

Find The Slope Of The Line. $4x+5y=10$ Select The Correct Choice Below And, If Necessary, Fill In The Answer

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Introduction to the Concept of Slope in Linear Equations

Understanding the slope of a line is fundamental in algebra and coordinate geometry. The slope indicates the steepness or incline of a line on the Cartesian plane, quantifying how much the y-value changes for a unit change in the x-value. It is represented by the letter "m" in the slope-intercept form of a line, $y = mx + b$. Calculating the slope accurately enables students and professionals to analyze relationships between variables, predict values, and interpret data trends effectively.

In this article, we focus on the process of finding the slope of a specific linear equation: $4x + 5y = 10$. We will explore methods to convert the equation into slope-intercept form, select the correct slope from multiple choices, and understand the importance of the slope in the broader context of mathematics and real-world applications.

Understanding the Equation $4x + 5y = 10$

Before we determine the slope, it's essential to analyze the structure of the given linear equation:

Equation: $4x + 5y = 10$

This is a standard form linear equation, where the coefficients of x and y are 4 and 5, respectively, and the constant term is 10. To find the slope, we typically need to express the equation in slope-intercept form ($y = mx + b$), which involves solving for y.

Converting the Equation to Slope-Intercept Form

The slope-intercept form is crucial because it directly reveals the slope (m) as the coefficient of x.

Follow these steps to convert $4x + 5y = 10$ into $y = mx + b$:

Step 1: Isolate the y-term

Subtract $4x$ from both sides:

$$5y = -4x + 10$$

Step 2: Solve for y

Divide both sides by 5:

$$y = (-4x + 10) / 5$$

Step 3: Simplify the expression

Split the fraction:

$$y = (-4/5)x + 10/5$$

Simplify the constant:

$$y = (-4/5)x + 2$$

Now, the equation is in slope-intercept form:

$$y = (-4/5)x + 2$$

Identifying the Slope from the Equation

In the slope-intercept form $y = mx + b$, the coefficient of x (m) is the slope of the line.

From our simplified equation:

$$y = (-4/5)x + 2$$

The slope m is $-4/5$.

Choosing the Correct Slope: Multiple Choice Analysis

Suppose you are presented with options to select the slope of the line:

- A. $\frac{4}{5}$
- B. $-\frac{4}{5}$
- C. $\frac{5}{4}$
- D. $-\frac{5}{4}$

Based on our conversion, the correct choice is B. $-\frac{4}{5}$.

It's important to understand how to interpret these options:

- The positive or negative sign indicates the direction of the line.
- The fraction represents the steepness or incline.

Understanding the Significance of the Slope

The slope of $-\frac{4}{5}$ indicates a line that decreases as x increases, exhibiting a downward trend from left to right. Specifically:

- For every 5 units increase in x , y decreases by 4 units.
- The negative sign shows the inverse relationship between x and y in this line.

This information is vital in many contexts, such as physics (rate of change), economics (costs and revenues), and data analysis.

How to Calculate the Slope in Different Scenarios

While the current example involves a linear equation in standard form, in practice, you might encounter various forms requiring different approaches:

1. From Two Points

Given two points, (x_1, y_1) and (x_2, y_2) , the slope is:

$$m = (y_2 - y_1) / (x_2 - x_1)$$

2. From Slope-Intercept Form

Directly identified from the equation $y = mx + b$.

3. From Standard Form $Ax + By = C$

Convert to slope-intercept form as shown above.

Practical Applications of Slope Calculation

Understanding and calculating the slope has numerous real-world applications:

- Engineering: Determining the incline of ramps or roads.
- Economics: Analyzing cost versus production quantity.
- Physics: Calculating velocity or acceleration.
- Environmental Science: Assessing changes in climate data over time.
- Computer Graphics: Rendering lines and curves accurately.

Summary and Key Takeaways

- The linear equation $4x + 5y = 10$ can be transformed into slope-intercept form to identify the slope.
- Converting $4x + 5y = 10$ into $y = (-4/5)x + 2$ reveals that the slope is $-4/5$.
- The correct choice from multiple options is B. $-4/5$.
- The negative slope signifies a line descending from left to right.
- Calculating the slope accurately is essential for various mathematical and real-world applications.

Additional Practice Problems

To reinforce understanding, consider practicing with these problems:

1. Find the slope of the line $3x - 2y = 6$.
2. Given the points $(1, 2)$ and $(3, 8)$, find the slope of the line passing through them.
3. Convert the equation $y = 7x + 4$ into standard form and identify the slope.

Conclusion

Mastering the process of finding the slope of a line from different forms of equations is a vital skill in algebra. By converting equations into slope-intercept form, you can quickly and accurately determine the line's steepness and direction. In the specific case of $4x + 5y = 10$, the slope is $-4/5$, signifying a line that declines as x increases. Understanding these concepts enhances your ability to analyze linear relationships and apply them across diverse disciplines.

Remember: Always check your conversions carefully, and recognize the importance of the slope in interpreting the behavior of lines in coordinate geometry.

Frequently Asked Questions

What is the first step to find the slope of the line given by $4x + 5y = 10$?

Rewrite the equation in slope-intercept form ($y = mx + b$) by solving for y .

How do you solve $4x + 5y = 10$ for y ?

Subtract $4x$ from both sides to get $5y = -4x + 10$, then divide both sides by 5 to get $y = (-4/5)x + 2$.

What is the slope of the line $4x + 5y = 10$?

The slope is $-4/5$.

If a line is written in the form $Ax + By = C$, how do you find its slope?

Rearrange the equation to $y = (-A/B)x + (C/B)$ and identify the coefficient of x as the slope.

Choose the correct slope from the options: A) $4/5$ B) $-4/5$ C) $5/4$ D) $-5/4$

B) $-4/5$

Fill in the blank: The slope of the line $4x + 5y = 10$ is _____.

$-4/5$

Additional Resources

Find The Slope Of The Line. $4x + 5y = 10$ Select The Correct Choice Below And, If Necessary, Fill In The Answer

Understanding how to find the slope of a line is a fundamental skill in algebra and coordinate geometry. The phrase "Find The Slope Of The Line. $4x + 5y = 10$ Select The Correct Choice Below And, If Necessary, Fill In The Answer" emphasizes the importance of interpreting linear equations accurately and transforming them into a form that reveals the slope. This process is not only central to solving geometric problems but also critical in real-world applications, such as engineering, physics, and economics, where relationships between variables are often represented by lines. In this article, we will explore the method to find the slope from a standard form linear equation, analyze the steps involved, discuss common pitfalls, and present practice questions to reinforce understanding.

Understanding the Standard Form of a Linear Equation

Before diving into calculations, it's essential to understand the general forms of linear equations. The most common forms are:

- Slope-Intercept Form: $y = mx + b$
where m is the slope, and b is the y -intercept.

- Standard Form: $Ax + By = C$
where A , B , and C are constants.

In the standard form, the slope is not immediately obvious, so one must rearrange the equation into the slope-intercept form to identify it easily.

Why Convert to Slope-Intercept Form?

Converting to $y = mx + b$ simplifies the process of identifying the slope and y -intercept directly. The coefficient of x in this form (m) is the slope of the line.

Step-by-Step Guide to Find the Slope

Let's examine the specific example: $4x + 5y = 10$.

Step 1: Write the Equation in Standard Form

Given: $4x + 5y = 10$

This is already in standard form.

Step 2: Rearrange to Slope-Intercept Form

Solve for y :

$$4x + 5y = 10$$

Subtract $4x$ from both sides:

$$5y = -4x + 10$$

Step 3: Divide Both Sides by the Coefficient of y

Divide both sides by 5:

$$y = (-4/5)x + 10/5$$

Simplify:

$$y = (-4/5)x + 2$$

Step 4: Identify the Slope

In $y = mx + b$, the slope m is the coefficient of x :

$$m = -4/5$$

Conclusion: The slope of the line $4x + 5y = 10$ is $-4/5$.

Interpreting the Slope

The slope, $m = -4/5$, has several implications:

- Negative Slope: The line decreases as x increases.
- Rate of Change: For every increase of 5 units in x , y decreases by 4 units.
- Direction and Inclination: The line is inclined downward from left to right.

Understanding the slope's sign and magnitude helps visualize the line's behavior and graph it accurately.

Choosing the Correct Answer and Filling in the Blank

In multiple-choice questions, you might be presented with options such as:

- a) $4/5$
- b) $-4/5$
- c) $5/4$
- d) $-5/4$

Given our calculation, the correct choice would be b) $-4/5$.

Alternatively, the question might ask you to fill in the answer if the options are missing. In this case, the answer to fill in would be $-4/5$.

Common Mistakes and How to Avoid Them

When calculating the slope from an equation, students often make errors. Here are some common mistakes and tips to avoid them:

- Not Rearranging Properly:

Always isolate y before determining the slope. Forgetting to divide through by the coefficient of y can lead to incorrect answers.

- Misreading the Coefficients:

Remember that the coefficient of x in the slope-intercept form is directly the slope, not the constant term.

- Sign Errors:

Be careful with negative signs. Moving a term across the equality sign changes the sign.

- Ignoring the Equation's Form:

Some equations are given in other forms (e.g., point-slope or two-point form). Convert them appropriately.

Practice Problems

To solidify your understanding, try the following problems:

1. Find the slope of the line given by $3x - 2y = 6$.
2. The equation of a line is $y = 7x + 3$. What is its slope?
3. The line passes through points $(2, 5)$ and $(4, 1)$. Find its slope.
4. Convert the equation $2x + 3y = 12$ into slope-intercept form and identify the slope.

Answers:

1. Rearranged: $3x - 2y = 6 \rightarrow -2y = -3x + 6 \rightarrow y = (3/2)x - 3 \rightarrow \text{Slope} = 3/2$.
2. Slope is directly given as 7.
3. $\text{Slope} = (1 - 5) / (4 - 2) = (-4)/2 = -2$.
4. $2x + 3y = 12 \rightarrow 3y = -2x + 12 \rightarrow y = (-2/3)x + 4 \rightarrow \text{Slope} = -2/3$.

Features and Summary

Features of Finding the Slope from an Equation:

- Methodical Approach: Rearrangement into slope-intercept form is straightforward and reliable.
- Versatility: Applies to any linear equation, regardless of initial form.
- Graphical Interpretation: Slope indicates the line's inclination and direction.

Pros:

- Clarifies the linear relationship between variables.
- Facilitates graphing and analysis.
- Essential for understanding linear models in various fields.

Cons:

- Can be confusing if equations are not properly rearranged.
- Mistakes in sign or arithmetic can lead to incorrect slopes.
- Not applicable for non-linear equations.

Final Thoughts

Mastering how to find the slope of a line from an equation like $4x + 5y = 10$ is an essential part of algebra. It involves recognizing the equation's form, rearranging it into slope-intercept form, and then identifying the coefficient of x . This process enhances understanding of linear relationships and prepares students for more advanced topics such as modeling and calculus. Practicing with various equations ensures accuracy and confidence, enabling you to select the correct answer confidently and fill in answers as needed. Remember, the key steps are to isolate y and carefully interpret the resulting coefficient, paying close attention to signs and arithmetic. With consistent practice, finding the slope becomes an intuitive and valuable skill in your mathematical toolkit.

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