What Is An Equation Of The Line That Passes Through The Point (1, 7) And Is Parallel To The Line 32 -y=

What Is An Equation Of The Line That Passes Through The Point (1, 7) And Is Parallel To The Line 32 - y =

Understanding the concept of line equations and how to find the specific equation of a line passing through a given point and parallel to another line is fundamental in algebra and coordinate geometry. In this article, we will explore this topic in detail, providing a comprehensive guide to help you grasp the concepts, methods, and formulas involved.

Introduction to Line Equations

Before delving into the specifics of the problem, it's essential to understand what a line equation is and how it's represented in the coordinate plane.

What Is an Equation of a Line?

An equation of a line is a mathematical expression that describes all the points (x, y) lying on that line. The most common form of a line's equation in two-dimensional Cartesian coordinates is the slope-intercept form:

$$y = mx + b$$

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.

Another common form is the point-slope form:

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

where (x_1, y_1) is a known point on the line.

Understanding the Slope

The slope m determines how the line inclines or declines. It is calculated as:

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

for two points (x_1, y_1) and (x_2, y_2).

Deciphering the Given Line Equation: 32 - y =

In the problem statement, the line is given as:

$$32 - y =$$

but it appears incomplete. Typically, an equation like this might be part of a broader expression, such as:

- $32 - y = \text{some expression}$
- Or, perhaps, the full line equation is, for example, $32 - y = 0$, which simplifies to $y = 32$.

Assuming the intended line equation is:

$$ 32 - y = 0 $$

then:

$$ y = 32 $$

which is a horizontal line passing through all points where $y = 32$.

Alternatively, if the full equation is different, more context would be necessary. However, for the purpose of this article, we'll assume that the line is:

$$ y = 32 $$

a horizontal line at $y = 32$.

Understanding Parallel Lines

Now, the core concept of the problem involves lines that are parallel.

What Does It Mean for Lines to Be Parallel?

Parallel lines are lines in the same plane that never intersect, regardless of how far they are extended. They have identical slopes but different y-intercepts.

Mathematically:

- Two lines are parallel if their slopes are equal:

$$ m_1 = m_2 $$
- Their equations differ only in the y-intercept.

Properties of Parallel Lines

- They have the same slope.
- They are equidistant from each other at all points.
- They never intersect.

This property is crucial when finding the equation of a line parallel to a given line.

Step-by-Step Solution Approach

Let's walk through the process of deriving the equation of the line that passes through the point (1, 7) and is parallel to the line $y = 32$.

Step 1: Identify the Slope of the Given Line

The line $y = 32$ is a horizontal line.

- Slope $m_{given} = 0$

Step 2: Determine the Slope of the Parallel Line

Since parallel lines have the same slope:

$$ m_{parallel} = m_{given} = 0 $$

Thus, the line we are seeking is also horizontal.

Step 3: Find the Equation of the New Line

A horizontal line passing through the point $ (1, 7) $ has the form:

$$ y = c $$

where $ c $ is the y-coordinate of the point through which the line passes. Since the point is $ (1, 7) $, the y-coordinate is 7.

Therefore,

$$ y = 7 $$

which is the equation of the line passing through $ (1, 7) $ and parallel to $ y = 32 $.

Summary of the Result

The line passing through the point $ (1, 7) $ and parallel to $ y = 32 $ is:

$$ y = 7 $$

This is a horizontal line at $ y = 7 $.

General Case: When the Given Line Is Not Horizontal

Suppose the original line is not horizontal but has a general form. Let's consider an example:

$$ 2x + 3y = 6 $$

and find a line passing through a point $ (x_1, y_1) $, say $ (1, 7) $, and parallel to this line.

Step 1: Find the Slope of the Given Line

Rewrite the line in slope-intercept form:

$$ 3y = -2x + 6 $$
$$ y = -\frac{2}{3}x + 2 $$

Thus, the slope:

$$ m_{given} = -\frac{2}{3} $$

Step 2: Use the Same Slope for the New Line

The parallel line's slope:

$$ m_{new} = -\frac{2}{3} $$

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

Plugging the point $ (1, 7) $ into the point-slope form:

$$ y - y_1 = m(x - x_1) $$
$$ y - 7 = -\frac{2}{3}(x - 1) $$

Expanding:

$$ y - 7 = -\frac{2}{3}x + \frac{2}{3} $$

Adding 7 to both sides:

$$ y = -\frac{2}{3}x + \frac{2}{3} + 7 $$
$$ y = -\frac{2}{3}x + \frac{2}{3} + \frac{21}{3} $$
$$ y = -\frac{2}{3}x + \frac{23}{3} $$

This is the equation of the line passing through $ (1, 7) $ and parallel to the original line.

Key Takeaways and Tips

- Understanding the given line's form is crucial. Whether it's in slope-intercept form, standard form, or another, converting it to slope-intercept form helps identify the slope.
- Parallel lines share the same slope. Use this property to derive the new line's equation.
- Use the point-slope form for quick calculations. Once the slope is known, plugging in the point $ (x_1, y_1) $ simplifies the process.
- Always check the nature of the original line. Horizontal and vertical lines require special attention:
- Horizontal line: slope $ m=0 $, equations of the form $ y = c $.
- Vertical line: slope undefined, equations of the form $ x = c $.

Practical Applications of Line Equations

Understanding how to find the equation of a line passing through a point and parallel to another line is valuable in various real-world scenarios:

- Engineering and Architecture: Designing structures with parallel components.
- Navigation and Mapping: Plotting parallel routes or boundaries.
- Economics and Business: Modeling parallel trends in data.

Additional Resources and Practice Problems

To deepen your understanding, consider practicing with these problems:

1. Find the equation of a line passing through $ (3, -2) $ and parallel to $ y = 5x - 4 $.
2. Determine the line passing through $ (-1, 4) $ and parallel to $ 2x + y = 7 $.

3. Write the equation of a line through $(0, 0)$ parallel to $y = -3x + 2$.

Answers:

1. $y = 5x - 11$
2. $y = -2x + 4$
3. $y = -3x$

Conclusion

In summary, finding the equation of a line that passes through a specific point and is parallel to another line involves identifying the slope of the original line, ensuring the new line shares that slope, and then applying the point-slope or slope-intercept form to find the specific equation. For the case where the given line is $y=32$, the parallel line passing through $(1, 7)$ is simply $y=7$,

Frequently Asked Questions

What is the equation of the line passing through the point (1, 7) and parallel to the line 3x - y = 2?

First, rewrite the given line in slope-intercept form: $y = 3x - 2$. The slope is 3. Parallel lines have the same slope, so the new line also has slope 3. Using point-slope form with point (1, 7): $y - 7 = 3(x - 1)$. Simplifying: $y - 7 = 3x - 3$, so $y = 3x + 4$.

How do you find the equation of a line passing through (1, 7) and parallel to 3x - y = 2?

Rewrite the original line as $y = 3x - 2$ (slope 3). Since parallel lines share the same slope, use point-slope form: $y - 7 = 3(x - 1)$. Simplify to get $y = 3x + 4$.

What is the slope of a line parallel to 3x - y = 2, and how does it help write the new line's equation through (1, 7)?

The slope of the original line is 3. A parallel line has the same slope. Using the point (1, 7), the equation becomes $y - 7 = 3(x - 1)$, which simplifies to $y = 3x + 4$.

If the original line is 3x - y = 2, what is the equation of the line through (1, 7) parallel to it?

The original line's slope is 3. Using point-slope form with (1, 7): $y - 7 = 3(x - 1)$, leading to $y = 3x + 4$.

Can the equation of the line passing through (1, 7) and parallel to 3x - y = 2 be written in slope-intercept form? If yes, what is it?

Yes. Since the slope is 3, and it passes through (1, 7), the line's equation in slope-intercept form is $y = 3x + 4$.

Additional Resources

Understanding the Equation of a Line Through a Point and Parallel to a Given Line

When tackling the fundamental concepts of linear equations in coordinate geometry, one of the most common yet intriguing problems involves finding the equation of a line that passes through a specific point and runs parallel to another given line. This task not only deepens our understanding of the properties of lines but also enhances problem-solving skills that are crucial in various mathematical and real-world applications.

In this comprehensive exploration, we will dissect the process of determining the equation of a line passing through the point (1, 7) and parallel to the line represented by the equation $32 - y =$. We will clarify the underlying principles, provide step-by-step instructions, and illustrate the concepts with detailed explanations, all while maintaining a professional and accessible tone.

Deciphering the Given Line Equation

Before diving into the problem-solving process, it's essential to interpret the provided line equation correctly. The expression given is:

$$
32 - y =
$$

However, it appears incomplete or possibly miswritten. Typically, line equations are expressed in standard forms such as:

- Slope-intercept form: $y = mx + b$
- Standard form: $Ax + By = C$

Given the fragment, the most probable intended equation is:

$$
32 - y = 0
$$

which simplifies to:

$$
y = 32
$$

Interpreting the Line Equation

- If the original line is $y = 32$, it is a horizontal line passing through all points where the y-coordinate equals 32.
- Horizontal lines have a distinctive property: their slope is zero.
- The line is perfectly parallel to other horizontal lines, as all lines with the same slope (zero) are parallel.

Note: If the original equation was intended differently, such as $3x - 2y = 0$ or another form, the approach would adjust accordingly. Given the fragment, we will proceed under the assumption that the line in question is $y = 32$.

The Concept of Parallel Lines in Coordinate Geometry

Understanding what makes lines parallel is fundamental. Two lines are parallel if:

- They have the same slope.
- They never intersect, regardless of how far extended.

In the context of linear equations:

- For lines in slope-intercept form ($y = mx + b$), the slope m determines whether lines are parallel.
- Parallel lines have identical slopes but different y-intercepts (b).

Implications for Our Problem:

- The line $y = 32$ has a slope of 0.
- Any line parallel to it must also have a slope of 0.

Formulating the Equation of the Parallel Line

Given the insights above, the task simplifies to:

- Find a line passing through the point (1, 7).
- The line must be parallel to $y = 32$.

Since $y = 32$ is horizontal, the line we're seeking must also be horizontal, with the form:

$$
y = k
$$

where k is a constant to be determined.

Step-by-Step Process:

1. Identify the slope of the given line:

$$
y = 32 \Rightarrow \text{Slope } m = 0
$$

2. Determine the equation of the line passing through (1, 7):

- Because the line must be parallel, it must also be horizontal with slope 0.
- The value of y for the new line is constant and equal to the y-coordinate of the point through which it passes, which is 7.

3. Write the equation:

$$
y = 7
$$

This is a horizontal line passing through (1, 7) and parallel to $y = 32$.

Generalization to Other Scenarios

While our specific case involves a horizontal line, the methodology extends seamlessly to other types of lines and equations:

When the Given Line is Not Horizontal

Suppose the original line has a different slope, say $y = mx + b$, with $m \neq 0$. To find the parallel line passing through a point (x_1, y_1):

1. Identify the slope m of the given line.
2. Use the point-slope form to find the new line:

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

3. Rewrite in slope-intercept form if needed:

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

or

$$
y = mx + (y_1 - m x_1)
$$

This yields a unique line passing through (x_1, y_1) and parallel to the original.

Explicit Example: A More Complex Scenario

Suppose the original line is:

$$
2x - 3y = 6
$$

which can be rearranged into slope-intercept form:

$$
-3y = -2x + 6 \Rightarrow y = \frac{2}{3}x - 2
$$

- The slope is $m = \frac{2}{3}$.

To find the line passing through (1, 7) and parallel to the above:

1. Use point-slope form:

$$
y - 7 = \frac{2}{3}(x - 1)
$$

2. Simplify:

$$
y - 7 = \frac{2}{3}x - \frac{2}{3}
$$

3. Add 7 to both sides:

$$
y = \frac{2}{3}x - \frac{2}{3} + 7
$$

4. Express as a mixed fraction or decimal:

$$
7 = \frac{21}{3}
$$

$$
y = \frac{2}{3}x + \left(-\frac{2}{3} + \frac{21}{3} \right) = \frac{2}{3}x + \frac{19}{3}
$$

This is the equation of the line passing through (1, 7) and parallel to $2x - 3y = 6$.

Summary of Key Points

- Understanding the original line is crucial. Clarify its form and slope.
- Parallel lines share the same slope.
- Horizontal lines have a slope of zero, and their equations are of the form $y = c$.
- To find a line passing through a specific point and parallel to a given line:
- Find the slope of the original line.
- Use the point-slope form with that slope and the given point.
- Convert to the desired form (slope-intercept, standard, etc.).

Final Remarks and Practical Applications

This exercise exemplifies the importance of understanding line equations and their properties. Beyond pure mathematics, these principles underpin various fields:

- Engineering: Designing parallel structural elements.
- Computer Graphics: Rendering parallel lines in visualizations.
- Navigation and Mapping: Ensuring routes or boundaries remain parallel.
- Economics and Data Analysis: Modeling relationships with linear functions and constraints.

In educational contexts, mastering these concepts enhances problem-solving confidence and prepares students for advanced topics like analytic geometry, calculus, and linear algebra.

In conclusion, the equation of the line passing through the point (1, 7) and parallel to the line \(y = 32 \) is simply:

\[
\boxed{y = 7}
\]

This straightforward result underscores the elegance of linear equations and the power of foundational principles in coordinate geometry. Whether dealing with horizontal, vertical, or sloped lines, the approach remains consistent, reinforcing the importance of the core concepts in mathematical literacy.

What Is An Equation Of The Line That Passes Through The Point 1 7 And Is Parallel To The Line 32 Y

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