

TEST RN What Is The Equation Of The Line That Passes Through The Point (6.0) And Had A Slope Of -5/6?

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Understanding the equation of a line is a fundamental concept in algebra and analytical geometry. Whether you're a student preparing for exams, a teacher designing lesson plans, or someone working on a project involving linear models, knowing how to find the equation of a line given specific parameters is essential. In this article, we will explore in detail how to determine the equation of a line passing through a particular point with a given slope, focusing on the example point (6, 0) and a slope of -5/6. We will provide step-by-step instructions, explanations of key concepts, and tips to help you master this topic.

Introduction to the Equation of a Line

Before diving into the specific problem, it's important to understand the basic forms of a line's equation and the concepts involved:

- Slope (m): A measure of how steep a line is. It indicates the rate of change of y with respect to x.
- Point (x₁, y₁): A specific coordinate through which the line passes.
- Line Equation: The most commonly used forms are the slope-intercept form and the point-slope form.

The slope-intercept form is written as:

$$y = mx + b$$

where:

- (m) is the slope.
- (b) is the y-intercept, the point where the line crosses the y-axis.

The point-slope form is written as:

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

which is particularly useful when you know a point on the line and its slope.

Understanding the Problem

The problem states:

> "What is the equation of the line that passes through the point (6, 0) and has a slope of $-\frac{5}{6}$?"

This involves two key pieces of information:

1. The point: (6, 0)
2. The slope: $m = -\frac{5}{6}$

The goal is to find the line equation in a form that best suits interpretation or application—commonly the slope-intercept form.

Step-by-Step Solution

To determine the line's equation, follow these steps:

Step 1: Recall the point-slope form of a line

Given a point (x_1, y_1) and slope m , the line's equation is:

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

Step 2: Substitute the known values

Plug in the point (6, 0) and the slope $-\frac{5}{6}$:

$$y - 0 = -\frac{5}{6}(x - 6)$$

Simplify:

$$y = -\frac{5}{6}(x - 6)$$

Step 3: Simplify to slope-intercept form

Distribute the slope:

$$y = -\frac{5}{6}x + -\frac{5}{6} \times 6$$

Calculate:

$$\left[-\frac{5}{6} \times 6 = -5 \right]$$

So, the equation becomes:

$$\left[y = -\frac{5}{6}x - 5 \right]$$

Step 4: Final equation

The equation of the line passing through (6, 0) with a slope of $-\frac{5}{6}$ is:

$$\boxed{y = -\frac{5}{6}x - 5}$$

Understanding the Components of the Equation

Breaking down the final equation:

- Slope ($m = -\frac{5}{6}$): Indicates the line decreases (goes downward) as x increases, with a ratio of 5 units down for every 6 units to the right.
- Y-intercept ($b = -5$): The point where the line crosses the y-axis, at (0, -5).

This line can be visualized as passing through the point (6, 0) and crossing the y-axis at (0, -5).

Additional Forms and Interpretations

While the slope-intercept form is most straightforward for graphing and interpretation, other forms can be useful:

Point-Slope Form

$$\left[y - y_1 = m(x - x_1) \right]$$

Using the given point and slope:

$$\left[y - 0 = -\frac{5}{6}(x - 6) \right]$$

which is the initial form before simplification.

Standard Form

Rearranged as:

$$[Ax + By = C]$$

Starting from the slope-intercept form:

$$[y = -\frac{5}{6}x - 5]$$

Multiply both sides by 6 to clear fractions:

$$[6y = -5x - 30]$$

Rearranged into standard form:

$$[5x + 6y = -30]$$

This form is often used in algebraic applications and can be useful for solving systems of equations.

Graphing the Line

Understanding how to graph the line helps in visualizing the relationship:

1. Plot the y-intercept: at (0, -5).
2. Use the slope: from the y-intercept, move 6 units to the right ($x + 6$) and 5 units down ($y - (-5) = y + 5$), reaching (6, 0), which confirms the given point.
3. Draw the line through these points.

Practical Applications and Importance

Knowing how to find the equation of a line given a point and slope is crucial across various fields:

- Physics: Describing constant velocity motion.
- Economics: Modeling cost or revenue functions.
- Engineering: Analyzing relationships between variables.
- Data Science: Fitting linear models to data.

This skill allows you to quickly derive line equations for predictive models, trend analysis, and problem-solving.

Common Mistakes and Tips

- Mixing up the point coordinates: Ensure you correctly identify (x_1, y_1) .
- Incorrectly distributing the slope: Remember to multiply both terms in $m(x - x_1)$.
- Sign errors: Pay attention to signs when substituting and simplifying.
- Fractions: When working with slopes like $-\frac{5}{6}$, clear denominators to avoid errors in calculations.

Tips:

- Always verify your point and slope before substituting.
- Use a calculator or algebra software for complex fractions.
- Plot points to confirm the accuracy of your line.

Summary

In summary, to find the equation of a line passing through a specific point with a known slope:

1. Use the point-slope form to set up the equation.
2. Substitute the point coordinates and slope.
3. Simplify to the slope-intercept form or standard form as required.
4. Verify by plotting or substituting additional points.

For the problem at hand, the final equation is:

$$\boxed{y = -\frac{5}{6}x - 5}$$

This represents the unique line passing through $(6, 0)$ with a slope of $-\frac{5}{6}$.

Conclusion

Mastering the process of finding the equation of a line given a point and slope is a vital algebraic skill. It combines understanding of basic formulas, algebraic manipulation, and geometric interpretation. Whether you're solving homework problems, preparing for exams, or applying these concepts in real-world scenarios, the steps outlined here will serve as a reliable guide. Remember, practice makes perfect—try applying these steps to different points and slopes to strengthen your understanding and confidence.

Keywords for SEO Optimization:

Equation of a line, slope-intercept form, point-slope form, how to find the equation of a line, line passing through a point, line with given slope, algebra, linear equations, graphing lines, standard form of a line, slope calculation, algebra tips

Frequently Asked Questions

What is the equation of the line passing through the point (6, 0) with a slope of -5/6?

Using point-slope form: $y - 0 = (-5/6)(x - 6)$. Simplifying, $y = (-5/6)x + 5$.

How do you find the equation of a line given a point and a slope?

Use the point-slope form: $y - y_1 = m(x - x_1)$. Substitute the given point and slope, then simplify to slope-intercept form if needed.

What is the slope-intercept form of the line passing through (6, 0) with slope -5/6?

The slope-intercept form is $y = (-5/6)x + 5$.

Can you verify that the point (6, 0) lies on the line $y = (-5/6)x + 5$?

Yes. Substituting $x=6$: $y = (-5/6)(6) + 5 = -5 + 5 = 0$, confirming the point lies on the line.

What is the significance of the slope -5/6 in the line's equation?

The slope -5/6 indicates the line decreases by 5 units vertically for every 6 units it moves horizontally to the right.

Additional Resources

Test RN: Understanding the Equation of a Line Through a Point with a Given Slope

When diving into the fundamentals of algebra and coordinate geometry, one of the most essential concepts students encounter is the equation of a line. Whether you're solving for the line's equation in a math exam, preparing for standardized tests, or just seeking to strengthen your understanding of linear functions, grasping how to find the equation of a line passing through a specific point with a particular slope is crucial.

In this comprehensive review, we will explore the question: "What is the equation of the line that

passes through the point (6, 0) and has a slope of $-\frac{5}{6}$?" We will analyze each step meticulously, explain the formulas involved, and provide practical insights to make the process clear and approachable.

Understanding the Fundamentals: Key Concepts in Line Equations

Before we delve into the specific problem, it's important to review the foundational concepts that underpin the process:

The Slope of a Line

The slope (denoted as m) describes the steepness and direction of a line. It is calculated as the ratio of the change in y -values to the change in x -values between two points on the line:

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

- A positive slope indicates the line rises from left to right.
- A negative slope indicates 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.

The Point-Slope Form of a Line Equation

Given a point (x_1, y_1) and a slope (m) , the point-slope form of a line is expressed as:

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

This form is particularly useful because it directly incorporates the known point and the slope, allowing us to derive the line's equation straightforwardly.

The Slope-Intercept Form of a Line Equation

The slope-intercept form simplifies the line equation to:

$$y = mx + b$$

where (b) is the y -intercept—the point where the line crosses the y -axis.

Step-by-Step Solution: Deriving the Equation of the Line

Now, let's systematically approach our specific problem:

> Find the equation of the line passing through the point (6, 0) with a slope of $-\frac{5}{6}$.

Step 1: Identify Known Values

- Point $((x_1, y_1) = (6, 0))$
- Slope $(m = -\frac{5}{6})$

These values are the inputs for the point-slope form.

Step 2: Write the Point-Slope Equation

Using the formula:

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

Substitute the known values:

$$y - 0 = -\frac{5}{6}(x - 6)$$

which simplifies to:

$$y = -\frac{5}{6}(x - 6)$$

Step 3: Simplify to Slope-Intercept Form

Distribute the slope across the parentheses:

$$y = -\frac{5}{6}x + (-\frac{5}{6})(-6)$$

Calculating the second term:

$$-\frac{5}{6} \times -6 = \frac{5}{6} \times 6 = 5$$

because the negatives cancel out, and 6 cancels with the denominator.

Thus, the equation simplifies to:

$$y = -\frac{5}{6}x + 5$$

This is the slope-intercept form of the line.

Interpreting the Equation: What Does It Tell Us?

The final form:

$$y = -\frac{5}{6}x + 5$$

gives us several valuable insights:

- Slope ($m = -\frac{5}{6}$): The line decreases at a rate of 5 units vertically for every 6 units horizontally traveled to the right. This negative slope indicates a downward trend.
- Y-intercept ($b = 5$): The line crosses the y-axis at the point $(0, 5)$. This is the point where $x = 0$.

Visualizing the Line

To visualize the line:

- Start at the y-intercept $(0, 5)$.
- From this point, move down 5 units and right 6 units repeatedly to trace the line.
- Or, plot the initial point $(6, 0)$ and use the slope to find another point, such as:

$$x = 0 \rightarrow y = -\frac{5}{6} \times 0 + 5 = 5$$

which confirms the y-intercept at $(0, 5)$.

Practical Applications and Variations

Understanding how to derive the equation of a line with a given point and slope isn't just an academic exercise—it has real-world implications:

1. Engineering and Physics

- Calculating trajectories or motion paths where you know a specific point in space and the rate of change.

2. Economics and Business

- Modeling cost, revenue, or profit functions where initial conditions and rates of change are known.

3. Computer Graphics

- Drawing lines using pixel coordinates with specified slopes and points.

Variations to Consider

- Vertical Lines: When the slope is undefined (division by zero), the line is vertical, with an equation of the form $(x = a)$.
- Horizontal Lines: When the slope is zero, the line has an equation $(y = b)$.

Common Mistakes to Avoid

While deriving the equation of a line is straightforward, some pitfalls can cause errors:

- Incorrect substitution: Ensure you correctly plug in the point coordinates and slope.
- Forgetting to distribute: When simplifying the point-slope form, distribute the slope properly.
- Misinterpreting the slope: Remember the negative sign; it indicates the direction of the line.
- Omitting the y-intercept: When converting to slope-intercept form, always perform the algebraic steps carefully.

Summary and Final Thoughts

In conclusion, finding the equation of a line passing through a specific point with a given slope is a fundamental skill in algebra that combines understanding of various forms of line equations. For our particular problem:

- Given point: $((6, 0))$
- Given slope: $(-\frac{5}{6})$

The step-by-step derivation leads us to the equation:

$$\boxed{\phantom{y - 0 = -\frac{5}{6}(x - 6)}}$$

$$y = -\frac{5}{6}x + 5$$

This equation encapsulates all the necessary information about the line's position and direction in the coordinate plane.

Additional Resources for Mastery

To deepen your understanding of linear equations, consider exploring:

- Interactive graphing tools to visualize lines.
- Practice problems with different points and slopes.
- Tutorials on converting between line equation forms.
- Real-world applications of linear functions in various fields.

Mastering these concepts not only enhances your algebra skills but also builds a strong foundation for advanced mathematics, engineering, data analysis, and countless other disciplines.

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