Find The Slope Of The Line That Passes Through (2, 5) And (6,4).Simplify Your Answer And Write It As

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Introduction to the Concept of Slope

Understanding the slope of a line is fundamental in coordinate geometry. The slope indicates the steepness and direction of a line on a graph. When given two points through which a line passes, calculating the slope helps describe the line's inclination relative to the x-axis. In this article, we will explore how to find the slope of the line passing through the points (2, 5) and (6, 4). We will break down the process step-by-step, explain the formula involved, and simplify the answer to its lowest terms.

The Coordinates of the Two Points

Before diving into the calculation, let's clearly state the points involved:

- Point 1: (2, 5)
- Point 2: (6, 4)

Here, the first number in each pair represents the x-coordinate, and the second number represents the y-coordinate.

The Formula for Calculating the Slope

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

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

This formula calculates the rate of change of y with respect to x, essentially measuring how much y changes for a unit change in x.

Applying the Formula to the Given Points

Step 1: Identify the Coordinates

From the points, we assign:

- $x_1 = 2$, $y_1 = 5$
- $x_2 = 6$, $y_2 = 4$

Step 2: Calculate the Differences

Compute the change in y:

$$y_2 - y_1 = 4 - 5 = -1$$

Compute the change in x:

$$x_2 - x_1 = 6 - 2 = 4$$

Step 3: Plug Values into the Slope Formula

$m = (y_2 - y_1) / (x_2 - x_1) = (-1) / 4$

Simplifying the Slope

The fraction *-1/4* is already in its simplest form because the numerator and denominator share no common factors other than 1. The negative sign indicates the slope is decreasing as x increases.

Expressing the Final Answer

Therefore, the slope of the line passing through the points (2, 5) and (6, 4) is:

-1/4

In words, this means that for every 4 units increase in x, y decreases by 1 unit.

Understanding the Significance of the Slope

Negative Slope and Line Direction

A negative slope signifies that the line slopes downward from left to right. In our case, as we move from x=2 to x=6, the y-value drops from 5 to 4, which aligns with the negative slope.

Implications of the Slope Magnitude

The absolute value of the slope, *1/4*, indicates the rate of change in y relative to x. A smaller absolute value implies a gentler incline, whereas a larger value would suggest a steeper line. Here, the gentle slope reflects a slight decline over the interval.

Alternative Forms of the Slope

Decimal Representation

Expressed as a decimal, *-1/4* is:

```
-0.25
```

This form is often useful for practical calculations or when graphing the line.

Slope as a Ratio

Since the slope is *-1/4*, it can be interpreted as a ratio: for every 4 units moved horizontally, the line drops 1 unit vertically.

Additional Notes and Tips

- Always verify the order of points when calculating the slope; the order affects the sign but not the magnitude.
- If the x-coordinates are the same ($x_1 = x_2$), the line is vertical, and the slope is undefined.
- Similarly, if the y-coordinates are the same ($y_1 = y_2$), the line is horizontal, and the slope is zero.
- When simplifying fractions, always check for common factors to reduce the fraction to its simplest form.

Summary

Given two points, (2, 5) and (6, 4), the process to find the slope involves:

1. Identifying the coordinates of each point.
2. Applying the slope formula: $m = (y_2 - y_1) / (x_2 - x_1)$.
3. Calculating the differences: *-1* in y and *4* in x.
4. Dividing to find the slope: *-1/4*.
5. Expressing the answer in simplified form: *-1/4*.

This slope indicates a line that declines gently as x increases, with a rate of one unit down for every four units across.

Final Note

Understanding how to find and interpret slopes is crucial in graphing lines, analyzing relationships between variables, and solving real-world problems involving rates of change. Practice with different points and forms will deepen your grasp of this fundamental concept in algebra and coordinate geometry.

Frequently Asked Questions

What is the formula to find the slope of a line passing through two

points?

The slope (m) is calculated as $(y_2 - y_1)$ divided by $(x_2 - x_1)$.

How do you find the slope of the line passing through points (2, 5) and (6, 4)?

Use the formula: m = (4 - 5) / (6 - 2) = (-1) / 4 = -1/4.

What is the simplified slope of the line passing through (2, 5) and (6, 4)?

The slope is -1/4, already in simplest form.

Can the slope be expressed as a decimal?

Yes, -1/4 as a decimal is -0.25.

Why is it important to simplify the slope fraction?

Simplifying makes it easier to understand and use in equations or graphs, and ensures clarity in communication.

What is the slope-intercept form of the line passing through (2, 5) with the slope -1/4?

Using y = mx + b, substitute m = -1/4 and point (2, 5): 5 = (-1/4)(2) + b; so 5 = -1/2 + b; b = 5 + 1/2 = 11/2. The equation is y = -1/4 x + 11/2.

Additional Resources

Find The Slope Of The Line That Passes Through (2, 5) And (6, 4)

Introduction

In the realm of algebra and analytical geometry, understanding the concept of slope is fundamental. The slope of a line provides insight into its steepness and direction, serving as a key component in graphing, linear equations, and various applications across science, engineering, and mathematics. This investigative article delves into a precise problem: determining the slope of the line passing through two specific points, (2, 5) and (6, 4). We will explore the theoretical basis, computational steps, and implications of calculating this slope, presenting a comprehensive understanding suitable for educators, students, and researchers alike.

Theoretical Foundation of Slope in Coordinate Geometry

Definition of Slope

In coordinate geometry, the slope (often denoted as m) of a line is defined as the ratio of the vertical change to the horizontal change between any two points on the line. Formally, if two points (x_1, y_1) and (x_2, y_2) lie on the same line, then the slope is given by:

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

This measure indicates how much y changes for a unit change in x. A positive slope indicates an upward trend, a negative slope indicates a downward trend, and a zero slope denotes a horizontal line.

Significance of Slope

- Directionality: Indicates whether the line ascends or descends as it moves from left to right.
- Line Equation: The slope is crucial in forming the line's equation, especially in the point-slope and slope-intercept forms.
- Application: Used in calculating rates of change, velocity, and other real-world phenomena.

Applying the Concept: Calculating the Slope for Specific Points

Given Data Points

The problem provides two points:

- $P_1 = (2, 5)$
- $P_2 = (6, 4)$

Our goal is to compute the slope m of the line passing through these points.

Step-by-Step Calculation

1. Identify the coordinates:

$$
x_1 = 2, \quad y_1 = 5
$$

$$
x_2 = 6, \quad y_2 = 4
$$

\]

2. Compute the differences:

- Change in \(y \):

\[
\Delta y = y_2 - y_1 = 4 - 5 = -1
\]

- Change in \(x \):

\[
\Delta x = x_2 - x_1 = 6 - 2 = 4
\]

3. Calculate the slope:

\[
m = \frac{\Delta y}{\Delta x} = \frac{-1}{4}
\]

4. Simplify:

Since \(-1/4 \) is already in its simplest form, the slope is:

\[
\boxed{m = -\frac{1}{4}}
\]

Interpretation and Implications

Geometric Meaning

A slope of $-\frac{1}{4}$ indicates that for every 4 units the line moves horizontally to the right, it descends by 1 unit vertically. The negative sign confirms the downward trend from left to right.

Visual Representation

Plotting the points:

- $(2, 5)$
- $(6, 4)$

and drawing the line passing through both, reveals a gentle decline, consistent with the slope magnitude.

Broader Context

Understanding this slope allows for the equation of the line to be formulated, enabling predictions and further analysis:

$$
\text{Point-slope form:} \quad y - y_1 = m(x - x_1)
$$

Substituting $(2, 5)$:

$$
y - 5 = -\frac{1}{4}(x - 2)
$$

which can be rewritten into slope-intercept form as:

$$
y = -\frac{1}{4}x + \frac{1}{2} + 5 = -\frac{1}{4}x + \frac{11}{2}
$$

Additional Considerations

Validity of the Calculation

- Difference in x values: Since $x_2 - x_1 = 4 \neq 0$, the slope calculation is valid; division by zero is avoided.
- Coordinate consistency: The points are distinct and well-defined, ensuring accurate slope determination.

Potential Variations

- If the points had the same x-coordinate (e.g., vertical line), the slope would be undefined.
- For points with identical y-coordinates, the slope would be zero, indicating a horizontal line.

Practical Applications

Understanding the slope between two points extends beyond pure mathematics:

- Engineering: Calculating the gradient of a roadway or a pipeline.
- Economics: Determining the rate of change of cost or demand with respect to quantity.
- Physics: Computing velocity as a rate of change of position over time.

- Data Analysis: Establishing trends and relationships between variables.

Conclusion

The rigorous computation of the slope passing through points $(2, 5)$ and $(6, 4)$ yields a value of $-\frac{1}{4}$. This negative slope indicates a line that gently descends as it moves from left to right, with a consistent rate of change. Recognizing and calculating slopes accurately is essential for a multitude of scientific and mathematical endeavors, providing foundational insights into the behavior of linear relationships. This exploration underscores the importance of fundamental algebraic skills and their broad applicability in real-world contexts.

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Final Note

Mastering the calculation of slopes, as demonstrated through this specific example, is a stepping stone toward more advanced topics in mathematics and applied sciences. Whether analyzing trends, designing systems, or just understanding the geometry of the world around us, the slope remains a crucial and versatile concept.

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