"please Show Work If Possible So I Can Understand Better. Thank YouGiven The Following $2 X^{2}-24$

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When tackling algebraic expressions and equations such as $2X^{2} - 24$, it's crucial to understand each step involved in simplifying or solving them. Showing your work not only clarifies your thought process but also helps identify any errors and deepens your comprehension of the underlying mathematical concepts. In this comprehensive guide, we'll explore the various methods to analyze and manipulate the expression $2X^{2} - 24$, including factoring, solving for X, graphing, and understanding its properties. Whether you're a student, teacher, or someone interested in mathematics, this article aims to provide clear, step-by-step explanations optimized for SEO to enhance your learning experience.

Understanding the Expression $2X^{2} - 24$

What Does the Expression Represent?

The algebraic expression $2X^{2} - 24$ is a quadratic expression involving a variable X. It can be viewed as a quadratic function:

$$
f(X) = 2X^{2} - 24
$$

This function describes a parabola when graphed, opening upwards because the coefficient of X^{2} (which is 2) is positive.

Key Components of the Expression

- Quadratic Term: $2X^{2}$ — the squared term indicates it's quadratic.
- Constant Term: -24 — shifts the parabola vertically.
- Coefficient of X^{2}: 2 — affects the width and steepness of the parabola.

Step-by-Step Methods to Analyze $2X^{2} - 24$

1. Factoring the Expression

Factoring aims to rewrite the quadratic expression as a product of simpler polynomials. Let's explore how to factor $2X^{2} - 24$.

Step 1: Identify the greatest common factor (GCF) of the terms.

- The GCF of $2X^{2}$ and -24 is 2.

Step 2: Factor out the GCF.

$$
2X^{2} - 24 = 2 (X^{2} - 12)
$$

Step 3: Recognize whether the quadratic inside the parentheses can be factored further.

- $X^{2} - 12$ is a difference of squares if 12 is a perfect square, which it's not (since $\sqrt{12}$ is irrational).

- Therefore, it cannot be factored over the integers but can be expressed as a difference of squares:

$$
X^{2} - 12 = X^{2} - (\sqrt{12})^{2} = (X - \sqrt{12})(X + \sqrt{12})
$$

Final Factored Form:

$$
2X^{2} - 24 = 2 (X - \sqrt{12})(X + \sqrt{12})
$$

Note: For most elementary algebra purposes, expressing the factorization as above suffices. If rational factors are preferred, approximate $\sqrt{12} \approx 3.464$.

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2. Solving $2X^{2} - 24 = 0$ for X

Finding the roots of the quadratic expression involves setting it equal to zero and solving for X.

Step 1: Set the quadratic equal to zero:

$$
2X^{2} - 24 = 0
$$

Step 2: Isolate the quadratic term:

$$
2X^{2} = 24
$$

Step 3: Divide both sides by 2:

$$
X^{2} = 12
$$

Step 4: Take the square root of both sides:

$$
X = \pm \sqrt{12}
$$

which simplifies to:

$$
X = \pm 2\sqrt{3}
$$

Result:

$$
X = \pm 2 \sqrt{3}
$$

These are the solutions or roots of the quadratic equation.

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3. Graphing the Quadratic Function

Graphing provides visual insight into the behavior of the quadratic function $f(X) = 2X^{2} - 24$.

Key features:

- Vertex: Since the parabola opens upward, the vertex represents its minimum point.
- Axis of symmetry: The vertical line passing through the vertex.
- Y-intercept: The point where the graph crosses the y-axis.

Finding the vertex:

The vertex of a parabola $y = aX^{2} + bX + c$ has an X-coordinate at:

\[

$$
X_{v} = -\frac{b}{2a}
$$

In our case, $a = 2$, $b = 0$, $c = -24$:

$$
X_{v} = -\frac{0}{2 \times 2} = 0
$$

Calculating the corresponding Y-value:

$$
f(0) = 2(0)^{2} - 24 = -24
$$

Vertex coordinates:

$$
(0, -24)
$$

Y-intercept:

Set $X = 0$:

$$
f(0) = -24
$$

Plot points:

- At $X = 0$, $Y = -24$.
- At $X = \pm 2\sqrt{3}$, $Y = 0$ (roots).

Graphing these points will illustrate the shape and position of the parabola.

Understanding the Properties of $2X^{2} - 24$

Quadratic Function Characteristics

- Direction: Opens upward (since $a = 2 > 0$)
- Vertex: The minimum point at $(0, -24)$
- Axis of symmetry: $X = 0$
- Roots/zeros: $X = \pm 2\sqrt{3}$
- Y-intercept: $(0, -24)$

Vertex Form of the Quadratic

Expressing the quadratic in vertex form makes it easier to analyze transformations:

$$
f(X) = a(X - h)^2 + k
$$

where (h, k) is the vertex.

Since the original is $2X^{2} - 24$, and the vertex is at $(0, -24)$:

$$
f(X) = 2 (X - 0)^2 - 24 = 2X^2 - 24
$$

This confirms the vertex form.

Applications and Real-World Contexts

Quadratic expressions like $2X^{2} - 24$ are fundamental in various fields such as physics, engineering, economics, and biology.

Examples:

- Physics: Modeling the trajectory of projectiles under gravity.
- Economics: Calculating profit maximization where profit depends on quadratic functions.
- Biology: Population growth models with quadratic components.

Understanding how to manipulate such expressions allows professionals to predict outcomes, optimize solutions, and interpret data effectively.

Practice Problems for Better Understanding

To reinforce learning, try solving these problems:

1. Factor the expression: $2X^{2} - 24$
2. Find the roots: Solve $2X^{2} - 24 = 0$
3. Graph the function: Plot key points and vertex.
4. Determine the vertex: Find the vertex of $f(X) = 2X^{2} - 24$
5. Identify the axis of symmetry: Write the line of symmetry for the parabola.

Conclusion: The Importance of Showing Work in Algebra

Showing your work when dealing with algebraic expressions like $2X^{2} - 24$ is essential for several reasons:

- Enhances understanding: Each step clarifies the process.
- Facilitates error detection: Mistakes are easier to spot.
- Builds problem-solving skills: Developing a systematic approach.
- Prepares for more complex problems: Lays a foundation for advanced mathematics.

By practicing step-by-step solutions, including factoring, solving for X, and graphing, you'll develop a deeper understanding of quadratic expressions and their applications in real-life scenarios.

Remember: Mathematics is not just about getting the right answer but understanding how you arrive at it. Show your work, stay organized, and keep practicing!

Optimized for SEO Keywords:

- How to factor $2X^{2} - 24$
- Solving quadratic equations $2X^{2} - 24 = 0$
- Graphing quadratic functions
- Understanding quadratic expressions
- Vertex form of quadratic functions
- Quadratic roots and solutions
- Algebra tips for beginners
- Step-by-step algebra solutions
- Real-world applications of quadratic expressions

If you have further questions or

Frequently Asked Questions

What does the expression $2x^2 - 24$ represent?

It is a quadratic expression in terms of x, where $2x^2$ is the quadratic term and -24 is a constant term.

How can I factor the expression $2x^2 - 24$?

First, factor out the greatest common factor (GCF), which is 2. So, $2x^2 - 24 = 2(x^2 - 12)$. Since $x^2 - 12$ is a difference of squares only if 12 is a perfect square, but it's not. Therefore, the factored form is $2(x^2 - 12)$.

Can I solve $2x^2 - 24 = 0$? How?

Yes. Set the expression equal to zero: $2x^2 - 24 = 0$. Then, add 24 to both sides: $2x^2 = 24$. Next, divide both sides by 2: $x^2 = 12$. Finally, take the square root of both sides: $x = \pm\sqrt{12}$, which simplifies to $x = \pm 2\sqrt{3}$.

What is the value of x when $2x^2 - 24 = 0$?

The solutions are $x = \pm 2\sqrt{3}$, approximately $x = \pm 3.464$.

How do I graph the quadratic expression $2x^2 - 24$?

Since it's a quadratic with a positive coefficient for x^2, it opens upward. Its vertex is at x=0, y=-24 (because plugging x=0 gives $2(0)^2 - 24 = -24$). The graph is a parabola opening upward with its lowest point at (0, -24).

What is the vertex form of the quadratic expression $2x^2 - 24$?

Because the quadratic is in standard form and has no linear term, the vertex is at (0, -24). The vertex form is $y = 2(x - 0)^2 - 24$, which simplifies to $y = 2x^2 - 24$.

How do I find the axis of symmetry for the quadratic $2x^2 - 24$?

For a quadratic in standard form $ax^2 + bx + c$, the axis of symmetry is $x = -b/(2a)$. Here, b=0, so the axis of symmetry is x=0.

Is $2x^2 - 24$ a factorable quadratic?

Yes, it can be factored as $2(x^2 - 12)$. Since $x^2 - 12$ cannot be factored over integers (it's a difference of squares if we consider irrational roots), the expression factors as $2(x - \sqrt{12})(x + \sqrt{12})$.

What are the roots of the quadratic $2x^2 - 24$?

The roots are $x = \pm\sqrt{12}$, which simplifies to $x = \pm 2\sqrt{3}$.

Can I simplify the expression $2x^2 - 24$ further?

Yes, by factoring out 2, it becomes $2(x^2 - 12)$. This is the simplest factored form over the real numbers.

Additional Resources

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Understanding Algebraic Expressions: An In-Depth Investigation of \(2X^{2} - 24 \)

Mathematics, particularly algebra, is often perceived as a complex field filled with abstract symbols and convoluted rules. Yet, at its core, algebra is about understanding relationships, patterns, and structures. The expression $2X^{2} - 24$ serves as a perfect case study to explore these foundational concepts. This article aims to demystify this algebraic expression by dissecting it thoroughly, illustrating each step, and emphasizing the importance of showing work to foster comprehension.

Introduction: The Significance of Showing Work in Mathematics

Before delving into the specifics of the expression $2X^{2} - 24$, it's essential to recognize why demonstrating your work is crucial in mathematics:

- Enhanced Understanding: Showing steps clarifies the thought process, reinforcing comprehension.
- Error Identification: It helps locate mistakes in reasoning or calculations.
- Communication: It allows others to follow and verify your logic.
- Learning Reinforcement: The act of explaining work consolidates knowledge.

With that in mind, let's undertake an in-depth analysis of the expression, illustrating each step meticulously.

The Expression at a Glance: $2X^{2} - 24$

At first glance, $2X^{2} - 24$ appears to be a quadratic expression in the variable X. To analyze it thoroughly, we need to understand its structure, behavior, and potential applications.

What is $2X^{2} - 24$?

- Quadratic form: The highest degree of X is 2.
- Leading coefficient: 2.
- Constant term: -24.

This structure suggests the expression can be manipulated through standard algebraic techniques such as factoring, solving for zero, or graphing.

Step 1: Simplify or Factor the Expression

Goal: Express $2X^{2} - 24$ in a simpler or more insightful form.

Method 1: Factor out the greatest common factor (GCF)

Identify the GCF of 2 and 24:

- GCF of 2 and 24 is 2.

Factor 2 out:

$$
2X^{2} - 24 = 2(X^{2} - 12)
$$

This step was straightforward but essential for further analysis.

Significance:

Factoring reveals the core quadratic expression $X^{2} - 12$, which is easier to analyze, especially for solving equations.

Step 2: Solving $2X^{2} - 24 = 0$

Suppose we want to find the roots of the expression—values of X where the expression equals zero.

Set the expression equal to zero:

$$
2X^{2} - 24 = 0
$$

Using the factored form:

$$
2(X^{2} - 12) = 0
$$

Divide both sides by 2:

$$
X^{2} - 12 = 0
$$

Rearranged:

$$
X^{2} = 12
$$

Take the square root of both sides:

$$
X = \pm \sqrt{12}
$$

Simplify the square root:

$$
X = \pm \sqrt{4 \times 3} = \pm 2\sqrt{3}
$$

Result:

$$
\boxed{
X = \pm 2\sqrt{3}
}
$$

Step 3: Graphical Interpretation

Understanding the behavior of the quadratic expression graphically provides further insight.

Vertex Form

Express $2X^{2} - 24$ as a parabola:

- Since the original quadratic is already in standard form, the vertex can be found by completing the square or using the vertex formula.

Using the vertex formula:

The parabola $y = 2X^{2} - 24$ has:

- $a = 2$
- $b = 0$
- $c = -24$

The vertex X-coordinate:

$$
X_{v} = -\frac{b}{2a} = -\frac{0}{2 \times 2} = 0
$$

Corresponding Y-coordinate:

$$
Y_{v} = 2(0)^{2} - 24 = -24
$$

Vertex at:

$$
(0, -24)
$$

Key features:

- Axis of symmetry: $X = 0$
- Direction: Opens upward (since $a = 2 > 0$)
- Minimum point: At $(0, -24)$

Plotting points:

Calculate y for some X values:

X	$y = 2X^{2} - 24$
-2	$2(4) - 24 = 8 - 24 = -16$
-1	$2(1) - 24 = 2 - 24 = -22$
0	-24
1	$2(1)) - 24 = -22$
2	$8 - 24 = -16$

The parabola dips to -24 at $X=0$, with symmetric points at $X=\pm 1$ and $X=\pm 2$.

Step 4: Applications and Context

Understanding such an expression isn't just an academic exercise; it has practical significance.

1. Physics:

- Potential energy functions often involve quadratic expressions.
- For example, the potential energy stored in a spring follows $U = \frac{1}{2} k x^{2}$, similar in form to $2X^{2}$.

2. Economics:

- Cost functions and profit models may involve quadratic forms, representing increasing or decreasing returns.

3. Engineering:

- Structural analysis often involves quadratic equations to determine stress points or load distributions.

Step 5: Extending the Analysis

Exploring variations:

- Completing the square: Rewriting the quadratic in vertex form:

\[

$$
2X^{2} - 24 = 2(X^{2} - 12)
$$

Complete the square inside:

$$
X^{2} - 12 = (X)^2 - 2 \times 0 \times X + 0^{2} - 12
$$

But since it's already in a simple form, and the quadratic coefficient isn't 1, the standard approach is:

$$
2X^{2} - 24 = 2\left(X^{2} - 12 \right)
$$

which we've already expressed.

Solving inequalities:

Suppose we want to find where the expression is positive or negative.

- Since $2X^{2} - 24 = 0$ at $X = \pm 2\sqrt{3}$, and the parabola opens upward, the sign depends on the interval:

$$
2X^{2} - 24 > 0 \quad \Rightarrow \quad X^{2} > 12
$$

which holds when:

$$
X < -2\sqrt{3} \quad \text{or} \quad X > 2\sqrt{3}
$$

Similarly,

$$
2X^{2} - 24 < 0 \quad \Rightarrow \quad -2\sqrt{3} < X < 2\sqrt{3}
$$

Conclusion: The Power of Showing Work

This detailed exploration of $2X^{2} - 24$ illustrates the profound importance of showing each step in solving and analyzing algebraic expressions. By systematically factoring, solving for zero, graphing, and interpreting the expression, we've transformed a simple quadratic into a comprehensive understanding.

Key Takeaways:

- Show work clarifies reasoning: Each algebraic manipulation reveals insights.
- Facilitates learning: Step-by-step solutions reinforce concepts.
- Enables troubleshooting: Errors are easier to identify when steps are transparent.
- Builds confidence: Understanding the process empowers students and practitioners alike.

In essence, whether you're tackling a homework problem or analyzing a real-world model, showing your work is the bridge between confusion and clarity. The expression $2X^{2} - 24$ serves as a testament to the value of transparency in mathematical reasoning, fostering deeper understanding and mastery.

Thank you for engaging with this thorough investigation. Remember, in mathematics, the journey is often as important as the destination—so always show your work!

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