Find The Slope Of The Line That Passes Through (1, 13) And (10, 6).

Find The Slope Of The Line That Passes Through (1, 13) And (10, 6)

Understanding how to determine the slope of a line that passes through two points is a fundamental concept in algebra and coordinate geometry. Whether you're a student preparing for exams, a teacher creating lesson plans, or an enthusiast exploring the intricacies of mathematical relationships, mastering this skill opens the door to analyzing and interpreting linear relationships in various real-world scenarios.

In this comprehensive guide, we'll explore the concept of slope in detail, walk through the step-by-step process to find the slope of the line passing through the points (1, 13) and (10, 6), and discuss practical applications of this calculation. By the end of this article, you'll have a clear understanding of how to compute slopes and interpret their significance in different contexts.

What is the Slope of a Line?

The slope of a line is a measure of its steepness or incline. It quantifies how much the y-coordinate (vertical change) of a point on the line changes relative to the x-coordinate (horizontal change). The slope is often denoted by the letter 'm' and is expressed as a ratio or a decimal.

Mathematically, the slope between two points (x_1, y_1) and (x_2, y_2) is calculated as:

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

This formula is fundamental to understanding the behavior of linear functions and is used extensively in graphing, calculus, physics, and engineering.

Understanding the Formula for Slope

Before we proceed with the computation, let's break down the components of the slope formula:

- Numerator $(y_2 - y_1)$: Represents the change in the y-values between the two points, often called the "rise."
- Denominator $(x_2 - x_1)$: Represents the change in the x-values, called

the "run."

The ratio of rise over run gives the slope, indicating how many units the line rises (or falls, if negative) vertically for each unit it moves horizontally.

Key Points to Remember

- The order of points matters; switching the points changes the sign of the slope.
- If the slope is positive, the line rises from left to right.
- If the slope is negative, the line falls from left to right.
- A slope of zero indicates a horizontal line.
- An undefined slope (division by zero) indicates a vertical line.

Step-by-Step Calculation of the Slope for (1, 13) and (10, 6)

Let's now focus on the specific points:

- Point 1: $(x_1, y_1) = (1, 13)$
- Point 2: $(x_2, y_2) = (10, 6)$

Applying the slope formula:

$$
m = \frac{6 - 13}{10 - 1}
$$

Calculating numerator and denominator separately:

- Numerator: $6 - 13 = -7$
- Denominator: $10 - 1 = 9$

Therefore:

$$
m = \frac{-7}{9}
$$

This fraction indicates that the line decreases by 7 units in the y-direction for every 9 units in the x-direction, which reflects a negative slope.

Final Slope Value

$$
\boxed{
m = -\frac{7}{9}
}
$$

This exact fractional form preserves precision. For practical purposes, you may also express this as a decimal:

$$
m \approx -0.7778
$$

The negative value confirms the line is decreasing as it moves from left to right.

Interpreting the Slope

Understanding what this slope tells us about the line's behavior is crucial. Given that:

- The slope $m = -\frac{7}{9}$ indicates a negative inclination.
- The line decreases by approximately 0.78 units vertically for each 1 unit increase horizontally.
- The steepness of the line is moderate; it's neither very steep nor very flat.

This slope helps in graphing the line accurately and understanding its rate of change.

Applications of Finding the Slope

The calculation of slopes is not just an academic exercise; it has numerous practical applications across different fields:

1. Graphing Linear Equations

Knowing the slope allows you to quickly sketch the line passing through two points. Using the point-slope form:

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

\]

you can derive the equation of the line and graph it precisely.

2. Analyzing Business Trends

In economics and business, the slope can represent rates such as profit change over time, cost increase, or sales growth.

3. Physics and Engineering

Slopes are used to understand velocity in motion graphs or rate of change in various physical quantities.

4. Environmental Science

Determine how pollutant levels change over distance or time by calculating the slope of relevant data points.

How to Find the Equation of the Line Passing Through Two Points

Once the slope is known, the next step often involves finding the equation of the line, which can be used for predictions or further analysis.

Using Point-Slope Form

Given a point (x_1, y_1) and slope m:

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

Plug in the values:

$$
y - 13 = -\frac{7}{9}(x - 1)
$$

This form is useful for quick graphing and understanding the line's behavior.

Converting to Slope-Intercept Form

Simplify to:

$$
y = mx + b
$$

Starting from:

$$
y - 13 = -\frac{7}{9}(x - 1)
$$

Distribute:

$$
y - 13 = -\frac{7}{9}x + \frac{7}{9}
$$

Add 13 to both sides:

$$
y = -\frac{7}{9}x + \frac{7}{9} + 13
$$

Express 13 as a fraction with denominator 9:

$$
13 = \frac{117}{9}
$$

Now, sum the constants:

$$
y = -\frac{7}{9}x + \left(\frac{7}{9} + \frac{117}{9}\right) = -\frac{7}{9}x + \frac{124}{9}
$$

So, the line's equation in slope-intercept form is:

$$
\boxed{
y = -\frac{7}{9}x + \frac{124}{9}
}
$$

This formula allows for quick calculation of y-values for any given x-value on the line.

Additional Tips for Calculating Slopes

- Always double-check your subtraction to avoid sign errors.
- Use fraction form to preserve precision, especially for algebraic work.
- Remember that the order of points affects the sign of the slope.
- Practice with different pairs of points to become comfortable with the concept.

Conclusion

Calculating the slope of a line passing through two points, such as (1, 13) and (10, 6), is a fundamental skill in mathematics that underpins many concepts in algebra, calculus, physics, and beyond. The slope $-\frac{7}{9}$ reveals that the line decreases as x increases, and understanding this rate of change is essential for graphing, analyzing data, and solving real-world problems.

By mastering the process of finding slopes, you enhance your ability to interpret linear relationships and apply this knowledge across diverse disciplines. Remember, practice with different point pairs to build confidence and deepen your understanding of the elegant simplicity and powerful utility of the slope in mathematics.

Frequently Asked Questions

How do you find the slope of a line passing through two points?

To find the slope, subtract the y-coordinates and divide by the difference of the x-coordinates: $(y_2 - y_1) / (x_2 - x_1)$.

What is the slope of the line passing through (1, 13) and (10, 6)?

The slope is $(6 - 13) / (10 - 1) = (-7) / 9 = -7/9$.

Why is the slope important in coordinate geometry?

The slope indicates the steepness and direction of a line, helping to understand its behavior and equation.

Can the slope be undefined for points on a line?

Yes, if the two points have the same x-coordinate, resulting in division by zero, making the slope undefined (vertical line).

How do you write the equation of a line given two points?

First, find the slope, then use point-slope form: y - y1 = m(x - x1).

Is the slope of the line passing through (1, 13) and (10, 6) positive or negative?

It is negative, specifically -7/9, indicating a decreasing line.

What real-world scenarios can be modeled using the slope of a line?

Examples include calculating speed, rate of change in economics, or predicting trends in data analysis.

Additional Resources

Slope Calculation: Unlocking the Secrets of a Line's Steepness

When examining the fascinating world of coordinate geometry, one concept reigns supreme in understanding the behavior of straight lines: the slope. It’s a fundamental measure that quantifies how steep a line is, indicating both direction and inclination. Whether you are a student tackling algebra homework, a teacher designing lessons, or a professional analyzing data trends, mastering how to find the slope of a line passing through two points is an essential skill.

In this detailed exploration, we will focus on a specific example: finding the slope of the line passing through the points (1, 13) and (10, 6). By dissecting this problem step-by-step, explaining the underlying principles, and discussing its broader significance, this article aims to provide a comprehensive understanding of slope calculation.

Understanding the Concept of Slope

What Is the Slope?

At its core, the slope of a line measures its inclination relative to the horizontal axis. It indicates how much the y-coordinate (vertical change) increases or decreases as the x-coordinate (horizontal change) increases. Mathematically, the slope is represented as m and can be viewed as the ratio of the change in y-values (rise) to the change in x-values (run):

$$
m = \frac{\Delta y}{\Delta x}
$$

This ratio provides a numeric value that encapsulates the line's steepness and direction:

- Positive slope: The line inclines upward from left to right.
- Negative slope: The line declines downward from left to right.
- Zero slope: The line is horizontal.
- Undefined slope: The line is vertical, with no horizontal change.

Calculating the Slope Between Two Points

The Slope Formula

Given two points in the coordinate plane, (x_1, y_1) and (x_2, y_2), the slope m is calculated as:

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

This formula emphasizes the importance of the order of points, but since slope is a ratio of differences, the order only affects the sign, not the magnitude.

Important considerations:
- The points must have different x-values; otherwise, the denominator becomes zero, indicating a vertical line with an undefined slope.
- The calculation captures the average rate of change between the two points.

Applying the Formula to (1, 13) and (10, 6)

Let’s assign:

- $(x_1, y_1) = (1, 13)$
- $(x_2, y_2) = (10, 6)$

Plugging these into the formula:

$$
m = \frac{6 - 13}{10 - 1}
$$

Calculating numerator and denominator separately:

- $6 - 13 = -7$
- $10 - 1 = 9$

Thus,

$$
m = \frac{-7}{9}
$$

This simplified fraction indicates the slope of the line passing through the points (1, 13) and (10, 6) is -$\frac{7}{9}$.

Interpreting the Slope

What Does a Slope of -7/9 Signify?

A slope of $-\frac{7}{9}$ conveys several important insights:

- Negative value: The line decreases as x increases, meaning it slopes downward from left to right.
- Magnitude: The absolute value, $\frac{7}{9}$, indicates that for every 9 units moved horizontally, the line drops approximately 7 units vertically.
- Steepness: Since $\frac{7}{9}$ is less than 1, the line is relatively gentle in its decline, not extremely steep.

This information is valuable in numerous applications:

- Graphing: Understanding the slope helps plot the line accurately.
- Analysis of trends: In data analysis, the slope indicates the rate of

change.
- Engineering and physics: Slope relates to velocity, acceleration, and other dynamic measures.

Broader Context: Why Is Finding the Slope Important?

Applications in Real Life and Academia

Calculating the slope is not merely an academic exercise; it has rich practical applications:

- Economics: Determining the rate of change in cost or revenue over time.
- Physics: Calculating velocity as the rate of change of position.
- Biology: Analyzing growth rates from data points.
- Navigation: Assessing the incline or decline of terrains.
- Data Science: Identifying trends and correlations in datasets.

Graphing and Visualization

Once the slope is known, it becomes straightforward to write the equation of the line in the slope-intercept form:

$$
y = mx + b
$$

where b is the y-intercept. With the slope $\frac{-7}{9}$ and one point, you can determine b and graph the line precisely.

Step-by-Step Guide to Find the Slope of Any Line

To generalize the process, here is a step-by-step approach:

1. Identify the points: Write down the coordinates clearly.
2. Apply the slope formula: Use $m = \frac{y_2 - y_1}{x_2 - x_1}$.

3. Calculate the differences: Subtract y-values and x-values accordingly.
4. Simplify the fraction: Reduce to lowest terms for clarity.
5. Interpret the result: Consider the sign, magnitude, and implications.

Common Pitfalls and Tips

- Division by zero: If $x_2 = x_1$, the line is vertical, and the slope is undefined.
- Order of points: The order affects the sign; always be consistent.
- Fraction simplification: Always reduce the fraction to its simplest form.
- Check your work: Confirm calculations by plugging in the points into the line equation once the slope is known.

Conclusion: Mastering the Slope Calculation

The process of finding the slope between two points, exemplified by the points (1, 13) and (10, 6), underscores a vital skill in mathematics: translating coordinate differences into meaningful measures of line behavior. With a calculated slope of $-\frac{7}{9}$, we grasp that the line in question declines gently, with a consistent rate of change.

This fundamental concept extends far beyond classroom exercises, influencing fields as diverse as engineering, economics, physics, and data science. By mastering the formula and understanding its implications, students and professionals alike gain a powerful tool to interpret, analyze, and visualize the world around them through the lens of straight lines and their inclinations.

Whether plotting a graph, analyzing trends, or solving complex problems, knowing how to find the slope equips you with the insights needed to navigate the geometric landscape with confidence and precision.

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