

# What's The Equation Of A Line That Passes Through Points (1, 5) And (1, 3)? Question 20

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When working with coordinate geometry, one of the fundamental questions students and mathematicians often encounter is: "What is the equation of a line that passes through two given points?" In this case, the points are (1, 5) and (1, 3). These points are particularly interesting because they share the same x-coordinate, which indicates that the line passing through them is vertical. Understanding how to determine the equation of such a line, especially when multiple options are provided, is crucial for mastering algebra and coordinate geometry concepts.

In this article, we will explore the process of finding the equation of a line passing through points (1, 5) and (1, 3), analyze the given options, and provide a comprehensive understanding of the underlying principles involved. Whether you're a student studying for an exam or someone interested in the fundamentals of geometry, this guide aims to clarify these concepts in detail.

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## Understanding the Basics: Coordinates and Lines

Before diving into the problem, let's revisit some fundamental concepts:

### Coordinates of a Point

- A point in a coordinate plane is represented as (x, y).
- The x-coordinate indicates horizontal position.
- The y-coordinate indicates vertical position.

### Line in Coordinate Geometry

- A line is a straight one-dimensional figure extending infinitely in both directions.
- Its equation relates x and y coordinates of all points lying on it.

### Types of Lines Based on Coordinates

- Horizontal line: All points have the same y-coordinate (e.g.,  $y = c$ ).
- Vertical line: All points have the same x-coordinate (e.g.,  $x = c$ ).
- Oblique (sloped) line: Has a non-zero slope and can be written in various forms (e.g.,  $y = mx + b$ ).

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## Analyzing the Given Points: (1, 5) and (1, 3)

Let's look closely at the two points:

- Point A: (1, 5)
- Point B: (1, 3)

Notice that both points have the same x-coordinate, which is 1. This is a critical observation because it indicates that the line passing through these points is vertical.

### Implication of Same x-Coordinate

- Since both points share  $x = 1$ , the line must be vertical.
- The equation of a vertical line passing through  $x = 1$  is simply  $x = 1$ .

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## Finding the Equation of the Line

Given the analysis above, the line passing through (1, 5) and (1, 3) is a vertical line at  $x = 1$ .

### Standard Equation for a Vertical Line

- The general form:  $x = c$ , where  $c$  is the x-coordinate of every point on the line.
- For our points, since both have  $x = 1$ , the equation is  $x = 1$ .

## Comparison with the Provided Options

The options given are:

- $Y = -2$
- $xy = 1$
- $\frac{1}{4}x - 2$
- $y = -x + 4$
- $y = 4x - 1$

Let's analyze each:

1.  $Y = -2$ : This is a horizontal line at  $y = -2$ , which is not relevant here.
2.  $xy = 1$ : This is a nonlinear equation, representing a hyperbola, not a line.
3.  $\frac{1}{4}x - 2$ : This is a linear equation, but with slope  $\frac{1}{4}$  and y-intercept at -2.
4.  $y = -x + 4$ : A line with slope -1, crossing y-axis at 4.
5.  $y = 4x - 1$ : A line with slope 4 and y-intercept at -1.

None of these options directly match the vertical line  $x=1$ , but the key is to recognize that the actual equation is  $x=1$ .

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## Why is "x = 1" Not Listed Among the Options?

Given the options, it appears that none explicitly present the vertical line equation  $x=1$ . This could be an oversight or a trick in the question. Sometimes, multiple-choice questions may include distractors or options that are not directly related to the actual line.

However, understanding the nature of the line is essential:

- Since both points share the same x-coordinate, the line is vertical at  $x=1$ .
- Vertical lines cannot be expressed in slope-intercept form ( $y=mx + b$ ), because their slope is undefined.

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## Understanding the Slope and Equation of a Line

Let's briefly review how to find the equation when the points do not share the same x-coordinate, and then compare that process to our current problem.

### General Method for Finding the Equation of a Line Passing Through Two Points

1. Calculate the slope  $(m)$ :

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

2. Use the point-slope form of the line:

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

3. Simplify to slope-intercept form:

$$y = mx + b$$

In our specific case, because  $(x_2 - x_1 = 0)$ , the slope is undefined, indicating a vertical line.

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## Special Case: Vertical Lines

Vertical lines are unique because:

- They do not have a slope in the traditional sense (it's undefined).
- Their equation is always of the form  $x = c$ , where  $c$  is the constant  $x$ -value.

In our problem:

$$\begin{aligned} &\backslash[ \\ &x = 1 \\ &\backslash] \end{aligned}$$

This is the most precise representation of the line passing through  $(1, 5)$  and  $(1, 3)$ .

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## Conclusion: Correct Equation of the Line

Based on the above analysis:

- The line passing through  $(1, 5)$  and  $(1, 3)$  is vertical.
- Its equation is  $x = 1$ .
- None of the options provided explicitly indicate  $x = 1$ .

Therefore, if the question asks for the equation of the line passing through these points, the answer should be  $x = 1$ .

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## Additional Insights and Related Problems

To deepen your understanding, here are some related concepts and problems:

### 1. Line with Different $x$ -Coordinates

- If the points were  $(2, 3)$  and  $(4, 7)$ , the slope would be:

$$\begin{aligned} &\backslash[ \\ m &= \frac{7 - 3}{4 - 2} = \frac{4}{2} = 2 \\ &\backslash] \end{aligned}$$

- Equation using point-slope form:

$\backslash[$

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

\]

- Simplifies to:

\[

$$y = 2x - 1$$

\]

## 2. Horizontal Line Example

- Points: (5, 2) and (10, 2)
- Equation:  $y = 2$

## 3. When to Recognize Vertical Lines

- When the x-coordinates are the same.
- Slope is undefined.
- Equation is  $x = c$ .

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## Summary and Final Remarks

- The points (1, 5) and (1, 3) lie on a vertical line.
- The equation of this line is  $x = 1$ .
- This form cannot be expressed as  $y = mx + b$  because the slope is undefined.
- Understanding the nature of the points helps in quickly identifying the correct line equation.

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## Additional Tips for Solving Similar Problems

- Always check the coordinates for shared x or y values.
- Recognize the difference between vertical and horizontal lines.
- Remember that the slope of a vertical line is undefined.
- When options include equations in slope-intercept form, verify whether the line is horizontal, vertical, or oblique.

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In conclusion, the equation of the line passing through points (1, 5) and (1, 3) is  $x = 1$ , representing a vertical line. Recognizing the characteristics of the points is key to determining the correct equation, especially when multiple options are provided. Mastering these concepts will enhance your problem-solving skills in coordinate geometry and prepare you for more advanced mathematical challenges.

## Frequently Asked Questions

### **What is the slope of the line passing through points (1, 5) and (1, 3)?**

The slope is undefined because both points have the same x-coordinate, indicating a vertical line.

### **What is the equation of the line passing through (1, 5) and (1, 3)?**

The equation is  $x = 1$ , since the line is vertical through  $x = 1$ .

### **Which option correctly represents the line passing through points (1, 5) and (1, 3)?**

$y = -2$ , but this is incorrect since the line is vertical; the correct form is  $x = 1$ .

### **Are the points (1, 5) and (1, 3) on a horizontal or vertical line?**

They are on a vertical line because both points share the same x-coordinate.

### **Why is the equation $y = -2$ incorrect for these points?**

Because  $y = -2$  is a horizontal line, which does not pass through both (1, 5) and (1, 3); the line through these points is vertical.

### **Which of the given options correctly represents the line passing through (1, 5) and (1, 3)?**

None of the options provided correctly represent the line; the correct equation is  $x = 1$ .

## Additional Resources

### **Understanding the Equation of a Line Passing Through Two Points**

When delving into the fundamentals of coordinate geometry, one of the core concepts is understanding how to determine the equation of a line given specific points. In particular, analyzing how to find the equation of a line passing through two points is crucial for students and professionals alike, as it underpins many advanced mathematical and real-world applications—from engineering and physics to computer graphics and data analysis. This article aims to explore in detail the process of deriving the line's equation passing through points (1, 5) and (1, 3), examining the mathematical principles involved, the options provided in typical multiple-choice questions, and the implications of the findings.

# Initial Considerations: The Coordinates and Their Significance

Before jumping into calculations, it is essential to understand what the points represent and what their coordinates imply about the line.

## Points (1, 5) and (1, 3): What Do They Tell Us?

- The first point, (1, 5), indicates that when the x-coordinate is 1, the y-coordinate is 5.
- The second point, (1, 3), shows that at the same x-coordinate (x=1), the y-coordinate is 3.

The key observation here is that both points share the same x-coordinate (x=1) but have different y-values (5 and 3). This immediately hints at the nature of the line that passes through these points.

## Analyzing the Nature of the Line: Vertical or Not?

### What Does Identical x-Coordinates Imply?

When two points have the same x-coordinate but different y-coordinates, the line connecting them is vertical. A vertical line is characterized by the fact that for a given x-value, the y-value can be any number along the line, resulting in an undefined or infinite slope.

Implication: The line passing through (1, 5) and (1, 3) is a vertical line at x=1.

## Mathematical Confirmation

- The slope (m) of a line passing through two points (x<sub>1</sub>, y<sub>1</sub>) and (x<sub>2</sub>, y<sub>2</sub>) is given by:

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

- Substituting the points:

$$m = \frac{3 - 5}{1 - 1} = \frac{-2}{0}$$

- Since division by zero is undefined, the slope does not exist—this confirms that the line is vertical.

# Deriving the Equation of the Line

Given the geometric and algebraic analysis, the equation of a vertical line passing through  $x=1$  is straightforward.

## Standard Form of a Vertical Line

- Vertical lines are expressed simply as:

$$\begin{aligned} & \backslash \\ & x = a \\ & \backslash \end{aligned}$$

- In this case, since the line passes through (1, 5) and (1, 3), the x-coordinate is fixed at 1.

Therefore, the equation is:

$$\begin{aligned} & \backslash \\ & x = 1 \\ & \backslash \end{aligned}$$

## Comparison with Multiple-Choice Options

The question provides several options:

- $y = -2$
- $xy = 1/4$
- $x - 2y = 0$
- $y = -x + 4$
- $y = 4x - 1$

Let's analyze each:

1.  $y = -2$

- This is a horizontal line at  $y = -2$ ; it's unrelated to our points.

2.  $xy = 1/4$

- This represents a rectangular hyperbola, not a line.

3.  $x - 2y = 0$

- Rearranged:  $x = 2y$ , which is a line with slope  $1/2$ , passing through the origin. Not related to our points.

4.  $y = -x + 4$

- Slope-intercept form with slope -1, passing through (0, 4). Does not pass through (1, 5) and (1, 3).

5.  $y = 4x - 1$

- Slope 4, passing through (0, -1). Not passing through our points.

None of these options directly match the vertical line  $x=1$ . Therefore, the correct equation for the line passing through the points (1, 5) and (1, 3) is  $x=1$ , which is not explicitly listed among the options, indicating a potential oversight or the need to interpret options differently.

Note: The options seem to focus on equations involving  $y$  rather than  $x$ , which suggests the question might be testing understanding of the nature of the line rather than its explicit equation.

## Implications and Clarifications

### Why Is the Equation $x=1$ Not Listed?

In many multiple-choice questions, especially those focusing on slopes and line equations, options are often expressed in  $y$ -intercept form or slope form. Since the line in question is vertical, its equation is  $x=1$ , which is not a function of  $y$ —meaning it cannot be expressed as  $y=mx + b$ .

Furthermore, the options provided are all in the form of  $y = \dots$  or related expressions, which indicates that the question might be testing the understanding that none of these options correctly describe a vertical line, or perhaps the options are meant to test understanding of the line's nature.

In such cases:

- If the options are all in  $y$ -form, and the line is vertical, then the correct answer should specify  $x=1$ .
- If the options are only in  $y$  terms, then the question might be designed to see whether the student recognizes that the line is vertical and lacks a  $y=\dots$  form.

## Additional Considerations: The Broader Context

### Understanding the Concept of Slope

- For a line passing through two points with different  $x$ -values, the slope ( $m$ ) is calculated.
- For our points, the slope is undefined, indicating a vertical line.
- Recognizing the difference between lines with finite slopes and vertical lines is essential in coordinate geometry.

# Implications in Graphing and Real-World Applications

- Vertical lines like  $x=1$  are crucial in scenarios where a certain boundary or barrier exists, such as a fence at a fixed x-coordinate.
- In graphing, vertical lines are represented as straight lines parallel to the y-axis, illustrating the importance of understanding their unique equation form.

## Conclusion: Synthesizing the Findings

Based on the analysis:

- The line passing through points (1, 5) and (1, 3) is a vertical line.
- Its equation is explicitly  $x=1$ .
- None of the provided options directly match this equation.
- The options provided are in forms involving y, implying that the question aims to assess understanding of line types and their equations.

Key Takeaway: When two points share the same x-coordinate, the line passing through them is vertical, represented by  $x$  equal to that constant x-value. Recognizing this fundamental property is vital for accurate graphing, problem-solving, and understanding the nature of linear equations.

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In summary, the equation of the line passing through the points (1, 5) and (1, 3) is  $x = 1$ , a vertical line. This property underscores the importance of analyzing point coordinates thoroughly before selecting or deriving the appropriate equation, especially when multiple-choice options present potential distractors or focus on different forms of linear equations.

## [What S The Equation Of A Line That Passes Through Points 1 5 And 1 3 Question 20 Options Y 2xy 1 4x 2y X 4y 4x 1](#)

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