphing, depending on the context.

Key Takeaways and Tips for Algebraic Manipulation

Understanding Substitution

- Always verify the correspondence between variables. In this problem, lowercase variables b and a are linked to uppercase B and A.
- Substituting the given expressions correctly is crucial for accurate simplification.

Distributive Property

- Use the distributive property to expand expressions with coefficients outside parentheses.

Combining Like Terms

- Group similar powers of the variable to simplify the expression efficiently.

Writing in Standard Form

- Arrange polynomial terms from highest to lowest power.
- Simplify coefficients where possible for clarity.

Additional Practice Problems

To reinforce your understanding, consider working on similar problems:

- Given $C = p - 4$ and $D = p^2 - 3p + 7$, find an expression that equals $4C - 2D$ in standard form.
- If $X = 2p + 3$ and $Y = p^2 - p + 5$, find an expression for $3X + 2Y$ in standard form.
- Given $E = p^2 + 2p + 3$ and $F = 3p + 4$, find the simplified expression for $5E - 2F$.

Practicing these will help solidify your algebra skills and improve problem-solving efficiency.

Conclusion

In summary, to find an expression that equals $2b + 3a$ in standard form given the relationships $B = p + 5$ and $A = p^2 + 10p + 1$, follow these key steps:

1. Recognize the variables and substitute the given expressions.
2. Expand the expressions using the distributive property.
3. Combine like terms carefully.
4. Arrange the resulting polynomial in standard form, with descending powers of p .

The resulting simplified expression:

$$\boxed{3p^2 + 32p + 13}$$

is a concise, standard form that accurately represents $2b + 3a$ based on the given relationships. Mastering these steps enhances your ability to handle similar algebraic problems confidently and efficiently.

Remember: Practice is essential in algebra. The more problems you solve, the more intuitive these steps will become, making complex expressions much easier to simplify and

analyze.

Frequently Asked Questions

What is the expression for B in terms of p?

$$B = p + 5.$$

How is A expressed in terms of p?

$$A = p^2 + 10p + 1.$$

What is the goal when finding an expression that equals $2B + 3A$?

To find a simplified expression in standard form that represents $2B + 3A$ in terms of p.

How do you substitute B and A into the expression $2B + 3A$?

Replace B with $p + 5$ and A with $p^2 + 10p + 1$, resulting in $2(p + 5) + 3(p^2 + 10p + 1)$.

What is the step-by-step process to simplify $2(p + 5) + 3(p^2 + 10p + 1)$?

First, distribute: $2p + 10 + 3p^2 + 30p + 3$. Then combine like terms: $3p^2 + (2p + 30p) + (10 + 3)$, resulting in $3p^2 + 32p + 13$.

What is the simplified standard form expression for $2B + 3A$?

$$3p^2 + 32p + 13.$$

How can the resulting expression be expressed in terms of B and A without p?

Since $B = p + 5$ and $A = p^2 + 10p + 1$, expressing in terms of B and A directly involves solving for p, which can be complex; typically, the simplified form in p ($3p^2 + 32p + 13$) is acceptable unless specified otherwise.

Additional Resources

If $B = p + 5$ And $A = p^2 + 10p + 1$ Find An Expression That Equals $2b + 3a$ In Standard

Form

Introduction

Mathematics often presents us with intriguing problems that require a blend of algebraic manipulation and conceptual understanding. One such problem involves expressing a combination of algebraic variables in a simplified, standard form. Specifically, given the relationships $B = p + 5$ and $A = p^2 + 10p + 1$, the challenge is to find an expression that equals $2b + 3a$ in standard form. This task requires a careful substitution of variables, expansion, and simplification to arrive at a clear, concise expression. In this article, we will explore the steps involved in solving this problem, delve into the algebraic techniques used, and illustrate the process with detailed explanations and examples.

Understanding the Given Relationships

Before proceeding with the main problem, it's essential to understand the given expressions and their implications:

- $B = p + 5$: This indicates that B is linearly related to p , shifted by 5 units.
- $A = p^2 + 10p + 1$: This quadratic expression involves p , with a coefficient of p^2 , a linear term, and a constant.

The goal is to find an expression for $2b + 3a$ that is expressed solely in terms of p , then simplify it to standard form.

Step 1: Expressing b and a in terms of p

Given the relationships, it's natural to assume that b and a correspond to B and A , respectively. To clarify:

- $b = B = p + 5$
- $a = A = p^2 + 10p + 1$

This assumption is standard in algebraic problems where variables are related; unless otherwise specified, lowercase variables typically mirror uppercase ones.

Step 2: Formulating the Expression $2b + 3a$

With b and a expressed in terms of p , we substitute to get:

$$\backslash \\ 2b + 3a = 2(p + 5) + 3(p^2 + 10p + 1)$$

\]

Expanding this expression involves distributing coefficients:

$$\begin{aligned} &= 2p + 10 + 3p^2 + 30p + 3 \\ & \end{aligned}$$

Now, combine like terms:

- Quadratic term: $(3p^2)$
- Linear terms: $(2p + 30p = 32p)$
- Constant terms: $(10 + 3 = 13)$

Thus, the expression simplifies to:

$$\begin{aligned} &3p^2 + 32p + 13 \\ & \end{aligned}$$

Step 3: Presenting in Standard Form

Standard form for a quadratic expression arranges terms in descending powers of the variable:

$$\boxed{3p^2 + 32p + 13}$$

This is the simplified, standard form of the expression $2b + 3a$ in terms of p .

Deep Dive: Confirming the Validity of the Result

To ensure clarity and correctness, let's verify the process:

1. Substitution of variables: We replaced b with $p + 5$ and a with $p^2 + 10p + 1$, aligning with the problem statement.
2. Distribution: Correctly applied coefficients to each term.
3. Combining like terms: Properly summed linear and constant terms.
4. Standard form: Arranged the quadratic in descending powers of p .

This systematic approach guarantees that the derived expression accurately reflects the relationship between b , a , and p .

Applications and Broader Implications

While this problem appears straightforward, it exemplifies key algebraic principles applicable across various fields:

- Quadratic expressions: Understanding how to manipulate and simplify quadratic forms is fundamental in algebra, calculus, physics, and engineering.
- Variable substitution: Demonstrates the power of substitution to simplify complex expressions.
- Standard form importance: Expressing equations in standard form facilitates analysis, such as identifying roots, vertex, or intercepts in graphing.

Extending the Problem: Exploring Variations

To deepen understanding, consider variations or extensions:

- Changing relationships: What happens if A or B are defined differently? For example, if $A = p^2 - 10p + 1$ or $B = 2p + 3$.
- Different combinations: Find expressions like $3b - 2a$ or $b^2 + a^2$.
- Graphical interpretation: Plotting the quadratic in terms of p could reveal insights into its behavior.

Such exercises reinforce algebraic skills and demonstrate the versatility of these methods.

Conclusion

In this exploration, we've demonstrated how to find an expression equivalent to $2b + 3a$ given the relationships $B = p + 5$ and $A = p^2 + 10p + 1$. Through systematic substitution, expansion, and simplification, we derived the quadratic expression $3p^2 + 32p + 13$ in standard form. This process highlights the importance of careful algebraic manipulation and reinforces foundational skills applicable across a broad spectrum of mathematical problems. Whether in academic settings or real-world applications, mastering such techniques is essential for effective problem-solving and analytical reasoning.

Final Remarks

Mathematics challenges like this serve as building blocks for more complex problems, fostering a deeper understanding of algebraic structures and their applications. By breaking down the problem into manageable steps and verifying each stage, learners develop confidence and precision. As you encounter similar problems, remember the power of substitution, expansion, and standardization — tools that are as fundamental as they are versatile in the mathematician's toolkit.

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