Find The Slope Of The Given Line, If It Is Defined.The Line Through The Origin And (-9,12)Select The

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Understanding how to find the slope of a line is fundamental in coordinate geometry. When given two points, such as the line passing through the origin (0, 0) and another point (-9, 12), calculating the slope provides insight into the line’s steepness and direction. This article offers a comprehensive guide to determining the slope of such a line, explaining the concept step-by-step, including relevant formulas, examples, and applications, all structured for clarity and SEO optimization.

What Is the Slope of a Line?

The slope of a line measures its inclination or steepness. It indicates how much the y-coordinate (vertical change) of the line changes concerning the x-coordinate (horizontal change). The slope is typically denoted by the letter m.

Key points about slope:

- The slope is a ratio of the "rise" over the "run."
- It can be positive, negative, zero, or undefined.
- A positive slope means the line ascends from left to right.
- A negative slope indicates the line descends from left to right.
- A zero slope corresponds to a horizontal line.
- An undefined slope corresponds to a vertical line.

Understanding these concepts is essential before calculating the slope of the line passing through specific points.

How to Find the Slope of a Line Given Two Points

The general method to find the slope when two points are known involves using

the slope formula:

$$ m = \frac{y_2 - y_1}{x_2 - x_1} $$

where:

- (x_1, y_1) are the coordinates of the first point.
- (x_2, y_2) are the coordinates of the second point.

This formula calculates the ratio of the change in y-values to the change in x-values between the two points.

Steps to find the slope:

1. Identify the coordinates of the two points.
2. Subtract the y-coordinate of the first point from the y-coordinate of the second point.
3. Subtract the x-coordinate of the first point from the x-coordinate of the second point.
4. Divide the difference in y by the difference in x.

Calculating the Slope for the Line Through the Origin and (-9, 12)

Given the problem:

- First point: Origin (0, 0)
- Second point: (-9, 12)

We will apply the slope formula:

$$ m = \frac{12 - 0}{-9 - 0} $$

Calculating numerator and denominator:

$$ m = \frac{12}{-9} $$

Simplify the fraction:

$$ m = -\frac{12}{9} = -\frac{4}{3} $$

Thus, the slope of the line passing through the origin and (-9, 12) is $-\frac{4}{3}$.

Interpreting the Slope $-\frac{4}{3}$

The slope value provides valuable information about the line's behavior:

- Negative slope: The line descends from left to right.
- Magnitude $\frac{4}{3}$: For every 3 units it moves horizontally to the right (positive x-direction), it moves 4 units downward (negative y-direction).

Implications:

- The line is inclined downward as we move along the positive x-axis.
- The steepness is moderate; it's neither flat nor almost vertical.
- The slope indicates a consistent rate of change between x and y coordinates.

Equation of the Line Through the Origin and (-9, 12)

Once the slope is known, the equation of the line can be written using the point-slope form:

$$ y - y_1 = m(x - x_1) $$

Since the line passes through the origin (0, 0), the point-slope form simplifies to:

$$ y = m x $$

Substituting the slope:

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

This is the equation of the line passing through (0, 0) and (-9, 12).

Verification: Confirming the Line Passes Through (-9, 12)

To verify, substitute $x = -9$ into the equation:

$$ y = -\frac{4}{3} \times (-9) $$

$$ y = -\frac{4}{3} \times -9 = \frac{4}{3} \times 9 $$

$$ y = 4 \times 3 = 12 $$

Since this matches the y-coordinate of the second point, the calculation is correct, confirming the line passes through both points.

Applications of Finding the Slope of a Line

Understanding how to find the slope has numerous practical applications in various fields:

- Physics: Calculating velocity (rate of change of position over time).
- Economics: Analyzing cost functions and marginal analysis.
- Engineering: Designing inclined planes or ramps.
- Mathematics: Solving systems of equations and analyzing linear relationships.
- Data Science: Determining correlations between variables.

Additional Tips for Calculating Slope

- Always check whether the denominator ($x_2 - x_1$) is zero to avoid division by zero, which indicates a vertical line with an undefined slope.
- Simplify fractions to understand the steepness better.
- Remember that the slope is unaffected by the line’s position; only the direction and steepness matter.

Common Mistakes to Avoid

- Swapping the points, which can lead to a different sign for the slope.
- Forgetting to reduce fractions for clarity.
- Confusing the points’ coordinates, especially when points are given in different formats.
- Ignoring vertical or horizontal lines, which have special slope considerations.

Conclusion

Determining the slope of a line passing through two points, especially when one point is the origin, is a straightforward process involving the slope formula $\frac{y_2 - y_1}{x_2 - x_1}$. For the line passing through (0, 0) and (-9, 12), the slope is $-\frac{4}{3}$, indicating a downward-sloping line with a moderate incline. Recognizing this value allows for the derivation of the line's equation and understanding of its geometric behavior. Mastery of slope calculation is essential in algebra, calculus, and real-world problem-solving, providing foundational knowledge for more complex mathematical concepts.

Keywords for SEO Optimization:

- Slope of a line
- Find slope between two points
- Line through origin and point
- Slope formula
- Equation of line
- Coordinate geometry
- How to calculate slope
- Slope of a line passing through (-9, 12)
- Line equation from two points
- Slope applications

Meta Description:

Learn how to find the slope of a line passing through the origin and point (-9, 12). Step-by-step explanation, formula application, and practical insights for understanding line slopes in coordinate geometry.

Frequently Asked Questions

How do you find the slope of a line passing through the origin and a point (-9, 12)?

The slope is calculated using the formula (y2 - y1) / (x2 - x1). Since the line passes through the origin (0,0) and point (-9, 12), the slope is (12 - 0) / (-9 - 0) = 12 / -9 = -4/3.

Is the slope of the line through (0,0) and (-9,12) defined or undefined?

The slope is defined because the denominator in the slope formula, which is the change in x-values, is not zero. In this case, it is -9, so the slope is defined.

What is the slope of the line passing through the origin and the point (-9, 12)?

The slope is -4/3.

Why is the slope of the line through (0,0) and (-9,12) negative?

Because the change in y (12 - 0) is positive, and the change in x (-9 - 0) is negative, their ratio results in a negative slope, indicating the line decreases as x increases.

Can the slope of the line through (0,0) and (-9,12) be zero?

No, the slope cannot be zero because the change in y is not zero; it is 12. Zero slope would indicate a horizontal line, which is not the case here.

How does knowing the slope help in graphing the line through (0,0) and (-9,12)?

Knowing the slope (-4/3) allows you to use the point-slope form or slope-intercept form to accurately draw the line, starting from the origin and applying the slope to find other points.

Additional Resources

Find The Slope Of The Given Line, If It Is Defined. The Line Through The Origin And (-9,12) Select The

Understanding how to find the slope of a line is fundamental in coordinate geometry, especially when analyzing the relationship between two points. In this article, we will delve deeply into the process of determining the slope of a specific line that passes through the origin (0,0) and another point (-9, 12). This example not only illustrates the calculation method but also highlights important concepts about the nature of slopes, their significance, and how to interpret them in various contexts.

Introduction to the Concept of Slope

The slope of a line is a measure of its steepness or inclination. Mathematically, it describes how much y changes in response to a change in x along the line. The slope, often denoted by the letter m, is a crucial concept in algebra, calculus, and various applied sciences because it quantifies the rate of change.

Key Points:

- The slope indicates whether a line is increasing, decreasing, or horizontal.
- A positive slope means the line rises from left to right.
- A negative slope indicates the line falls from left to right.
- A zero slope corresponds to a horizontal line.
- An undefined slope corresponds to a vertical line.

Understanding these properties helps in visualizing the line's behavior in the coordinate plane and solving related real-world problems.

Understanding the Given Points and the Line

The problem provides two points:

- The origin: (0, 0)
- Another point: (-9, 12)

Since the line passes through both points, and the origin is one of the points, the line's features can be analyzed straightforwardly. The key task is to find the slope, which is essentially the ratio of the change in y to the change in x between these two points.

Why These Points?

- The origin serves as a natural reference point with coordinates (0, 0).
- The other point, (-9, 12), lies somewhere in the second quadrant, indicating the line crosses into the negative x-region but positive y.

This setup simplifies calculations because the initial point (the origin) has zero coordinates, reducing potential computational complexity.

Calculating the Slope: Step-by-Step Process

The formula for the slope m between two points (x_1, y_1) and (x_2, y_2) is:

$$
m = \frac{y_2 - y_1}{x_2 - x_1}
$$

Applying this to our points:

- $(x_1, y_1) = (0, 0)$
- $(x_2, y_2) = (-9, 12)$

Step 1: Compute the numerator (change in y):

$$
12 - 0 = 12
$$

Step 2: Compute the denominator (change in x):

$$
-9 - 0 = -9
$$

Step 3: Calculate the slope:

$$
m = \frac{12}{-9} = -\frac{12}{9} = -\frac{4}{3}
$$

Thus, the slope of the line passing through the origin and (-9, 12) is -$\frac{4}{3}$.

Interpretation:

- The negative sign indicates that the line decreases as x increases.
- The magnitude $\frac{4}{3}$ signifies that for every 3 units increase in x, y decreases by 4 units.

Features and Significance of the Calculated Slope

Having the slope $-\frac{4}{3}$ provides insight into the line’s behavior and its position relative to the coordinate axes.

Features:

- The slope is defined because the denominator is non-zero.
- The line is descending from left to right, as indicated by the negative slope.
- The slope's fractional form simplifies understanding the rate of change

between the coordinates.

Significance:

- The slope allows for the equation of the line to be written in various forms (slope-intercept, point-slope).
- It helps in graphing the line accurately.
- It reflects how the y-value responds to x-value changes along this specific line.

Equation of the Line Passing Through the Points

With the slope known, we can determine the equation of the line.

Using the point-slope form:

$$
y - y_1 = m(x - x_1)
$$

Substituting the point $(0, 0)$ and $m = -\frac{4}{3}$:

$$
y - 0 = -\frac{4}{3}(x - 0)
$$

Simplifies to:

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

This is the equation of the line in slope-intercept form, passing through the origin and the point (-9, 12).

Verifying the Line Equation with the Second Point

To confirm the correctness, plug in -9 for x:

$$
y = -\frac{4}{3} \times (-9) = 12
$$

which matches the y-coordinate of the second point, confirming the accuracy of our calculation.

Implications and Applications

Knowing how to find the slope in such a case is essential in many fields:

- Physics: Calculating rates of change or velocity.
- Economics: Analyzing cost and revenue functions.
- Engineering: Designing systems with specific inclinations.
- Mathematics: Solving systems of equations and analyzing lines.

Practical applications include:

- Graphing lines accurately.
- Determining whether two lines are parallel or perpendicular (by comparing slopes).
- Calculating angles of inclination using slopes.

Pros and Cons of Calculating Slope from Two Points

Pros:

- Straightforward process using the slope formula.
- Provides quick insights into the nature of the line.
- Facilitates the derivation of the line's equation.
- Useful in both theoretical and applied contexts.

Cons:

- Cannot be applied if the line is vertical (slope undefined).
- Sensitive to calculation errors, especially with complex points.
- Assumes points are distinct; identical points lead to zero denominator issues.

Features of the Line Through the Origin and (-9, 12)

- Line is linear and passes through the origin, simplifying calculations.
- Slope is negative, indicating a decreasing trend.
- Equation is simple and linear: $y = -\frac{4}{3}x$.
- Crosses the second quadrant, as seen from the point (-9, 12).

Visual features:

- The line crosses the y-axis at the origin.

- It slopes downward from left to right.
- It passes through a point with negative x and positive y.

Conclusion

Calculating the slope of the line passing through the origin and (-9, 12) demonstrates fundamental principles of coordinate geometry. The process involves applying the basic slope formula, simplifying the fraction, and interpreting the result in context. The final slope of $-\frac{4}{3}$ reveals a line that declines at a consistent rate, slopes downward from left to right, and provides a foundation for further geometric and algebraic analysis. Mastering such calculations enhances understanding of linear relationships, enabling effective problem-solving across mathematics and real-world applications.

Whether you're a student learning about lines for the first time or a professional applying these concepts, understanding how to find and interpret slopes is an invaluable skill. It empowers you to analyze relationships, graph lines accurately, and develop models that mirror real-world phenomena.

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