

Describe And Correct The Error A Student Made Finding The Intercepts Of The Graph Of The Line $4x-6y=12$ (PLEASE

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When studying linear equations and their graphs, finding the intercepts—where the line crosses the axes—is a fundamental skill. Intercepts provide valuable insights into the characteristics of the line, such as its position and slope. However, students often make mistakes during this process, especially if they misinterpret the equation or perform algebraic steps incorrectly. This article explores a common student error encountered when finding the intercepts of the line defined by the equation $4x - 6y = 12$, and provides a comprehensive guide on how to correctly determine these points. By understanding the mistake and the correct method, students can improve their algebraic skills and confidently analyze linear equations.

Understanding the Equation $4x - 6y = 12$

Before identifying errors and correcting them, it's essential to understand the structure of the given equation.

Standard Form of a Linear Equation

The equation $4x - 6y = 12$ is in standard form, which generally looks like $Ax + By = C$, where:

- A, B, and C are constants,
- x and y are variables.

In this form, it's straightforward to find intercepts by setting one variable to zero and solving for the other.

Graphing the Equation

The graph of this line will cross the x-axis at the point where $y=0$ and the y-axis at the point where $x=0$.

Common Student Errors When Finding Intercepts

Students often encounter pitfalls during the process of finding intercepts. Some common mistakes include:

1. Misinterpreting the Equation

- Swapping x and y values.
- Failing to recognize the standard form or incorrectly rewriting the equation.

2. Incorrectly Solving for Intercepts

- When finding the x-intercept, setting $y=0$ but making algebraic errors.
- When finding the y-intercept, setting $x=0$ but making similar mistakes.

3. Arithmetic Mistakes

- Sign errors (e.g., forgetting to change the sign when moving terms).
- Incorrect division or multiplication.

4. Not Verifying the Solution

- Failing to substitute the obtained intercepts back into the original equation to verify correctness.

Step-by-Step Correct Method to Find the Intercepts of $4x - 6y = 12$

To avoid errors, it's crucial to follow a systematic approach. Here is a step-by-step guide.

Finding the x-Intercept

The x-intercept occurs where $y=0$.

Step 1: Substitute $y=0$ into the original equation:

$$4x - 6(0) = 12$$

Step 2: Simplify:

$$4x = 12$$

Step 3: Solve for x:

$$x = \frac{12}{4} = 3$$

Result: The x-intercept is at the point (3, 0).

Finding the y-Intercept

The y-intercept occurs where $x=0$.

Step 1: Substitute $x=0$ into the original equation:

$$\backslash[4(0) - 6y = 12 \backslash]$$

Step 2: Simplify:

$$\backslash[-6y = 12 \backslash]$$

Step 3: Solve for y :

$$\backslash[y = \frac{12}{-6} = -2 \backslash]$$

Result: The y -intercept is at the point $(0, -2)$.

Common Mistakes in the Calculation Process and How to Correct Them

Let's analyze a typical student mistake and demonstrate how to correct it.

Example of a Student Error

Suppose a student tries to find the intercepts and makes the following mistake:

- When finding the x -intercept, they set $y=0$, but then incorrectly solve for x as follows:

$$\backslash[4x - 6(0) = 12 \backslash]$$

$$\backslash[4x = 12 \backslash]$$

$$\backslash[x = 4 \backslash] \text{ (Incorrectly written as 4 instead of 3)}$$

They then conclude the x -intercept is at $(4, 0)$, which is wrong.

Why is the Error Incorrect?

The algebraic steps are correct, but the initial substitution or calculation was flawed, or perhaps the student misread the original equation.

Corrected Approach

- Reiterate the substitution:

$$\backslash[y=0 \backslash]$$

- Substitute into the original:

$$\backslash[4x - 6(0) = 12 \backslash]$$

$$\backslash[4x = 12 \backslash]$$

- Divide both sides by 4:

$$\backslash[x = \frac{12}{4} = 3 \backslash]$$

- Confirm the value:

$$\backslash[x = 3 \backslash]$$

Key Point: Always double-check algebraic operations, especially division steps.

Another Common Mistake: Sign Errors

Suppose a student forgets to change the sign when moving terms and writes:

$$[4x - 6y = 12]$$

$$[4x = 12 + 6y]$$

and then substitutes $y=0$:

$$[4x = 12 + 6(0) = 12]$$

$$[x=3]$$

This is correct, but if they forget to move the term with y correctly or incorrectly handle the signs, errors can occur. For example, if they write:

$$[4x - 6y = 12]$$

$$[4x = 12 - 6y]$$

which is incorrect because they did not move the $(-6y)$ term to the right side properly.

How to Avoid Sign Errors:

- Always perform algebraic operations carefully.
- When moving terms across the equals sign, change the signs accordingly.
- Use parentheses when necessary to keep track of signs.

Verifying the Intercepts

After calculating the intercepts, always verify by substituting the points back into the original equation.

Example:

- Check the x-intercept (3, 0):

$$[4(3) - 6(0) = 12]$$

$$[12 - 0 = 12]$$

- Correct.

- Check the y-intercept (0, -2):

$$[4(0) - 6(-2) = 0 + 12 = 12]$$

- Correct.

This verification confirms the accuracy of the intercepts.

Graphing the Line Using the Intercepts

Once the intercepts are correctly identified:

1. Plot the x-intercept at (3, 0).
2. Plot the y-intercept at (0, -2).
3. Draw a straight line through these points.

This visual approach helps students understand the line's position and slope.

Summary of the Correct Procedure

To ensure accuracy when finding intercepts:

- Set $y=0$, substitute into the equation, and solve for x .
- Set $x=0$, substitute into the equation, and solve for y .
- Simplify carefully, paying attention to signs.
- Verify your solutions by plugging the intercepts back into the original equation.
- Plot the points and draw the line for visual confirmation.

Conclusion

Finding the intercepts of a linear equation is a straightforward yet critical skill in algebra and coordinate graphing. Common errors often stem from misinterpretation, sign mistakes, arithmetic slip-ups, or skipping verification steps. By systematically substituting zero for the opposite variable and solving carefully, students can avoid these mistakes. The example of the line $4x - 6y = 12$ highlights the importance of accurate algebraic manipulation and verification. Mastery of this process not only improves understanding of linear equations but also builds a foundation for more advanced topics in mathematics.

Remember: double-check your work, verify your solutions, and practice regularly to develop confidence in graphing and interpreting linear equations effectively.

Frequently Asked Questions

What is the first step to find the intercepts of the line $4x - 6y = 12$?

To find the x-intercept, set $y = 0$ and solve for x ; to find the y-intercept, set $x = 0$ and solve for y .

A student set $y = 0$ and found $x = 3$ when finding the intercept, but their answer was incorrect. Where might they have gone wrong?

They likely made an algebraic error when solving for x ; specifically, they should have substituted $y=0$ into the equation and carefully solved $4x - 6(0) = 12$, which simplifies to $4x = 12$, giving $x = 3$.

How do you correctly find the y-intercept of the line $4x - 6y = 12$?

Set $x=0$ in the equation: $4(0) - 6y = 12$, which simplifies to $-6y = 12$, so $y = -2$.

What common mistake might students make when solving for intercepts in the equation $4x - 6y = 12$?

A common mistake is to forget to switch signs when dividing or to miscalculate the algebraic steps, such as dividing both sides by -6 or mishandling the coefficients.

After correctly finding the intercepts, how should a student verify their answers?

They should substitute the found intercepts back into the original equation to ensure both satisfy it, confirming the points lie on the line.

Additional Resources

Describe And Correct The Error A Student Made Finding The Intercepts Of The Graph Of The Line $4x - 6y = 12$

Understanding how to find the intercepts of a linear equation is fundamental in algebra and coordinate geometry. Intercepts provide crucial points that help graph lines accurately and interpret their behavior within a coordinate plane. When students attempt this process, errors can occur, often stemming from misconceptions, algebraic missteps, or misinterpretations of the problem. Analyzing these errors and understanding how to correct them not only strengthens mathematical skills but also deepens conceptual understanding.

This article provides a comprehensive review of the common mistake a student made in finding the intercepts of the line given by the equation $4x - 6y = 12$. We will explore the correct procedures for finding intercepts, examine the specific error, analyze its root causes, and offer detailed correction strategies. The goal is to equip educators, students, and math enthusiasts with insights to prevent similar mistakes and foster a more robust understanding of linear equations.

Understanding the Equation and the Concept of Intercepts

What Are Intercepts?

Intercepts are points where a line crosses the axes of a coordinate plane. Specifically:

- x-intercept: The point where the line crosses the x-axis ($y=0$). This point has coordinates $(x, 0)$.
- y-intercept: The point where the line crosses the y-axis ($x=0$). This point has coordinates $(0, y)$.

Finding these points involves substituting 0 for y to find the x-intercept and substituting 0 for x to find the y-intercept. These points are critical because they give immediate insights into the position and slope of the line.

Why Are Intercepts Important?

- They help in sketching the graph quickly.
- They provide points for the line's visual representation.
- They help in solving real-world problems where intercepts may represent thresholds or boundaries.

Standard Procedure to Find Intercepts

Finding the x-Intercept

1. Set $y = 0$ in the equation.
2. Solve for x.
3. The solution gives the x-coordinate of the x-intercept.

Example:

Given the line: $4x - 6y = 12$

- Set $y = 0$:

...

$$4x - 6(0) = 12$$

$$4x = 12$$

$$x = 12 / 4$$

$$x = 3$$

...

- x-intercept: $(3, 0)$

Finding the y-Intercept

1. Set $x = 0$.
2. Solve for y .
3. The solution gives the y -coordinate of the y -intercept.

Example:

- Set $x = 0$:

...

$$4(0) - 6y = 12$$

$$-6y = 12$$

$$y = 12 / -6$$

$$y = -2$$

...

- y -intercept: $(0, -2)$

The Student's Error: A Closer Look

Suppose a student attempts to find the intercepts of the line $4x - 6y = 12$ and makes the following mistake:

- For the x -intercept, they correctly set $y = 0$ but then incorrectly solve for x , perhaps by misapplying algebra or miscalculating:

...

$$4x - 6(0) = 12$$

$$4x = 12$$

$$x = 12$$

...

- For the y -intercept, they set $x = 0$ but then incorrectly calculate y , perhaps by misapplying signs:

...

$$4(0) - 6y = 12$$

$$-6y = 12$$

$$y = -12 / 6$$

$$y = -2$$

...

But, suppose the student then incorrectly concludes the intercepts as $(12, 0)$ and $(0, -2)$, leading to a misinterpretation of the line.

Common Mistakes Identified:

- Misreading the coefficients or constants.

- Incorrectly simplifying equations after substitution.
- Failing to pay attention to signs, leading to errors such as miscalculating y-intercept as positive instead of negative.
- Confusing the operations or algebraic steps, such as dividing incorrectly.

Analyzing the Root Causes of the Error

Understanding why such errors occur is crucial to preventing them. The primary causes include:

1. Misapplication of Algebraic Principles

Students sometimes forget fundamental algebra rules. For example, misapplying division when solving for x or y, or misinterpreting the negative signs, can lead to incorrect intercepts.

2. Sign Confusion

Negative signs are a common source of errors. Students may misinterpret the negative coefficient or constant term, leading to incorrect signs in the intercepts.

3. Lack of Clear Step-by-Step Approach

Without a systematic process, students may skip steps or perform calculations out of order, increasing chances of mistakes.

4. Misinterpretation of the Equation

Some students confuse the coefficients or constants, especially when the equations are more complex or involve fractions.

5. Overgeneralization or Guesswork

Trying to estimate or guess the intercepts without proper calculation often results in inaccuracies.

Correcting the Student's Error: A Step-by-Step Approach

To correct and reinforce accurate methods, it's essential to go through each step carefully,

emphasizing the importance of proper algebraic manipulation and sign handling.

Step 1: Restate the Equation Clearly

- The original equation: $4x - 6y = 12$
- Ensure understanding of each term: $4x$ (positive), $-6y$ (negative), and 12 (constant).

Step 2: Find the x-Intercept

- Set $y = 0$:

```

$$4x - 6(0) = 12$$

$$4x = 12$$

$$x = 12 / 4$$

$$x = 3$$

```

- Result: The x-intercept is $(3, 0)$

Key Point: The student must recognize that setting $y=0$ simplifies the equation directly, and the division must be handled carefully.

Step 3: Find the y-Intercept

- Set $x = 0$:

```

$$4(0) - 6y = 12$$

$$-6y = 12$$

$$y = 12 / -6$$

$$y = -2$$

```

- Result: The y-intercept is $(0, -2)$

Important: The division by -6 introduces the negative sign, which must be carefully applied. The student should verify the sign after division.

Step 4: Verify the Results

- Graph the intercepts: $(3, 0)$ and $(0, -2)$.
- Draw the line passing through these points.
- Confirm that these points satisfy the original equation:

For $(3, 0)$:

```

$$4(3) - 6(0) = 12$$

$$12 - 0 = 12 \rightarrow \text{Correct}$$

```

For (0, -2):

```

$$4(0) - 6(-2) = 12$$

$$0 + 12 = 12 \rightarrow \text{Correct}$$

```

Additional Tips for Avoiding Errors

- Always write out each step clearly to prevent skipping or misapplying operations.
- Pay close attention to signs—a negative times a negative yields a positive, and division signs can change the sign of the result.
- Double-check calculations by substituting the intercepts back into the original equation.
- Use visual aids or graphing tools to confirm the correctness of the intercepts.
- Practice with varied equations to build confidence and familiarity with different forms.

Conclusion: Emphasizing Conceptual Understanding and Methodical Approach

The errors made by students when finding the intercepts of a line often stem from fundamental misunderstandings of algebraic principles, sign handling, or procedural steps. Correcting these mistakes involves not only reviewing the procedural steps but also fostering a deeper conceptual understanding of what intercepts represent and how to find them systematically.

By emphasizing a clear, step-by-step approach—setting the appropriate variable to zero, solving carefully for the remaining variable, verifying the solutions, and understanding the significance of signs—students can significantly improve their accuracy and confidence. Educators should encourage students to check their work at each stage and to develop a disciplined approach to solving these kinds of problems.

Ultimately, mastering the process of finding intercepts enhances overall mathematical literacy and prepares students for more advanced topics in algebra, coordinate geometry, and beyond. Recognizing and correcting errors is a vital part of this learning journey, turning mistakes into valuable opportunities for growth and understanding.

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Intercepts Of The Graph Of The Line $4x + 6y = 12$ Please

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