1. Line A Passes Through Points (-2, 1) And (2, 9). Write An Equation In Slope Intercept Form That Is

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Understanding how to find the equation of a line given two points is a fundamental skill in algebra and coordinate geometry. This process involves calculating the slope of the line and then using the point-slope form to derive the slope-intercept form, which is expressed as y = mx + b. In this article, we will walk through the step-by-step process to find the equation of the line passing through the points (-2, 1) and (2, 9), and present it in the slope-intercept form.

What Is the Slope-Intercept Form of a Line?

The slope-intercept form of a line's equation is one of the most common and straightforward ways to represent a line mathematically:

```
y = mx + b
```

where:
- m is the slope of the line, indicating its steepness and direction.
- b is the y-intercept, the point where the line crosses the y-axis.

Knowing both m and b allows us to graph the line quickly and understand its behavior.

Step 1: Identify the Given Points

Given points are:
- Point 1: (-2, 1)
- Point 2: (2, 9)

These points are expressed as (x_1, y_1) and (x_2, y_2), respectively.

Step 2: Calculate the Slope (m)

The slope formula when given two points is:

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

Applying the given points:

$$m = (9 - 1) / (2 - (-2))$$

Simplify numerator and denominator:

$$m = 8 / (2 + 2) = 8 / 4 = 2$$

Therefore, the slope of Line A is 2.

Step 3: Use the Point-Slope Form to Find the Equation

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

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

Choose either of the given points to substitute into the formula. Let's use (-2, 1):

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

Simplify:

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

Distribute the 2:

$$y - 1 = 2x + 4$$

Now, solve for y to get the slope-intercept form.

Step 4: Convert to Slope-Intercept Form

Add 1 to both sides:

$$y = 2x + 4 + 1$$

Simplify:

```
y = 2x + 5
```

The equation of Line A in slope-intercept form is:

```
y = 2x + 5
```

Additional Insights on the Equation of the Line

Having derived the equation y = 2x + 5, it's beneficial to understand its components and implications.

1. Slope (m = 2)

- Indicates the line rises 2 units vertically for every 1 unit it moves horizontally.
- A positive slope means the line is increasing; as x increases, y increases.

2. Y-Intercept (b = 5)

- The line crosses the y-axis at (0, 5).
- This point can be plotted directly when graphing.

Graphing the Line

To visualize the line:

- Plot the y-intercept at (0, 5).
- From this point, use the slope to find another point: go up 2 units and right 1 unit to (1, 7), or down 2 units and left 1 unit to (-1, 3).
- Draw a straight line through these points.

Verifying the Equation with the Given Points

It's always a good practice to verify the derived equation with the original points:

- For (-2, 1):

$$y = 2(-2) + 5 = -4 + 5 = 1 \checkmark$$

- For (2, 9):

$$y = 2(2) + 5 = 4 + 5 = 9 \checkmark$$

Both points satisfy the equation, confirming its accuracy.

Applications of Line Equations in Real Life

Understanding how to formulate the equation of a line from two points has numerous practical applications, including:

- **Economics:** Modeling cost or revenue functions.
- **Physics:** Describing linear motion.
- **Engineering:** Planning trajectories.
- **Data Analysis:** Finding relationships between variables.

Accurate line equations enable professionals to make predictions, analyze trends, and optimize processes.

Common Mistakes to Avoid

When working with line equations, students often make certain errors, such as:

- Swapping points when calculating the slope, leading to incorrect signs.
- Forgetting to simplify fractions or incorrect calculation of numerator/denominator.
- Misapplying the point-slope formula by using the wrong point or incorrect substitution.
- Neglecting to verify the equation with the original points.
- Confusing the slope-intercept form with other forms like standard form.

Being cautious and double-checking calculations helps ensure accuracy.

Conclusion

In summary, deriving the equation of a line passing through two points involves calculating the slope, then using either the point-slope or the slope-intercept form to find the precise equation. For the points (-2, 1) and (2, 9), the process yields the line's equation as $y = 2x + 5$. This equation not only provides a clear mathematical representation but also facilitates graphing, analysis, and practical application in various fields. Mastering this method enhances your overall understanding of linear functions and their role in modeling real-world scenarios.

Frequently Asked Questions

What is the slope of the line passing through points (-2, 1) and (2, 9)?

The slope is $(9 - 1) / (2 - (-2)) = 8 / 4 = 2$.

How do you find the equation of a line in slope-intercept form given two points?

First, find the slope using the two points, then use point-slope form to find the equation, and finally convert it to slope-intercept form $y = mx + b$.

What is the slope of the line passing through points (-2, 1) and (2, 9)?

The slope is 2.

Using the points (-2, 1) and (2, 9), what is the slope-intercept form of the line?

First, calculate the slope: 2. Then, use point-slope form: $y - 1 = 2(x + 2)$. Simplify to get $y = 2x + 5$.

How do you find the y-intercept of the line passing through points (-2, 1) and (2, 9)?

After calculating the slope, substitute one point into the slope-intercept form $y = mx + b$ to solve for b. Using point (-2, 1): $1 = 2(-2) + b$, so $b = 5$.

What is the equation of the line passing through (-2, 1) and (2, 9) in slope-intercept form?

The equation is $y = 2x + 5$.

Can you verify that the points (-2, 1) and (2, 9) satisfy the equation y = 2x + 5?

Yes. For (-2, 1): $y = 2(-2) + 5 = -4 + 5 = 1$. For (2, 9): $y = 22 + 5 = 4 + 5 = 9$. Both satisfy the equation.

Why is the slope of the line between (-2, 1) and (2, 9) important?

The slope determines the steepness and direction of the line, which is essential for writing its equation.

What steps are involved in writing the equation of a line in slope-intercept form from two points?

Calculate the slope, use one point and the slope in point-slope form, then rearrange to slope-intercept form $y = mx + b$.

Additional Resources

Line A Passes Through Points (-2, 1) and (2, 9). Write An Equation In Slope Intercept Form That Is

When exploring the fundamental concepts of linear equations, understanding how to derive an equation from given points is a crucial skill in algebra. The problem statement, "Line A passes through points (-2, 1) and (2, 9). Write an equation in slope-intercept form that is," provides an excellent opportunity to delve into the process of finding the slope and y-intercept from two known points. This process not only reinforces the core principles of linear functions but also demonstrates how algebraic manipulation translates geometric information into an algebraic equation. In this comprehensive review, we will analyze the steps involved in deriving the slope-intercept form, discuss the significance of each component, and explore related concepts that deepen understanding of linear equations.

Understanding the Problem: Points and the Slope-Intercept Form

The problem involves two key elements: the points (-2, 1) and (2, 9), and the goal of expressing the line passing through these points in slope-intercept form, which is:

$$y = mx + b$$

where:
- m is the slope of the line,
- b is the y-intercept, the point where the line crosses the y-axis.

The first step is to interpret what it means for a line to pass through two points. Each point gives us specific coordinates on the Cartesian plane, and the line connecting these points has a unique slope and y-intercept. The slope-intercept form is particularly useful because it explicitly shows the rate of change (slope) and the initial value (y-intercept), making it easy to graph and analyze the line.

Calculating the Slope (m)

The Concept of Slope

The slope m of a line measures its steepness and direction. It is calculated as the ratio of the change in y to the change in x between two points:

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

This ratio indicates how much y increases or decreases as x moves between two points.

Applying to the Given Points

Given points:
- $(-2, 1)$ (let's denote as (x_1, y_1))
- $(2, 9)$ (denote as (x_2, y_2))

Calculating the slope:

$$
m = \frac{9 - 1}{2 - (-2)} = \frac{8}{4} = 2
$$

The positive slope indicates the line rises as x increases.

Features of Slope Calculation:
- Straightforward with two points.
- Provides a measure of the line's inclination.
- The sign indicates direction: positive for upward, negative for downward.

Deriving the Equation in Slope-Intercept Form

Step 1: Write the Slope-Point Form

Using the point-slope form:

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

Substituting $(x_1, y_1) = (-2, 1)$ and $m = 2$:

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

Step 2: Simplify to Slope-Intercept Form

Distribute the 2:

$$
y - 1 = 2x + 4
$$

Add 1 to both sides:

$$
y = 2x + 5
$$

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

Final Equation:

$$
\boxed{ y = 2x + 5 }
$$

Verifying the Equation

Verification ensures the correctness of the derived equation:

- Substitute $x = -2$:

$$
y = 2(-2) + 5 = -4 + 5 = 1
$$

which matches the point $(-2, 1)$.

- Substitute $x = 2$:

$$
y = 2(2) + 5 = 4 + 5 = 9
$$

which matches the point $(2, 9)$.

Both points satisfy the equation, confirming its accuracy.

Features and Significance of the Slope-Intercept Form

Features:
- Clarity: Explicitly displays the slope m and y-intercept b.
- Ease of Graphing: Starting from the y-intercept, the line can be plotted by applying the slope.
- Linear Relationship: Represents a constant rate of change, ideal for modeling real-world scenarios with uniform change.

Pros:
- Simple to interpret and graph.
- Useful for rapid analysis of linear relationships.
- Facilitates quick substitution for predictions or calculations.

Cons:
- Only applicable when the line can be expressed explicitly as y in terms of x.
- Less effective for vertical lines (which have undefined slope).

Related Concepts and Extensions

Alternate Forms of Linear Equations

- Point-Slope Form: $y - y_1 = m(x - x_1)$
- Standard Form: $Ax + By = C$

Understanding Slope Significance

- Positive slope: line rises from left to right.
- Negative slope: line falls from left to right.
- Zero slope: horizontal line.
- Undefined slope: vertical line.

Applications in Real Life

- Speed and distance calculations.
- Economics: cost vs. production.
- Scientific data analysis: rates of change.

Common Mistakes to Watch Out For

- Confusing the order of points when calculating slope.
- Forgetting to simplify the equation.
- Ignoring the point verification step.

Conclusion

The process of deriving the equation of a line passing through two points in slope-intercept form is a fundamental skill that combines algebraic manipulation with geometric understanding. Starting from the two points (-2, 1) and (2, 9), the calculated slope of 2 reveals a line that ascends at a steady rate, with the y-intercept at 5. The resulting equation, $y = 2x + 5$, not only accurately models the line but also serves as a practical tool for graphing and analysis. Understanding this process enhances one's ability to interpret linear relationships across various disciplines, emphasizing the elegance and utility of algebra in solving real-world problems.

In summary, mastering the derivation of linear equations from points fosters a deeper comprehension of the relationship between algebra and geometry, equipping learners with essential skills for more advanced mathematical concepts and applications.

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