

Given The Following Perfect Square Trinomial, Find The Missing Term: $4x^2 __ x + 49$

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Understanding the Problem: Perfect Square Trinomials and Missing Terms

Mathematics often involves recognizing patterns and applying algebraic formulas to solve problems efficiently. One common pattern is the perfect square trinomial, which takes the form:

$$(a x + b)^2 = a^2 x^2 + 2ab x + b^2$$

In this context, the problem presents a partial expression: $4x^2 __ x + 49$, and challenges us to find the missing term. Recognizing the structure of perfect square trinomials is essential to solving this problem.

This article will guide you through understanding perfect square trinomials, identifying the missing term, and applying algebraic techniques to find the complete expression. Whether you're a student preparing for exams or someone interested in deepening your algebra skills, this comprehensive guide will clarify the process.

What Is a Perfect Square Trinomial?

A perfect square trinomial is a quadratic expression that factors neatly into a binomial squared. These trinomials are characterized by their symmetry and predictable pattern. The general form is:

$$a^2 x^2 + 2ab x + b^2$$

which factors as:

$$\begin{aligned} & \backslash \\ & (a x + b)^2 \\ & \backslash \end{aligned}$$

Examples of perfect square trinomials:

- $\backslash(x^2 + 6x + 9 = (x + 3)^2\backslash$
- $\backslash(4x^2 + 20x + 25 = (2x + 5)^2\backslash$
- $\backslash(9x^2 - 12x + 4 = (3x - 2)^2\backslash$

Key features:

- The first term is a perfect square: $\backslash(a^2 x^2\backslash$.
- The last term is a perfect square: $\backslash(b^2\backslash$.
- The middle term is twice the product of the roots: $\backslash(2ab x\backslash$.

Understanding these features helps in recognizing perfect square trinomials and in identifying missing terms when parts of the expression are given.

Deciphering the Given Expression

The problem statement:

> Given The Following Perfect Square Trinomial, Find The Missing Term: $4x^2 \text{ ___ } x$ 49 7 14 28 36.

At first glance, this sequence appears to be a partial quadratic expression with some missing parts, accompanied by a list of numbers. The numbers likely represent potential values or terms related to the missing part.

Let's analyze the given clues:

- The initial part: $4x^2 \text{ ___ } x$ suggests an expression involving $\backslash(4x^2\backslash$ and an unknown linear term.
- The subsequent numbers: 49, 7, 14, 28, 36 may relate to the perfect square components or coefficients.

Given that the task is to find the missing term, and the mention of a perfect square trinomial, the most logical interpretation is that the expression is:

$$\begin{aligned} & \backslash \\ & 4x^2 + \text{ ______ } x + \text{ \texttt{(some constant)}} \\ & \backslash \end{aligned}$$

and that this trinomial is a perfect square.

Reconstructing the Perfect Square Trinomial

Let's assume the perfect square trinomial takes the form:

$$(2x + b)^2 = 4x^2 + 2 \times 2x \times b + b^2 = 4x^2 + 4bx + b^2$$

Comparing this with the given form:

$$4x^2 + ___ x + \text{constant}$$

we see that:

$$\text{middle term} = 4bx$$

and the constant term is:

$$b^2$$

From the list of numbers, potential candidates for (b^2) are 49, 36, 28, 14, 7. Out of these, 49 and 36 are perfect squares:

- $(49 = 7^2)$
- $(36 = 6^2)$

This suggests the constant term (b^2) could be 49 or 36.

Identifying the Correct Constant Term

Let's examine both options:

Option 1: Constant term = 49

- $(b^2 = 49 \Rightarrow b = \pm 7)$
- Middle term: $(4bx = 4 \times 7x = 28x)$

Therefore, the perfect square trinomial is:

$$(2x + 7)^2$$

$$(2x + 7)^2 = 4x^2 + 28x + 49$$

\]

In this case, the missing term (the coefficient of (x)) is 28.

Option 2: Constant term = 36

$$- (b^2 = 36 \Rightarrow b = \pm 6)$$

$$- \text{Middle term: } (4b x = 4 \times 6 x = 24 x)$$

The trinomial:

\[

$$(2x + 6)^2 = 4x^2 + 24x + 36$$

\]

The missing term here would be 24.

Matching the Missing Term with the Provided Options

From the list provided: 7, 14, 28, 36, the most fitting middle term is 28 (from Option 1). The number 28 appears directly in the list, indicating that the missing term is 28.

Thus, the perfect square trinomial is:

\[

$$(2x + 7)^2 = 4x^2 + 28x + 49$$

\]

and the missing term to fill in the blank is 28.

Final Expression and Explanation

The complete perfect square trinomial is:

\[

$$4x^2 + 28x + 49$$

\]

which factors as:

$$\begin{aligned} & \backslash \\ & (2x + 7)^2 \\ & \backslash \end{aligned}$$

Answer: The missing term is $\boxed{28}$.

Step-by-Step Summary of How to Find the Missing Term

1. Identify the structure of a perfect square trinomial:

$$\begin{aligned} & \backslash \\ & (a x + b)^2 = a^2 x^2 + 2ab x + b^2 \\ & \backslash \end{aligned}$$

2. Match known parts:

- Leading term: $(4x^2)$ matches $(a^2 x^2 \rightarrow a = 2)$.
- Constant term: likely among the provided options (49 or 36).

3. Calculate the middle term for each candidate:

- If $(b^2 = 49 \rightarrow b = 7)$, then middle term: $(2 \times 2 \times 7 = 28)$.
- If $(b^2 = 36 \rightarrow b = 6)$, then middle term: $(2 \times 2 \times 6 = 24)$.

4. Compare the middle term to the options:

- The options include 7, 14, 28, 36.
- The middle term matching is 28.

5. Conclude the missing term:

- The missing term (coefficient of (x)) is 28.

Additional Tips for Recognizing Perfect Square Trinomials

- Always look for the first and last terms being perfect squares.
- Check if the middle term is twice the product of the roots of the first and last terms.

- Use the pattern:

$$(a x + b)^2 = a^2 x^2 + 2ab x + b^2$$

- When given parts of the quadratic, compare to this pattern to identify missing components.

Practice Problems to Strengthen Your Skills

1. Find the missing term in the perfect square trinomial: $(9x^2 + ___ x + 16)$.
2. Given the perfect square trinomial $((3x + 4)^2)$, expand and identify the missing term.
3. The quadratic expression $(x^2 + 10x + ___)$ is a perfect square. Find the missing term.
4. Which of the following is a perfect square trinomial?
 - a) $(x^2 + 5x + 6)$
 - b) $(4x^2 + 20x + 25)$
 - c) $(x^2 + 4x + 5)$

Answers:

1. $8x$ (since $(3x^2 + 2 \times 3 \times 4x + 16)$)
2. $((3x + 4)^2 = 9x^2 + 24x + 16)$
3. 25 (since $((x + 5)^2 = x^2 + 10x + 25)$)
4. b) $(4x^2 + 20x + 25)$

Conclusion

Recognizing perfect square trinomials is a vital skill in algebra that simplifies quadratic expressions and solving equations. In the problem "Given The Following

Frequently Asked Questions

What is the missing term in the perfect square trinomial

$4x^2 \text{ ___ } x + 49$?

The missing term is 14, making the trinomial $4x^2 + 14x + 49$.

How can you identify the missing term in a perfect square trinomial?

In a perfect square trinomial of the form $(ax + b)^2$, the middle term is $2ab$. Using this, you can find the missing term by calculating 2 times the square root of the first and last terms.

Given the trinomial $4x^2 + \text{___ } x + 49$, what is the general method to find the missing term?

First, identify the square roots of the first and last terms: $\sqrt{4x^2} = 2x$ and $\sqrt{49} = 7$. Then, multiply these roots and double the result: $2 \cdot 2x \cdot 7 = 28$. So, the missing term is 28.

Why is the missing term in the trinomial $4x^2 + 14x + 49$ not 7 or 36?

Because in a perfect square trinomial, the middle term is 2 times the product of the roots of the first and last terms. 14 matches $2 \cdot 2x \cdot 7$, whereas 7 and 36 do not fit this pattern.

What is the factored form of the perfect square trinomial $4x^2 + 14x + 49$?

The factored form is $(2x + 7)^2$.

Additional Resources

Given The Following Perfect Square Trinomial, Find The Missing Term: $4x^2 \text{ ___ } x + 49$
7 14
28 36

In the realm of algebra, quadratic expressions and their properties form the foundation of many mathematical concepts. Among these, perfect square trinomials hold a special place due to their predictable structure and elegant factorization. The problem of identifying the missing term in a perfect square trinomial is a classic exercise that not only tests algebraic skills but also deepens understanding of polynomial identities. This article delves into the problem: Given The Following Perfect Square Trinomial, Find The Missing Term: $4x^2 \text{ ___ } x + 49$
7 14 28 36. We will explore the nature of perfect square trinomials, analyze the given options, and methodically determine the correct missing term.

Understanding Perfect Square Trinomials

Definition and General Form

A perfect square trinomial is a quadratic expression that can be expressed as the square of a binomial. Its general form is:

$$(ax + b)^2 = a^2x^2 + 2abx + b^2$$

where:

- a and b are real numbers,
- a^2x^2 is the quadratic term,
- $2abx$ is the linear term,
- b^2 is the constant term.

Characteristics

- The quadratic and constant terms are perfect squares.
- The middle term is twice the product of the square roots of the quadratic and constant terms.
- The expression factors neatly as a binomial squared.

Examples

- $x^2 + 6x + 9 = (x + 3)^2$
- $4x^2 + 20x + 25 = (2x + 5)^2$
- $9x^2 + 24x + 16 = (3x + 4)^2$

Understanding these properties allows us to reverse-engineer the problem when given a trinomial and to verify its perfect square status.

Analyzing the Given Problem

The problem statement provides a partially complete trinomial:

"Given The Following Perfect Square Trinomial, Find The Missing Term: $4x^2$ ___ x 49 7 14 28 36"

At first glance, the question appears to be missing some context or formatting. However, the key clues are:

- The quadratic term: $4x^2$
- The linear term: ___ x (missing coefficient)
- The options: 49, 7, 14, 28, 36

The phrase "Given The Following Perfect Square Trinomial" suggests that the expression:

$$4x^2 + \text{(missing term)} \times x + \text{(constant)}$$

is a perfect square trinomial. Our goal is to determine the missing term coefficient based on the options provided.

Step-by-Step Solution Approach

To solve this problem systematically, follow these steps:

1. Recognize the structure of the perfect square trinomial:

$$\boxed{(ax + b)^2 = a^2x^2 + 2abx + b^2}$$

Given $(a^2x^2 = 4x^2)$:

$$\boxed{a^2 = 4 \Rightarrow a = 2 \quad (\text{assuming positive for simplicity})}$$

2. Express middle term:

$$\boxed{2abx = \text{missing coefficient} \times x}$$

Since $(a = 2)$:

$$\boxed{2 \times 2 \times b = 4b}$$

The missing term (coefficient of (x)) is thus $(4b)$.

3. Match the constant term:

$$\boxed{b^2 = \text{constant term}}$$

From the options, the possible constants are 49, 7, 14, 28, 36.

4. Find (b) for each constant:

- If $(b^2 = 49 \Rightarrow b = \pm 7)$
- If $(b^2 = 36 \Rightarrow b = \pm 6)$
- If $(b^2 = 14 \Rightarrow b = \pm \sqrt{14})$ (not a perfect square, discard)
- If $(b^2 = 28 \Rightarrow b = \pm \sqrt{28})$ (not a perfect square, discard)
- If $(b^2 = 7 \Rightarrow b = \pm \sqrt{7})$ (not a perfect square, discard)

Given the context of perfect square trinomials, the most plausible options are 49 and 36, as these are perfect squares.

Determining the Correct Missing Term

For $(b^2 = 49)$:

$$\boxed{b = \pm 7}$$

The coefficient of the linear term:

$$\boxed{4b = 4 \times (\pm 7) = \pm 28}$$

Thus, the possible linear coefficients are +28 or -28.

For $(b^2 = 36)$:

$$[b = \pm 6]$$

The linear coefficient:

$$[4 \times 6 = 24 \text{ or } 4 \times (-6) = -24]$$

However, 24 is not among the options provided, so unless negative signs are considered, this might be less fitting.

Matching with the Provided Options

The options are: 7, 14, 28, 36

- The linear coefficient derived from $(b^2=49)$ is 28 or -28; among options, 28 is present.
- For $(b^2=36)$, the linear coefficient is 24 or -24, not listed among options.
- The constant term options are 49 and 36; both are perfect squares, but based on the linear coefficient options, the most compatible is with $(b^2=49)$ and the linear coefficient 28.

Therefore, the missing term coefficient is 28.

Final Expression and Verification

Construct the perfect square trinomial:

$$[(2x + 7)^2 = 4x^2 + 2 \times 2 \times 7x + 7^2 = 4x^2 + 28x + 49]$$

This aligns with the given options and the structure of a perfect square trinomial.

Additional Considerations

Sign Variations

- The negative form: $((2x - 7)^2 = 4x^2 - 28x + 49)$, also a perfect square trinomial, but since the options provided are positive, the positive form is more consistent.

Contextual Clarification

- The problem's wording suggests that the missing term is the coefficient before (x) . The options imply that the missing coefficient is 28.
- The presence of multiple options such as 7, 14, 28, and 36 indicates a multiple-choice format, reinforcing the conclusion that 28 is the correct choice.

Concluding Remarks

The investigation into the problem of "Given The Following Perfect Square Trinomial, Find The Missing Term" reveals the importance of understanding the structure of perfect square trinomials. By analyzing the quadratic term, recognizing the form $(ax + b)^2$, and matching the constant term, we deduced that:

- The quadratic coefficient is 4, implying $a=2$.
- The constant term options suggest $b^2 = 49$, so $b=7$.
- The linear coefficient is $2ab = 4b = 28$.

This confirms that the missing term coefficient is 28, and the complete perfect square trinomial is:

$$4x^2 + 28x + 49 = (2x + 7)^2$$

References

- Stewart, J. (2012). Algebra and Trigonometry. Cengage Learning.
- Blitzer, R. (2015). Algebra and Trigonometry. Pearson.
- Khan Academy. (n.d.). Perfect Square Trinomials. Retrieved from <https://www.khanacademy.org/>

Summary

- Recognize the structure of perfect square trinomials.
- Use the form $(ax + b)^2$ to identify the missing term.
- Match the constant term with options to determine b .
- Calculate the linear term coefficient as $2ab$.
- Confirm the answer aligns with the given options.

The missing term in the given perfect square trinomial is 28.

[Given The Following Perfect Square Trinomial Find The](#)

Missing Term $4x^2 + 49x + 1428 + 36$

Given The Following Perfect Square Trinomial Find The Missing Term $4x^2 + 49x + 1428 + 36$

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