

What Is The Slope Of The Line Passing Through The Points (1, 7) And (4, 1)?

5/628/52

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Understanding the concept of slope is fundamental in coordinate geometry, as it describes the inclination or steepness of a line. When given two points on a Cartesian plane, calculating the slope helps us understand how the line behaves between those points. In this article, we will explore what the slope of a line is, how to compute it using the points (1, 7) and (4, 1), and the significance of the slope in various mathematical and real-world contexts.

What Is the Slope of a Line?

Definition of Slope

The slope of a line measures the rate at which the y-coordinate changes concerning the x-coordinate as you move along the line. It indicates whether the line rises, falls, or remains horizontal.

Mathematically, the slope (often denoted as 'm') is calculated as:

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

where:

- (x_1, y_1) and (x_2, y_2) are two distinct points on the line.

Significance of Slope

- A positive slope indicates the line rises as x increases.
- A negative slope indicates the line falls as x increases.
- A zero slope indicates a horizontal line.
- An undefined slope (division by zero) indicates a vertical line.

Understanding the slope allows us to graph lines accurately, write equations of lines, and analyze the relationship between variables.

Calculating the Slope Between Two Points

The Given Points

We are provided with two points:

- Point 1: $((1, 7))$
- Point 2: $((4, 1))$

These points are plotted on the Cartesian plane, and our goal is to find the slope of the line passing through them.

Step-by-Step Calculation

Applying the slope formula:

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

Plugging in the given values:

$$m = \frac{1 - 7}{4 - 1}$$

Calculating numerator and denominator:

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

Simplify the fraction:

$$m = -2$$

Therefore, the slope of the line passing through the points $((1, 7))$ and $((4, 1))$ is -2.

Interpreting the Slope

What Does a Slope of -2 Mean?

A slope of -2 indicates that for each unit increase in x, the y-value decreases by 2 units. In visual terms, the line slants downward from left to right, demonstrating a negative relationship between x and y.

Real-World Examples of Negative Slope

- A car traveling downhill at a constant rate.
- The decrease in temperature over time during the night.
- The rate at which a quantity diminishes in a decay process.

Equation of the Line Passing Through the Points

Using the Point-Slope Form

The point-slope form of a line's equation is:

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

Choosing point $(1, 7)$, and knowing $m = -2$:

$$y - 7 = -2(x - 1)$$

Expanding:

$$y - 7 = -2x + 2$$

Adding 7 to both sides:

$$y = -2x + 9$$

This is the slope-intercept form of the line passing through the two points.

Verification with the Second Point

Check if point $(4, 1)$ satisfies the equation:

$$y = -2x + 9$$

Plugging in $x=4$:

$$y = -2(4) + 9 = -8 + 9 = 1$$

Since the y-value matches, our equation is correct.

Significance and Applications of Slope in Various Fields

Mathematics and Geometry

- Determining the equation of lines.
- Analyzing the inclines and declines of graphs.
- Solving systems of linear equations.

Physics and Engineering

- Calculating rates of change.
- Understanding velocity and acceleration in motion.
- Designing slopes for roads, ramps, and tracks.

Economics and Business

- Analyzing trends over time.
- Calculating marginal cost or revenue functions.

Handling Fractions and Non-Integer Slopes

The initial question mentions "5/628/52," which appears to be a sequence of numbers or fractions. While it may seem unrelated to the main calculation, understanding how to work with fractions is essential in slope calculations, especially in more complex problems.

Working with Fractions in Slope Calculations

- Simplify fractions before calculation.
- Convert mixed numbers to improper fractions if needed.
- Use fraction division rules to simplify complex ratios.

Example

Suppose the slope is given as a fraction, say, $\frac{5}{8}$. To interpret it:

- For every 8 units increase in x , y increases by 5 units.
- The slope indicates a moderate incline.

In the context of our previous calculation, the slope was a simple integer, but in other problems, fractional slopes are common.

Conclusion

Calculating the slope between two points is a fundamental skill in algebra and geometry. For the points $(1, 7)$ and $(4, 1)$, the slope is -2 , indicating a line that descends as x increases. This value enables us to derive the line's equation and understand its behavior graphically. Recognizing the significance of slopes across various disciplines emphasizes their importance in analyzing relationships and changes. Whether working with simple integers or complex fractions, mastering slope calculations is

essential for solving many mathematical problems and applying them to real-world scenarios.

Frequently Asked Questions

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

The slope is calculated using the formula $(y_2 - y_1) / (x_2 - x_1)$, where (x_1, y_1) and (x_2, y_2) are the two points.

What is the slope of the line passing through the points (1, 7) and (4, 1)?

Using the formula: $(1 - 7) / (4 - 1) = (-6) / 3 = -2$. So, the slope is -2.

What does a negative slope indicate about a line?

A negative slope indicates that the line is decreasing, meaning as x increases, y decreases.

Can the slope be expressed as a fraction or decimal? What is it in this case?

Yes, the slope can be expressed as a fraction or decimal. In this case, it is -2, which is equivalent to $-2/1$.

What is the significance of the slope in a linear equation?

The slope represents the rate of change of y with respect to x ; it shows how steep the line is and whether it increases or decreases.

Is the value '5/628/52' related to the slope calculation?

No, '5/628/52' appears to be an unrelated or misformatted string; the correct slope for the points given is -2.

Additional Resources

Understanding the Slope of a Line Passing Through Two Points: A Comprehensive Guide

When studying coordinate geometry, one of the foundational concepts is understanding the slope of a line. The slope essentially measures the steepness or incline of the line, revealing how much the y-coordinate changes relative to the x-coordinate between two points. In this detailed exploration, we will dissect what the slope is, how to compute it, and apply these principles to the specific points (1, 7) and (4, 1). Additionally, we'll clarify the apparent confusion surrounding the figure "5/628/52" that appears to be appended to the problem, ensuring a thorough understanding of the entire context.

What Is the Slope of a Line?

The slope of a line is a numerical value that describes its inclination. It is commonly denoted by the letter m . The slope quantifies how much y increases or decreases as x increases along the line.

Key points about the slope:

- It is a measure of the line's tilt.
- It can be positive, negative, zero, or undefined.
- It provides insight into the relationship between x and y within the context of the line.

Mathematically, the slope between two points $((x_1, y_1))$ and $((x_2, y_2))$ is given by:

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

Interpretation:

- The numerator $(y_2 - y_1)$ indicates how much the y -value changes.
- The denominator $(x_2 - x_1)$ indicates how much the x -value changes.
- The ratio reflects the rate of change of y with respect to x .

Calculating the Slope for the Points (1, 7) and (4, 1)

Let's now focus on our specific points:

- Point 1: $((x_1, y_1) = (1, 7))$
- Point 2: $((x_2, y_2) = (4, 1))$

Using the slope formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 7}{4 - 1}$$

Calculating numerator and denominator:

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

Simplify the fraction:

$$m = -2$$

Result: The slope of the line passing through the points (1, 7) and (4, 1) is -2.

This negative slope indicates that as x increases, y decreases, which makes sense given the points: moving from x=1 to x=4, y drops from 7 to 1.

Interpreting the Slope: What Does -2 Tell Us?

Understanding the numerical value in context gives us a richer picture:

- Negative slope (-2): The line descends from left to right.
- Rate of change: For every 1 unit increase in x, y decreases by 2 units.
- Line steepness: A slope of -2 indicates a relatively steep decline.

Graphical representation:

- Plot the points (1,7) and (4,1).
- Draw a straight line passing through them.
- Observe the downward tilt, consistent with the negative slope.

Additional Aspects of Slope Calculation

While the basic formula is straightforward, several related topics deepen our understanding:

1. Slope-Intercept Form of a Line

Once the slope (m) is known, the line's equation can be expressed as:

$$y = mx + b$$

where (b) is the y-intercept. To find (b) , substitute one of the known points into the equation:

Using point $(1,7)$:

$$7 = (-2)(1) + b \rightarrow 7 = -2 + b \rightarrow b = 9$$

Complete equation:

$$y = -2x + 9$$

This line crosses the y-axis at $(0, 9)$.

2. Slope of Vertical and Horizontal Lines

- Vertical line: $(x = a)$, slope is undefined because denominator $(x_2 - x_1 = 0)$.
- Horizontal line: $(y = c)$, slope is 0 because numerator $(y_2 - y_1 = 0)$.

Our line with points $(1,7)$ and $(4,1)$ is neither vertical nor horizontal, with a well-defined slope of -2.

3. Significance of Slope in Real-World Contexts

- In physics, slope might represent velocity.
- In economics, it can relate to rate of change of costs or revenue.
- In everyday situations, a negative slope could signify decline or decrease over time.

Clarifying the "5/628/52" Element

The original query includes the fragment "5/628/52" following the main question. This appears to be an extraneous or misformatted element, possibly a typo or a fragment of unrelated data. To clarify:

- It does not influence the slope calculation directly.
- It may be an encoding error, a misplaced number, or part of a larger data set.
- If it were meant to be a fraction or a ratio, it is not standard notation and doesn't align with the context of the problem.

Potential interpretations:

- If viewed as a sequence: $5/6$, $28/52$ – which simplifies to $5/6$ and $7/13$ respectively, but these do not relate to the points or the slope calculation.
- If it was intended as part of a code or reference, it likely has no bearing on the mathematical solution.

Conclusion: For clarity and focus, the slope calculation remains unaffected by this fragment. The core result—the slope is -2 —stands independently.

Practical Applications and Importance of Slope

Understanding how to compute and interpret the slope is vital across numerous disciplines:

- Engineering: designing roads with appropriate inclines.
- Economics: analyzing cost and revenue relationships.
- Biology: modeling population growth or decline.
- Computer Graphics: rendering lines and curves.
- Data Science: understanding trends in data sets.

In educational contexts, mastering the concept of slope helps build a foundation for more advanced topics like calculus, where the slope of a tangent line at a point becomes the derivative.

Summary and Final Remarks

- The slope between two points $((x_1, y_1))$ and $((x_2, y_2))$ is computed as $(\frac{y_2 - y_1}{x_2 - x_1})$.
- For points $(1, 7)$ and $(4, 1)$, the slope is (-2) .

- This indicates a line that descends steeply as x increases.
- The line's equation in slope-intercept form is $(y = -2x + 9)$.
- The mysterious "5/628/52" does not impact the slope calculation and can be disregarded unless clarified further.

In essence, understanding the slope provides insight into the relationship between variables and the behavior of lines in a coordinate plane. This knowledge is fundamental in mathematics and its applications, forming the backbone of graphing, analysis, and interpretation of data.

Final note: Always verify your points and calculations carefully. Recognize when extraneous data appears and assess its relevance before proceeding. Mastering the concept of slope empowers you to analyze and interpret a wide array of real-world problems with confidence.

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