

Whats The Slope Of The Equation $6x + 8y = 16$?

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Understanding the slope of a linear equation is fundamental in algebra, as it describes how one variable changes in relation to another. In particular, for the equation $6x + 8y = 16$, determining its slope provides insight into the line's steepness and direction. This article will guide you through the process of finding the slope of this equation, explain the underlying concepts, and explore related topics such as the slope-intercept form, standard form, and how to interpret the slope in real-world scenarios. Whether you're a student, teacher, or someone interested in mathematics, this comprehensive guide aims to clarify the concept and application of slope in linear equations.

Understanding the Equation $6x + 8y = 16$

Before diving into calculating the slope, it's essential to understand the form of the given linear equation.

Standard Form of a Linear Equation

The equation $6x + 8y = 16$ is expressed in standard form, which is typically written as:

$$[Ax + By = C]$$

where:

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

In our case:

- $A = 6$
- $B = 8$
- $C = 16$

Standard form is useful because it makes it straightforward to identify the coefficients of the variables and to convert the equation into other forms such as the slope-intercept form.

Why Find the Slope?

The slope indicates the rate at which y changes with respect to x . It tells us:

- The direction of the line (positive slope: upward; negative slope: downward).
- The steepness of the line.
- How to graph the line accurately.

Converting the Equation to Slope-Intercept Form

The most common way to determine the slope of a linear equation is to express it in slope-intercept form, which is:

$$y = mx + b$$

where:

- m is the slope.
- b is the y-intercept.

Steps to Convert $6x + 8y = 16$ into Slope-Intercept Form

1. Start with the standard form:

$$6x + 8y = 16$$

2. Isolate y on one side:

$$8y = -6x + 16$$

3. Divide both sides by 8 to solve for y :

$$y = \frac{-6x + 16}{8}$$

4. Simplify the fractions:

$$y = -\frac{6}{8}x + \frac{16}{8}$$

$$y = -\frac{3}{4}x + 2$$

Now, the equation is in slope-intercept form:

$$y = -\frac{3}{4}x + 2$$

Calculating the Slope of the Equation

From the slope-intercept form, the slope m is directly visible:

$$m = -\frac{3}{4}$$

Therefore, the slope of the line represented by the equation $6x + 8y = 16$ is $-\frac{3}{4}$.

Interpreting the Slope

Understanding what the slope $-\frac{3}{4}$ means in real-world contexts or graphing is crucial.

Positive vs. Negative Slope

- Negative Slope ($-\frac{3}{4}$): Indicates that as x increases, y decreases. The line slopes downward from left to right.
- Magnitude of the Slope: The absolute value $\frac{3}{4}$ shows that for every 4 units increase in x , y decreases by 3 units.

Steepness of the Line

- A slope of $-\frac{3}{4}$ suggests a moderate downward tilt.
- The steeper the absolute value of the slope, the steeper the line.

Graphical Representation

To visualize:

- The y-intercept is at $(b = 2)$, meaning the line crosses the y-axis at $(0, 2)$.
- From the point $(0, 2)$, moving 4 units to the right $(+x)$, y decreases by 3 units, reaching $(4, -1)$.

Plotting these points and drawing a line through them provides a visual representation of the equation.

Additional Methods for Finding the Slope

While converting to slope-intercept form is straightforward, other methods exist to find the slope directly from the standard form.

Method 1: Using the Formula from Standard Form

For a line in standard form $Ax + By = C$, the slope m is:

$$m = -\frac{A}{B}$$

Applying this to our equation:

$$m = -\frac{6}{8} = -\frac{3}{4}$$

This shortcut confirms our previous result, demonstrating the utility of the standard form in quickly determining the slope.

Method 2: Graphical Approach

- Plot the line based on the intercepts:
- Y-intercept at $(0, 2)$.
- X-intercept at the point where $y = 0$:

$$6x + 8(0) = 16 \rightarrow 6x = 16 \rightarrow x = \frac{16}{6} = \frac{8}{3}$$

- X-intercept at $(\frac{8}{3}, 0)$.

- Calculate the slope between these two points:

$$m = \frac{0 - 2}{\frac{8}{3} - 0} = \frac{-2}{\frac{8}{3}} = -2 \times \frac{3}{8} = -\frac{6}{8} = -\frac{3}{4}$$

which confirms the earlier result.

Real-World Applications of Slope in Linear Equations

Understanding the slope of a line like $(6x + 8y = 16)$ is not just an academic exercise; it has practical implications across various fields.

Economics and Finance

- Cost Analysis: The slope can represent the rate of change of cost with respect to units produced.
- Supply and Demand: The slope indicates how quantity demanded or supplied changes with price.

Physics and Engineering

- Velocity: The slope of a position vs. time graph represents velocity.
- Electrical Engineering: The slope can indicate the rate of change of voltage or current over time.

Business and Data Analysis

- Trend Analysis: The slope helps identify upward or downward trends in data series.
- Forecasting: Understanding how variables relate allows for better predictions.

Practice Problems and Examples

To reinforce understanding, try these practice problems:

1. Find the slope of the line given by $(3x - 4y = 12)$.

- Convert to slope-intercept form:

$$[-4y = -3x + 12]$$

$$[y = \frac{3}{4}x - 3]$$

- Slope $(m = \frac{3}{4})$.

2. Determine the slope of the line passing through points $(2, 5)$ and $(4, 1)$.

- Use the slope formula:

$$[m = \frac{1 - 5}{4 - 2} = \frac{-4}{2} = -2]$$

3. Given the standard form $(5x + 10y = 20)$, find the slope.

- Use the shortcut:

$$[m = -\frac{A}{B} = -\frac{5}{10} = -\frac{1}{2}]$$

Summary and Key Takeaways

- The slope of the line represented by the equation $(6x + 8y = 16)$ is $(-\frac{3}{4})$.
- Converting standard form to slope-intercept form simplifies the process of identifying the slope.
- The slope indicates a downward-sloping line, decreasing by 3 units in (y) for every 4 units increase in (x) .
- The shortcut $(m = -\frac{A}{B})$ allows quick calculation directly from the standard form.
- Understanding slope is essential for graphing lines, analyzing trends, and applying mathematical concepts in real-world scenarios.

Conclusion

Determining the slope of the equation $6x + 8y = 16$ is a straightforward process once you understand the conversion to slope-intercept form or the use of the standard form shortcut. The slope $-\frac{3}{4}$

Frequently Asked Questions

What is the slope of the equation $6x + 8y = 16$?

The slope is $-\frac{3}{4}$ because when you rewrite the equation in slope-intercept form ($y = mx + b$), it becomes $y = -\frac{3}{4}x + 2$.

How do you find the slope of the line given the equation $6x + 8y = 16$?

First, solve for y in terms of x to get it into slope-intercept form ($y = mx + b$). For $6x + 8y = 16$, subtract $6x$ from both sides and then divide by 8 , resulting in $y = -\frac{3}{4}x + 2$. The coefficient of x , $-\frac{3}{4}$, is the slope.

Can the slope of the equation $6x + 8y = 16$ be undefined?

No, the slope is not undefined. After rewriting the equation in slope-intercept form, the slope is $-\frac{3}{4}$, which is defined. An undefined slope occurs with vertical lines, but this line is not vertical.

What is the significance of the slope in the equation $6x + 8y = 16$?

The slope indicates the rate at which y changes with respect to x along the line. In this case, for every 4 units increase in x , y decreases by 3 units.

Is the line represented by $6x + 8y = 16$ increasing or decreasing?

The line is decreasing because the slope is negative ($-\frac{3}{4}$). This means as x increases, y decreases.

Additional Resources

Whats The Slope Of The Equation $6x + 8y = 16$?

In the realm of mathematics, understanding the properties of linear equations is fundamental to grasping more complex concepts across algebra, calculus, and applied sciences. One question that often arises for students and enthusiasts alike is: Whats the slope of the equation $6x + 8y = 16$? While seemingly straightforward, this question opens the door to exploring the deeper mechanics of linear equations, their graphical representations, and their real-world applications. This article aims to thoroughly investigate

this particular equation, analyze its slope, and provide a comprehensive understanding of what the slope signifies in this context.

Understanding the Equation $6x + 8y = 16$

Before delving into the slope, it's essential to understand the form and structure of the equation itself.

Standard Form of a Linear Equation

The equation provided:

$$6x + 8y = 16$$

is presented in what mathematicians call the standard form of a linear equation:

$$[Ax + By = C]$$

where A , B , and C are constants. This form is particularly useful for quickly identifying the intercepts and analyzing the equation's properties.

Rearrangement into Slope-Intercept Form

To find the slope, it is most convenient to express the equation in the slope-intercept form:

$$[y = mx + b]$$

where:

- m is the slope
- b is the y-intercept

Let's perform the algebraic manipulation:

$$\begin{aligned} [& \\ 6x + 8y &= 16 \\ & \end{aligned}$$

Subtract $6x$ from both sides:

$$\begin{aligned} [& \\ 8y &= -6x + 16 \\ & \end{aligned}$$

Divide through by 8:

$$\begin{aligned} [& \\ y &= -\frac{6}{8}x + \frac{16}{8} \end{aligned}$$

\]

Simplify the fractions:

\[

$$y = -\frac{3}{4}x + 2$$

\]

This form clearly reveals the slope as $-\frac{3}{4}$.

Calculating the Slope: The Core Question

From the algebraic manipulation above, the direct answer to What's the slope of the equation $6x + 8y = 16$? is:

The slope is $-\frac{3}{4}$.

This value indicates the rate at which y changes with respect to x along the line.

Significance of the Slope Value

- The negative sign indicates that the line slopes downward from left to right.
- The magnitude $\frac{3}{4}$ implies that for every 4 units increase in x , y decreases by 3 units.

Graphical Interpretation of the Slope

Understanding the slope visually enhances comprehension. Graphing the line derived from the equation offers concrete insight into its behavior.

Plotting the Line

Starting with the slope-intercept form:

$$y = -\frac{3}{4}x + 2$$

- The y-intercept is at $(0, 2)$. Plot this point on the coordinate plane.
- The slope $-\frac{3}{4}$ indicates that from the y-intercept, moving 4 units to the right (positive x direction), the line descends 3 units (negative y direction).

Sample points for plotting:

x	y	Calculation	Coordinates
0	$y = -\frac{3}{4} \times 0 + 2 = 2$		(0, 2)
4	$y = -\frac{3}{4} \times 4 + 2 = -3 + 2 = -1$		(4, -1)
-4	$y = -\frac{3}{4} \times (-4) + 2 = 3 + 2 = 5$		(-4, 5)

Plotting these points confirms the line's downward slope, illustrating the negative gradient visually.

Mathematical Significance and Applications

Understanding the slope of this linear equation extends beyond mere calculation; it connects to real-world applications and deeper mathematical principles.

Relationship Between Standard and Slope-Intercept Forms

The transformation from the standard form $(6x + 8y = 16)$ to the slope-intercept form exemplifies a key algebraic skill:

- Isolating y to interpret the line's steepness and intercepts.
- Recognizing how coefficients relate to geometric features.

Real-World Contexts

Linear equations and their slopes are foundational in modeling various phenomena:

- Economics: Representing cost functions or supply-demand relationships where the slope indicates rate of change.
- Physics: Describing constant velocity or acceleration in kinematic equations.
- Engineering: Analyzing stress-strain relationships or system behaviors.

In applications where the equation $(6x + 8y = 16)$ might model a scenario—say, resource allocation or budget constraints—the slope indicates the trade-off rate between the two variables.

Alternative Forms and Their Interpretations

While the slope-intercept form is most straightforward for identifying the slope, other forms offer additional insights.

Standard Form and Slope Calculation

Starting with:

$$6x + 8y = 16$$

The slope can be derived directly from the coefficients:

$$\text{Slope} = -\frac{A}{B} = -\frac{6}{8} = -\frac{3}{4}$$

This method confirms the previous calculation, emphasizing the relation between coefficients and the slope.

Implications of Coefficient Ratios

- The ratio $(-A/B)$ provides a quick way to identify the slope without rearranging the equation.
- This is especially useful in systems of equations or when dealing with multiple lines.

Special Cases and Variations

Understanding that linear equations can take various forms, it's valuable to consider special cases where the slope might be undefined or zero.

Vertical Lines

If the coefficients relate such that $(B = 0)$, the line becomes vertical:

$$6x + 8y = 16 \rightarrow \text{when } B=0$$

But in our case, $(B=8 \neq 0)$, so the line is not vertical.

Horizontal Lines

If the coefficient of (x) is zero, the line is horizontal:

$$6x + 8y = 16 \rightarrow \text{if } A=0$$

which is not the case here.

Summary and Conclusions

The detailed analysis of the equation $(6x + 8y = 16)$ reveals that:

- When expressed in slope-intercept form, the line's slope is $(-\frac{3}{4})$.
- The negative slope indicates a downward trend from left to right on the graph.
- The slope can be derived directly from the standard form coefficients as $(-A/B)$.
- Visual plotting confirms the algebraic findings and enhances understanding.

In summary, understanding What's the slope of the equation $6x + 8y = 16$? involves algebraic manipulation, graphical interpretation, and contextual comprehension. Recognizing the significance of the slope allows for better insights into the behavior of linear relationships in mathematical models and real-world applications.

Final Note: The process of deriving the slope highlights the importance of algebraic skills and conceptual understanding, serving as a foundation for advanced studies in mathematics, science, and engineering disciplines.

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