# Line Parallel To Y-1=4(x+3) And Passes Through (4,32)

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Understanding how to find a line parallel to a given line and passing through a specific point is a fundamental concept in coordinate geometry. In this article, we delve into the process of determining such a line, specifically focusing on the line parallel to y - 1 = 4(x + 3) that passes through the point (4, 32). Whether you're a student preparing for exams or a math enthusiast looking to strengthen your skills, this comprehensive guide will walk you through the steps, concepts, and related topics to master this problem.

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# Understanding the Given Line Equation

Before finding a parallel line, it’s crucial to understand the form and characteristics of the given line: y - 1 = 4(x + 3).

## Rewriting in Slope-Intercept Form

The given line is in point-slope form, but to better analyze it, we convert it into slope-intercept form y = mx + b.

1. Starting with the equation: y - 1 = 4(x + 3)
2. Expand the right side: y - 1 = 4x + 12
3. Add 1 to both sides: y = 4x + 13

Result:

- The line has a slope (m) of 4.
- The y-intercept (b) is 13.

## Key Characteristics of the Given Line

- Slope (m): 4
- Y-intercept: (0, 13)
- Line equation: y = 4x + 13

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# Finding a Line Parallel to the Given Line

Since parallel lines have identical slopes, the line we seek must also have a slope of 4.

## Using the Point-Slope Form

The point through which the new line passes is (4, 32). Using the point-slope form:

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

where $(x_1, y_1) = (4, 32)$ and $m = 4$.

Plugging in the values:

$y - 32 = 4(x - 4)$

## Converting to Slope-Intercept Form

1. Expand the right side: $y - 32 = 4x - 16$
2. Add 32 to both sides: $y = 4x - 16 + 32$
3. Simplify: $y = 4x + 16$

Result:

- The equation of the line parallel to $y = 4x + 13$, passing through (4, 32), is $y = 4x + 16$.

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# Summary of the Process

To find a line parallel to a given line and passing through a specific point, follow these steps:

1. Identify the slope of the given line.
2. Use the same slope for the new line.
3. Apply the point-slope form with the known point.
4. Simplify to the slope-intercept form if needed.

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# Additional Examples and Practice Problems

Practicing similar problems solidifies understanding. Here are some examples:

### Example 1: Find a line parallel to $2x - 3y = 6$ passing through (1, 2).

Solution:

- Convert to slope-intercept form: $2x - 3y = 6 \Rightarrow -3y = -2x + 6 \Rightarrow y = (2/3)x - 2$
- Slope: $m = 2/3$
- Equation passing through (1, 2):

$y - 2 = (2/3)(x - 1)$

- Simplify:

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

Answer:

$y = (2/3)x + (4/3)$

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### Practice Problems:

1. Find the equation of a line parallel to $y = -1/2x + 5$ passing through (3, -4).
2. Determine the line parallel to $3x + 4y = 12$ passing through (0, 0).
3. Find the line parallel to $y = 7x - 9$ that passes through (-2, 10).

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## Understanding the Geometry and Applications

Grasping how to find parallel lines has broader applications in various fields, including engineering, architecture, and physics.

### Real-World Applications of Parallel Lines

- Designing roads and railway tracks that run parallel.
- Creating architectural structures with parallel beams or walls.
- Analyzing forces in physics where parallel components are involved.

## Importance in Coordinate Geometry

- Helps in constructing geometric figures.
- Essential in solving problems involving distances between parallel lines.
- Critical for understanding transformations such as translations.

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# Additional Tips for Solving Parallel Line Problems

- Always identify the slope from the given line.
- Remember that the slope remains unchanged for parallel lines.
- Use the point-slope form for ease when passing through a specific point.
- Convert equations into slope-intercept form for better visualization.

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# Conclusion

Finding a line parallel to a given line and passing through a specific point is a fundamental skill in coordinate geometry. By understanding the slope of the original line and applying the point-slope formula, you can easily derive the new line's equation. In our case, the line parallel to y - 1 = 4(x + 3) passing through (4, 32) is y = 4x + 16. Mastery of these techniques enhances problem-solving skills and deepens your understanding of geometric relationships in the coordinate plane.

Whether you're tackling algebra homework, preparing for exams, or applying these concepts in real-world projects, the principles outlined here provide a solid foundation. Keep practicing with different equations and points to strengthen your proficiency in working with parallel lines and coordinate geometry.

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Keywords: line parallel to y - 1 = 4(x + 3), passing through (4, 32), coordinate geometry, slope, point-slope form, slope-intercept form, parallel lines, algebra, math practice

# Frequently Asked Questions

## What is the slope of the line parallel to the given line y - 1 = 4(x + 3)?

The slope of the given line is 4, so the parallel line will also have a slope of 4.

## How do you find the equation of a line parallel to y - 1 = 4(x + 3) passing through (4, 32)?

First, identify the slope as 4, then use point-slope form with point (4, 32): y - 32 = 4(x - 4). Simplify to get the equation.

## What is the equation of the line parallel to y - 1 = 4(x + 3) passing through the point (4, 32)?

The equation is y - 32 = 4(x - 4), which simplifies to y = 4x + 16.

## How do you verify that the line y = 4x + 16 passes through (4, 32)?

Substitute x=4 into y=4x+16: y=4(4)+16=16+16=32. Since y=32 matches the point, it passes through (4, 32).

## What is the significance of the slope being 4 in the context of parallel lines?

Lines with the same slope are parallel; therefore, the new line will be parallel to the original line since both have slope 4.

## Can you write the final equation of the line passing through (4, 32) and parallel to y - 1 = 4(x + 3)?

Yes, the equation is y = 4x + 16.

## What is the general approach to find a parallel line passing through a specific point?

Identify the slope of the original line, then use point-slope form with the given point to write the equation of the parallel line.

# Additional Resources

Line Parallel To y - 1 = 4(x + 3) And Passes Through (4, 32): A Comprehensive Guide to Understanding and Solving the Problem

When approaching problems involving lines in coordinate geometry, understanding how to determine a line parallel to a given line and passing through a specified point is fundamental. The problem "Line parallel to y - 1 = 4(x + 3) and passes through (4, 32)" is a classic example that tests your grasp of the concepts of slope, point-slope form, and the properties of parallel lines. In this detailed guide, we will explore how to interpret the given line, derive the equation of the parallel line passing through a specific point, and analyze the steps involved in solving such problems with clarity and precision.

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Understanding the Given Line: $y - 1 = 4(x + 3)$

Before we can determine a parallel line, it's crucial to understand the nature of the given line. The equation $y - 1 = 4(x + 3)$ is in point-slope form, which can be converted into slope-intercept form for better comprehension.

Converting to Slope-Intercept Form

Starting with the given:

- $y - 1 = 4(x + 3)$

Distribute the 4:

- $y - 1 = 4x + 12$

Add 1 to both sides:

- $y = 4x + 13$

This form clearly shows the slope of the line:

- Slope $(m) = 4$

and the y-intercept:

- (0, 13)

Significance of the Slope

The slope, $m = 4$, indicates that for every one unit increase in x, y increases by four units. This is a steep, positively sloped line. Recognizing the slope allows us to determine any line parallel to it, as parallel lines share the same slope.

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Determining the Equation of the Parallel Line

The core of this problem is to find a line parallel to the given line and passing through the point (4, 32).

Key Properties of Parallel Lines

- Same slope: Parallel lines have identical slopes.
- Different y-intercepts: Since they are distinct lines, they differ in their y-intercepts unless coincident.

Step-by-Step Approach

1. Identify the slope of the given line:

From the previous section, the slope is $m = 4$.

2. Use the point-slope form for the new line:

The point-slope form is:

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

where $(x_1, y_1)$ is the point the line passes through, and m is the slope.

3. Substitute the known values:

- $(x_1, y_1) = (4, 32)$
- $m = 4$

So,

$$y - 32 = 4(x - 4)$$

4. Simplify to slope-intercept form:

$$y - 32 = 4x - 16$$

Add 32 to both sides:

$$y = 4x - 16 + 32$$

$$y = 4x + 16$$

Thus, the equation of the line parallel to $y - 1 = 4(x + 3)$ and passing through (4, 32) is $y = 4x + 16$.

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Verifying the Solution

Verification ensures that the derived line meets the problem's conditions.

- Parallelism: Both lines have slope 4, confirming they are parallel.
- Passes through (4, 32): Plugging $x=4$ into $y=4x+16$:

$$y = 4(4) + 16 = 16 + 16 = 32$$

Which matches the point (4, 32), confirming correctness.

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Visualizing the Lines

Understanding the geometric positioning can reinforce your comprehension.

Graphical Interpretation:

- Original line: $y = 4x + 13$, passing through (0, 13).
- Parallel line: $y = 4x + 16$, passing through (4, 32).

Both lines have the same slope but different y-intercepts, indicating they are parallel and do not intersect.

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Additional Insights and Common Pitfalls

1. Confusing Forms of the Equation

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

Recognizing the form given helps in quick conversion and interpretation.

2. Misidentifying the Slope

Always double-check the slope from the original equation. For example, in $y - 1 = 4(x + 3)$, the slope is directly visible as 4, but in other forms, you may need to manipulate the equation.

3. Forgetting to Verify the Point

After deriving the new line, always substitute the given point to confirm it lies on the line.

4. Parallel vs. Perpendicular Lines

Remember:

- Parallel lines: Same slope.
- Perpendicular lines: Negative reciprocal slopes ($m_1 m_2 = -1$).

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Extending the Concept: Other Related Problems

Problem Variations:

- Line passing through a different point: Use the same approach with new coordinates.
- Perpendicular line to the given line passing through a point: Use negative reciprocal of the slope.
- Finding the intersection point of two lines: Set their equations equal and solve.

Practical Applications:

- Designing roads that run parallel at a fixed distance.
- Engineering structures where components need to be parallel.
- Graphing data trends and creating parallel lines for comparison.

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Summary: Key Takeaways

- Convert equations to a familiar form to identify the slope.
- Use the point-slope form to find the equation of a line passing through a specific point with a known slope.
- Parallel lines share the same slope but differ in their y-intercepts.
- Always verify your solution by substituting the point into the derived equation.
- Recognize the significance of different line forms and their conversions.

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Final Thoughts

Understanding how to find a line parallel to a given line and passing through a specific point is a fundamental skill in coordinate geometry. By following systematic steps—identifying the slope, applying the point-slope form, and verifying your solution—you develop a robust approach to tackling these problems. Whether for academic purposes or practical applications, mastering these concepts enhances your analytical and problem-solving capabilities in mathematics.

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If you want to deepen your understanding of line equations and their properties, consider practicing with various problems involving different forms of lines, slopes, and points. The more you practice, the more intuitive these concepts will become!

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