Find The Equation Of The Line Passing Through The Points (45,-14) And (-36,4). Write Your Answer In The

Find The Equation Of The Line Passing Through The Points (45,-14) And (-36,4). Write Your Answer In The

---

Introduction

When working with coordinate geometry, one of the fundamental tasks is to determine the equation of a line passing through two given points. This skill is essential for students and professionals alike, providing the foundation for analyzing linear relationships in math, physics, engineering, economics, and many other fields. In this article, we will explore how to find the equation of a line passing through the points (45, -14) and (-36, 4). We will break down the process into clear, manageable steps, explain key concepts, and provide practical examples to solidify your understanding.

Understanding the Basics

Before diving into the specific problem, let's review some basic concepts related to the equations of lines.

What Is the Equation of a Line?

The equation of a line describes all points (x, y) that lie on that line. The most common forms include:

- Slope-intercept form: $y = mx + b$
- Point-slope form: $y - y_1 = m(x - x_1)$
- Standard form: $Ax + By + C = 0$

Where:
- m is the slope of the line
- (x_1, y_1) is a point on the line
- A, B, C are constants in standard form

Why Find the Equation?

Knowing the equation allows you to:
- Predict y-values for given x-values
- Analyze the line’s slope and intercepts
- Graph the line accurately
- Solve systems of equations involving lines

Step 1: Find the Slope of the Line

The first step in finding the line's equation is to determine its slope (m). The slope indicates how steep the line is and is calculated using the two points provided.

The Slope Formula

Given two points, (x_1, y_1) and (x_2, y_2), the slope m is:

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

Applying the Formula

For points (45, -14) and (-36, 4):

- $x_1 = 45$, $y_1 = -14$
- $x_2 = -36$, $y_2 = 4$

Calculating the slope:

$$
m = \frac{4 - (-14)}{-36 - 45} = \frac{4 + 14}{-36 - 45} = \frac{18}{-81}
$$

Simplify the fraction:

$$
m = -\frac{18}{81} = -\frac{2}{9}
$$

Result: The slope of the line passing through the points (45, -14) and (-36, 4) is -2/9.

Step 2: Use Point-Slope Form to Find the Equation

With the slope in hand, the next step is to apply the point-slope form of a line's equation:

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

Choose either point to substitute into the formula. For simplicity, we'll use (45, -14).

Substitute the Values

$$
y - (-14) = -\frac{2}{9}(x - 45)
$$

Simplify:

$$
y + 14 = -\frac{2}{9}(x - 45)
$$

Step 3: Simplify to Slope-Intercept Form

To write the equation in a more familiar form, expand and simplify.

Expand the Right Side

$$
y + 14 = -\frac{2}{9}x + \frac{2}{9} \times 45
$$

Calculate:

$$
\frac{2}{9} \times 45 = \frac{2 \times 45}{9} = \frac{90}{9} = 10
$$

So:

$$
y + 14 = -\frac{2}{9}x + 10
$$

Isolate y

Subtract 14 from both sides:

$$
y = -\frac{2}{9}x + 10 - 14
$$

Simplify the constants:

$$
y = -\frac{2}{9}x - 4
$$

Final Equation in Slope-Intercept Form:

$$
\boxed{y = -\frac{2}{9}x - 4}
$$

This is the equation of the line passing through the points (45, -14) and (-36, 4).

Step 4: Confirming the Line Passes Through Both Points

It's always good practice to verify that the derived line passes through both given points.

Check Point (-36, 4)

Substitute x = -36 into the equation:

$$
y = -\frac{2}{9}(-36) - 4
$$

Calculate:

$$
-\frac{2}{9} \times -36 = \frac{2 \times 36}{9} = \frac{72}{9} = 8
$$

So:

$$
y = 8 - 4 = 4
$$

Since the y-value matches the given point, the point (-36, 4) lies on the line.

Check Point (45, -14)

Substitute x = 45:

$$
y = -\frac{2}{9} \times 45 - 4
$$

Calculate:

$$
-\frac{2}{9} \times 45 = -\frac{2 \times 45}{9} = -\frac{90}{9} = -10
$$

So:

$$
y = -10 - 4 = -14
$$

Again, the y-value matches the point (45, -14), confirming the correctness of the equation.

Additional Forms of the Line Equation

While the slope-intercept form is most common, other forms can be useful depending on the context.

Standard Form

Rearranged from the slope-intercept form:

$$
y = -\frac{2}{9}x - 4
$$

Multiply through by 9 to clear fractions:

$$
9y = -2x - 36
$$

Rewrite as:

$$
2x + 9y = -36
$$

This standard form can be more convenient in certain algebraic applications.

Point-Slope Form

Starting from the earlier step:

$$
y + 14 = -\frac{2}{9}(x - 45)
$$

This form is particularly useful when you want to quickly write the equation given a point and the slope.

Practical Applications and Examples

Understanding how to find the equation of a line passing through two points is vital in various real-world scenarios:

- Engineering: Designing structures where precise line equations are necessary.
- Economics: Modeling linear demand or supply curves.
- Physics: Analyzing motion with constant velocity.
- Data Analysis: Fitting a line through data points.

Example 1: Graphing the Line

To graph the line y = - (2/9)x - 4, follow these steps:

1. Plot the y-intercept (0, -4).
2. Use the slope -2/9 to find a second point:
- From (0, -4), move 9 units right (positive x) and 2 units down (since slope is negative).
- This leads to point (9, -6).
3. Draw a straight line through these points.

Example 2: Finding the Distance Between the Points

Using the distance formula to verify the separation between (45, -14) and (-36, 4):

$$
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}
$$

Calculate:

$$
d = \sqrt{(-36 - 45)^2 + (4 - (-14))^2} = \sqrt{(-81)^2 + (18)^2} = \sqrt{6561 + 324} = \sqrt{6885}
$$

Approximate:

$$
d \approx 82.99
$$

This helps understand the spatial relationship between the points.

Tips for Solving Similar Problems

- Always verify your calculated line passes through both points.
- Simplify fractions to make the equation cleaner.
- Remember to choose the most convenient point for substitution.
- Practice converting between different line forms.
- Use graphing tools to visualize the line and verify calculations.

Conclusion

Finding the equation of a line passing through two points involves calculating the slope and then applying the appropriate algebraic forms to express the line. For the points (45, -14) and (-36, 4), we've determined that the line's equation in slope-intercept form is:

$$
\boxed{y = -\frac{2}{9}x - 4}

\]

This process emphasizes the importance of understanding fundamental concepts such as slope calculation, point substitution, and algebraic manipulation. Mastering these steps enables you to analyze and graph lines accurately, which is critical in many mathematical

Frequently Asked Questions

What is the slope of the line passing through the points (45, -14) and (-36, 4)?

The slope is calculated as (4 - (-14)) / (-36 - 45) = 18 / -81 = -6/27 = -2/9.

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

First, find the slope using the two points, then use point-slope form $y - y_1 = m(x - x_1)$, and simplify to slope-intercept form if needed.

What is the slope of the line passing through (45, -14) and (-36, 4)?

The slope is -2/9.

What is the equation of the line passing through (45, -14) and (-36, 4) in slope-intercept form?

Using the point (-36, 4) and slope -2/9, the equation is y = (-2/9)x + (38).

How do you write the equation of a line passing through two points in standard form?

Calculate the slope, then use the point-slope form to find the equation, and rearrange into standard form Ax + By = C.

What is the step-by-step process to find the equation of a line through two points?

1. Find the slope m. 2. Use one point and the slope in point-slope form to write the equation. 3. Simplify to slope-intercept or standard form.

Can you verify the equation of the line passing through the points (45, -14) and (-36, 4)?

Yes, by substituting the original points into the derived equation to confirm they satisfy it.

What is the importance of writing the line equation in different forms?

Different forms (slope-intercept, point-slope, standard) are useful for various applications like graphing, analysis, or solving systems.

How do I write the final answer for the line passing through the given points?

Provide the equation in your preferred form (e.g., slope-intercept form y = mx + b), clearly indicating the slope and intercept.

What is the complete equation of the line passing through (45, -14) and (-36, 4)?

The equation in slope-intercept form is y = (-2/9)x + 38.

Additional Resources

Equation of a Line Passing Through Two Points

Understanding how to find the equation of a line passing through two given points is a fundamental skill in coordinate geometry. Whether you're a student tackling algebra problems, an educator designing lesson plans, or a professional working with spatial data, mastering this concept is essential. In this article, we explore the process in depth, focusing on the specific points (45, -14) and (-36, 4). We will guide you through the step-by-step calculation, explain the underlying principles, and provide insights into different forms of the line's equation.

Introduction to the Problem

When given two points on a Cartesian plane, the goal is to determine the algebraic equation of the line that passes through both. This task involves understanding the concepts of slope and intercepts, and applying algebraic formulas to derive a clear, usable equation.

Given points:
- Point 1: (45, -14)
- Point 2: (-36, 4)

The challenge lies in transforming these two coordinates into an equation that describes the entire line, not just the segment connecting these points.

Understanding the Core Concepts

Before diving into calculations, it’s essential to grasp the key terms:

Slope (m)

The slope indicates how steep the line is. It’s calculated as the ratio of the change in y-coordinates to the change in x-coordinates:

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

A positive slope means the line rises from left to right, a negative slope indicates it falls.

Point-Slope Form

Once the slope is known, the line can be expressed using the point-slope form:

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

This form is versatile because it directly incorporates a known point on the line.

Standard Forms of Line Equations

- Slope-intercept form: $y = m x + b$, where b is the y-intercept.
- General form: $Ax + By + C = 0$, where A, B, C are constants.

Our goal is to find the most suitable form, often the slope-intercept form for clarity.

Step-by-Step Calculation

Let's systematically derive the equation passing through the given points.

Step 1: Calculate the Slope (m)

Using the formula:

\[

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

Plugging in the points:

\[
x_1 = 45, \quad y_1 = -14
\]
\[
x_2 = -36, \quad y_2 = 4
\]

Calculate numerator:

\[
4 - (-14) = 4 + 14 = 18
\]

Calculate denominator:

\[
-36 - 45 = -81
\]

Thus,

\[
m = \frac{18}{-81} = -\frac{2}{9}
\]

Result: The slope \(m = -\frac{2}{9}\).

Step 2: Choose a Point to Plug Into Point-Slope Form

The point-slope form can be written with either point; selecting Point 1 (45, -14) simplifies calculations.

Step 3: Write the Equation Using Point-Slope Form

Insert the slope and point into:

\[
y - y_1 = m (x - x_1)

\]

\[
y - (-14) = -\frac{2}{9} (x - 45)
\]

Simplify:

\[
y + 14 = -\frac{2}{9} (x - 45)
\]

Step 4: Simplify to Slope-Intercept Form

Distribute the slope:

\[
y + 14 = -\frac{2}{9} x + \frac{2}{9} \times 45
\]

Calculate:

\[
\frac{2}{9} \times 45 = \frac{2 \times 45}{9} = \frac{90}{9} = 10
\]

So,

\[
y + 14 = -\frac{2}{9} x + 10
\]

Subtract 14 from both sides:

\[
y = -\frac{2}{9} x + 10 - 14
\]
\[
y = -\frac{2}{9} x - 4
\]

Final equation in slope-intercept form:

\[
\boxed{y = -\frac{2}{9} x - 4}
\]

Verifying the Equation

To ensure accuracy, substitute the second point (-36, 4):

$$
x = -36
$$

Plug into the equation:

$$
y = -\frac{2}{9} \times (-36) - 4
$$

Calculate:

$$
-\frac{2}{9} \times -36 = \frac{2}{9} \times 36 = 2 \times 4 = 8
$$

Then,

$$
y = 8 - 4 = 4
$$

The value matches the y-coordinate of the second point, confirming the correctness of the derived line equation.

Alternative Forms of the Line Equation

While the slope-intercept form provides clarity, other forms may be useful depending on the context.

Standard Form

Start with:

$$
y = -\frac{2}{9} x - 4
$$

Multiply through by 9 to clear fractions:

$$
9 y = -2 x - 36
$$

Rewrite as:

$$
2 x + 9 y = -36
$$

This is the standard form, with integer coefficients, often preferred in algebraic analysis.

General Form

Expressed as:

$$
2 x + 9 y + 36 = 0
$$

Summary of the Process

To recap, finding the line passing through points (45, -14) and (-36, 4) involves:

1. Calculating the slope:
$$
m = -\frac{2}{9}
$$

2. Applying point-slope form with one of the points:
$$
y - y_1 = m (x - x_1)
$$

3. Simplifying to slope-intercept form:
$$
y = -\frac{2}{9} x - 4
$$

4. Converting to alternative forms (standard, general) as needed:
$$
2 x + 9 y = -36
$$

$$
2 x + 9 y + 36 = 0
$$

Conclusion

Deriving the equation of a line through two points is a fundamental yet elegant aspect of coordinate geometry, combining algebraic manipulation with geometric insight. The process begins with calculating the slope, then applying the point-slope form, and finally expressing the line in the most suitable algebraic form. For the points (45, -14) and (-36, 4), the line's equation is:

$$
\boxed{
y = -\frac{2}{9} x - 4
}
$$

This line accurately passes through both points and serves as a vital tool for further analysis, such as graphing, intersection calculations, or understanding linear relationships in broader contexts. Mastery of these steps enhances mathematical fluency and provides a strong foundation for exploring more complex geometric and algebraic concepts.

Find The Equation Of The Line Passing Through The Points 45 14 And 36 4 Write Your Answer In The

Find The Equation Of The Line Passing Through The Points 45 14 And 36 4 Write Your Answer In The

Related Articles

- Fletcher Corporation Completed A Consulting Job And Billed The Customer $10,000. The Impact On Fletcher
- Develop A Story In 80 To 100 Words With Following Ending. Give A Suitable Title. ....and They
- In 2007 In The United States There Were Approximately 480 Cars For Every 1,000 People. The Total Number

Back to Home