Find The Equation Of The Line Through Point (4,7) And Parallel To =2/3+3/2 Use A Forward Slash (i.e.

Find The Equation Of The Line Through Point (4,7) And Parallel To =2/3+3/2 Use A Forward Slash (i.e.

Understanding how to find the equation of a line that passes through a specific point and is parallel to a given line is a fundamental skill in coordinate geometry. In this article, we will explore step-by-step how to determine this equation, particularly focusing on the line passing through the point (4, 7) and parallel to the line represented by the equation =2/3+3/2. We will clarify the process, interpret the given data accurately, and provide clear examples to enhance your understanding.

Deciphering the Given Equation and Its Meaning

Before proceeding to find the equation of the required line, it is crucial to interpret the provided information correctly.

Understanding the Notation =2/3+3/2

The notation "=2/3+3/2" appears to be a representation of a line's equation, but it is somewhat ambiguous. Typically, in algebra, an equation of a line can be expressed in various forms such as slope-intercept form (y = mx + b), point-slope form, or standard form.

Given the expression "=2/3+3/2", it suggests that the line's equation might be:

- Potential interpretation 1: y = 2/3 x + 3/2

- Potential interpretation 2: The line is represented by the equation y = (2/3) x + (3/2)

Because the notation uses an equal sign at the start, it is most consistent to interpret the line's equation as y = 2/3 x + 3/2.

Note: Using the forward slash (/) as requested, the equation can be written as:

y = 2/3 x + 3/2

This form is the slope-intercept form, which makes identifying the slope straightforward.

Identifying the Slope of the Given Line

From the equation y = 2/3 x + 3/2, the slope (m) of the line is 2/3. Since the line we are asked to find is parallel to this line, it will have the same slope, i.e., 2/3.

Step-by-Step Solution to Find the Equation of the Parallel Line

Having understood the given line's equation and slope, we now proceed to find the equation of the line passing through the point (4, 7) and parallel to the given line.

Step 1: Recall the Properties of Parallel Lines

- Parallel lines have identical slopes.

- Therefore, the slope of the required line is the same as the given line, which is 2/3.

Step 2: Use the Point-Slope Form

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

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

where:

- (x_1, y_1) is a point on the line

- m is the slope

Applying this to our problem:

- $(x_1, y_1) = (4, 7)$

- m = 2/3

The equation becomes:

$y - 7 = 2/3 (x - 4)$

Step 3: Simplify the Equation

Distribute the slope:

y - 7 = 2/3 x - 2/3 4

Calculate:

- 2/3 4 = (2 4) / 3 = 8/3

So:

y - 7 = 2/3 x - 8/3

Add 7 to both sides to solve for y:

y = 2/3 x - 8/3 + 7

Express 7 as a fraction with denominator 3:

7 = 21/3

Now, combine the fractions:

y = 2/3 x + (21/3 - 8/3) = 2/3 x + 13/3

Final equation in slope-intercept form:

y = 2/3 x + 13/3

Alternate Forms and Additional Considerations

While the slope-intercept form is often the most straightforward, sometimes you may need the equation in different forms or need to verify your solution.

Standard Form of the Equation

To write the equation in standard form (Ax + By = C), start from:

y = 2/3 x + 13/3

Multiply both sides by 3 to clear denominators:

3y = 2x + 13

Rearranged as:

2x - 3y = -13

This is the standard form.

Verification of the Solution

To verify, check that the point (4,7) satisfies the equation:

Plug x = 4:

y = 2/3 4 + 13/3 = 8/3 + 13/3 = 21/3 = 7

Since y = 7, the point lies on the line, confirming the correctness.

Summary of the Process

To find the equation of a line passing through a point and parallel to a given line:

1. Identify the slope of the given line (for y = 2/3 x + 3/2, slope m = 2/3).
2. Use the point-slope form with the known point and slope:

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y - y1 = m (x - x1)
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3. Substitute the point (4, 7) and the slope (2/3) into the formula:

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y - 7 = 2/3 (x - 4)
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4. Simplify and solve for y to find the slope-intercept form:

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y = 2/3 x + 13/3
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5. Optionally, convert to other forms such as standard form if required:

2x - 3y = -13

Frequently Asked Questions (FAQs)

1. What if the line equation is given differently, such as in standard form? How do I find the slope?

To find the slope from a standard form equation Ax + By = C, solve for y:

By = -Ax + C

y = (-A / B) x + C / B

The coefficient of x (with a negative sign) is the slope.

2. How do I find the equation of a line if only two points are given?

Calculate the slope using:

m = (y2 - y1) / (x2 - x1)

Then, use point-slope form with either point.

3. Can the line be vertical or horizontal? How does that affect the equation?

- If the line is vertical, the slope is undefined, and the equation is x = constant.

- If the line is horizontal, the slope is zero, and the equation is y = constant.

Conclusion

Finding the equation of a line passing through a specific point and parallel to a given line involves understanding the slope, using the point-slope form, and simplifying the result. In this case, with the point (4, 7) and the line y = 2/3 x + 3/2, the parallel line's equation is y = 2/3 x + 13/3, or in standard form, 2x - 3y = -13. Mastering these steps enhances your ability to handle various problems in coordinate geometry, providing a strong foundation for further mathematical exploration.

Frequently Asked Questions

What is the slope of the line parallel to the given line with equation y = (2/3)x + 3/2, passing through the point (4,7)?

The slope of the given line is 2/3. Since the lines are parallel, the slope of the new line is also 2/3.

How do you find the equation of a line passing through (4,7) and parallel to y = (2/3)x + 3/2?

Use the point-slope form: y - y1 = m(x - x1). Plug in m = 2/3, x1 = 4, y1 = 7 to get y - 7 = (2/3)(x - 4).

What is the equation of the line passing through (4,7) and parallel to y = (2/3)x + 3/2, in slope-intercept form?

Starting from y - 7 = (2/3)(x - 4), simplify to y - 7 = (2/3)x - (8/3), then y = (2/3)x - (8/3) + 7, which simplifies to y = (2/3)x + 13/3.

Can you convert the equation y = (2/3)x + 13/3 into standard form?

Yes. Multiply both sides by 3 to clear denominators: 3y = 2x + 13. Rearranged, it becomes 2x - 3y = -13.

What are some tips for finding the equation of a line parallel to a given line and passing through a specific point?

Identify the slope of the given line, use the point-slope formula with the point and the same slope, then simplify to your preferred form (slope-intercept or standard). Ensure all calculations are correct for accuracy.

Why is it important to remember that parallel lines have the same slope when finding their equations?

Because parallel lines never intersect and have equal slopes, knowing the slope of one line allows you to directly find the equation of any parallel line passing through a given point.

Additional Resources

Find The Equation Of The Line Through Point (4,7) And Parallel To y = (2/3)x + (3/2)

Introduction

Mathematics often involves understanding the relationships between points, lines, and slopes. One common problem in coordinate geometry is to find the equation of a line passing through a specific point and parallel to a given line. This task is fundamental, yet it requires precise application of concepts such as slope calculation, point-slope form, and the properties of parallel lines.

In this detailed investigation, we focus on the problem:

Find the equation of a line passing through the point (4,7) and parallel to the line y = (2/3)x + (3/2).

This problem encapsulates key principles of linear equations and offers an opportunity to explore the step-by-step process involved in deriving the desired line's equation. We will dissect the problem thoroughly, examine the mathematical concepts involved, and provide a comprehensive solution.

Understanding the Given Line and Its Slope

Before formulating the new line, it is essential to analyze the given line:

The Line: y = (2/3)x + (3/2)

This is in the slope-intercept form, y = mx + b, where:

- m is the slope of the line.
- b is the y-intercept.

From the equation:

- Slope (m) = 2/3
- Y-intercept (b) = 3/2

The Concept of Parallel Lines in Coordinate Geometry

Parallel Lines and Their Slopes

Lines that are parallel to each other in a plane will never intersect and have identical slopes. Therefore, the line we seek must have the same slope as the given line:

m_parallel = 2/3

This property is fundamental to solving the problem, as it simplifies the process to finding a line with the same slope passing through a specific point.

Implication for the Problem

The line passing through point (4,7) and parallel to the given line will have:

- Same slope: 2/3
- A point: (4,7)

Deriving the Equation of the Line

Step 1: Use the Point-Slope Form

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

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

Where:

- (x_1, y_1) is a point on the line
- m is the slope

Plugging in the known values:

- $(x_1, y_1) = (4,7)$
- m = 2/3

The equation becomes:

$y - 7 = (2/3)(x - 4)$

Step 2: Simplify to Slope-Intercept Form

Distribute the slope:

$y - 7 = (2/3)x - (2/3)4$

Calculate the second term:

$(2/3)4 = (8/3)$

Add 7 to both sides:

$y = (2/3)x - (8/3) + 7$

Express 7 as a fraction with denominator 3:

$7 = 21/3$

Combine the constants:

- (8/3) + (21/3) = (13/3)

Thus, the equation in slope-intercept form:

y = (2/3)x + (13/3)

Final Equation and Verification

The Equation

The line passing through (4,7) and parallel to y = (2/3)x + (3/2) is:

y = (2/3)x + (13/3)

Verification

- Check if the point (4,7) lies on the line:

Plug x = 4:

y = (2/3)(4) + (13/3) = (8/3) + (13/3) = (21/3) = 7

Yes, the point (4,7) satisfies the equation.

- Check if the slope matches:

The slope is 2/3, the same as the original line, confirming the lines are parallel.

Deep Dive Into Related Concepts

The Significance of Parallel Lines in Geometry

Parallel lines are foundational in Euclidean geometry. They are characterized by:

- Equal slopes in a plane
- Non-intersecting nature, extending infinitely in both directions

Understanding their properties is crucial in fields such as architecture, engineering, and computer graphics, where parallelism impacts design and calculations.

Calculating the Equation of a Line Given Two Points

While our problem specifies a point and a slope, sometimes two points are given, and the slope must be derived:

1. Find the slope using:

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

2. Use the point-slope form with one of the points and the calculated slope.

The Role of Slope-Intercept and Point-Slope Forms

- Slope-intercept form ($y = mx + b$): simplifies understanding the line's steepness and y-intercept.
- Point-slope form: useful when a point and slope are known; easily adaptable to find the slope-intercept form.

Common Mistakes and Clarifications

Mistake 1: Assuming the y-intercept Changes

Since parallel lines have the same slope but generally different y-intercepts, one might mistakenly assume the y-intercept remains the same. Clarification:

- The y-intercept b changes unless the point through which the line passes is also on the original line.

Mistake 2: Confusing the Slope of the Given Line with the New Line

Ensure the slope for the new line matches the original's slope (2/3) exactly, to guarantee parallelism.

Mistake 3: Arithmetic Errors in Simplification

Double-check fraction calculations, especially when combining constants, to avoid errors.

Additional Exercises for Practice

1. Find the equation of a line passing through (2,3) and parallel to $y = -(1/2)x + 4$.
2. Given the line $y = 5x - 7$, determine the equation of the line passing through (-1,2) and parallel to it.
3. Derive the equation of a line perpendicular to $y = (3/4)x + 1$ passing through the point (0,0).

Conclusion

The process of finding a line through a given point and parallel to a specified line hinges on understanding the fundamental properties of slopes and line equations. In this investigation, we confirmed that the key steps involve:

- Extracting the slope from the given line
- Using the point-slope form with the point (4,7)
- Simplifying to the slope-intercept form for clarity

The resulting line equation:

$y = (2/3)x + (13/3)$

satisfies all the conditions, passing through (4,7) and remaining parallel to $y = (2/3)x + (3/2)$. This exercise underscores the importance of precise calculations and a solid grasp of geometric principles in algebraic problem-solving.

Understanding these concepts enhances one's ability to analyze and construct linear functions, which are vital in various scientific and engineering applications.

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