

Find The Equation Of The Line That Passes Through (0, 2) And (5,2). Then Complete Parts (a) And (b) Below.a.

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Understanding how to find the equation of a line that passes through two points is a fundamental skill in algebra and coordinate geometry. In this article, we will explore the process of determining the equation of the line passing through the points (0, 2) and (5, 2). We will also address the specific parts (a) and (b) that follow, providing a detailed step-by-step explanation to enhance your understanding of line equations, slope calculation, and how to interpret the results in practical scenarios.

Finding the Equation of a Line Through Two Points

Before diving into the specific points (0, 2) and (5, 2), it's essential to understand the general approach to finding a line's equation when two points are given.

Step 1: Determine the Slope (m)

The slope of a line indicates its steepness and direction. It is calculated using the formula:

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

where (x1, y1) and (x2, y2) are the coordinates of the two points.

Step 2: Use Point-Slope Form

Once the slope is known, the equation of the line can be written using the point-slope form:

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

This formula allows you to find the line's equation using one of the known points.

Step 3: Convert to Slope-Intercept or Standard Form

Depending on the context, you might prefer the slope-intercept form ($y = mx + b$) or the standard form ($Ax + By = C$). Conversion involves algebraic manipulation.

Applying the Method to Points (0, 2) and (5, 2)

Let's now apply these steps to the specific points.

Step 1: Calculate the Slope (m)

Given the points:

- $(x_1, y_1) = (0, 2)$
- $(x_2, y_2) = (5, 2)$

Calculate the slope:

$$m = (2 - 2) / (5 - 0) = 0 / 5 = 0$$

This indicates the line is horizontal because the change in y is zero.

Step 2: Write the Equation in Slope-Intercept Form

Since the slope (m) is zero, the line is horizontal and crosses the y-axis at $y = 2$.

The equation of a horizontal line passing through (0, 2):

$$y = 2$$

This is the complete equation of the line passing through the points (0, 2) and (5, 2).

Understanding the Significance of the Line

Equation

The equation $y = 2$ represents a horizontal line crossing the y-axis at 2, extending infinitely in both directions along the x-axis.

Part (a): Interpretation of the Equation

Since the line's slope is zero, it indicates that y remains constant regardless of x . This type of line models situations where the dependent variable (y) does not change with the independent variable (x). Examples include:

- Constant temperature across different locations
- Uniform speed in a straight, level motion
- Fixed price or rate in economic models

Understanding this characteristic helps in identifying the nature of the relationship between variables in various real-world situations.

Part (b): Graphing the Line

To visualize the line $y = 2$:

1. Plot the point $(0, 2)$ on the coordinate plane.
2. Since the line is horizontal, draw a straight line through all points with y-coordinate 2.
3. The line extends infinitely in both directions along the x-axis.
4. Label the line clearly to distinguish it.

This visual representation confirms that the line passes through the points $(0, 2)$ and $(5, 2)$, as well as many other points with $y = 2$.

Additional Tips for Finding Line Equations

Understanding the process of deriving line equations is crucial for solving more complex

problems involving lines and their properties.

1. Recognizing Horizontal and Vertical Lines

- Horizontal lines have a slope of zero and are of the form $y = k$.
- Vertical lines have an undefined slope and are of the form $x = h$.

2. Handling Non-Parallel and Parallel Lines

- Parallel lines have equal slopes.
- Perpendicular lines have slopes that are negative reciprocals.

3. Using Graphing Tools

- Use graph paper or digital graphing tools to visualize the line.
- Plot the points first, then draw the line through them for accuracy.

Practical Applications of Line Equations

Line equations are fundamental in various fields beyond mathematics, including:

- **Physics:** Describing motion with constant velocity
- **Economics:** Modeling fixed rates or constant costs
- **Engineering:** Analyzing structural components and forces
- **Statistics:** Representing relationships between variables

Recognizing the type of line (horizontal, vertical, or sloped) aids in making predictions and understanding relationships between variables.

Summary

In this comprehensive guide, we've demonstrated how to find the equation of the line passing through the points (0, 2) and (5, 2). The key findings include:

- The slope is 0, indicating a horizontal line.
- The equation of the line is $y = 2$.
- This line represents a constant y-value across all x-values.
- Graphically, it is a straight, horizontal line crossing the y-axis at 2.

Understanding these concepts equips you with the tools to analyze and interpret linear relationships effectively, which is essential in many academic and real-world contexts.

If you want to delve deeper into line equations, slope calculations, or related topics, consider exploring additional resources or practicing with various coordinate points to strengthen your skills.

Frequently Asked Questions

What is the slope of the line passing through the points (0, 2) and (5, 2)?

The slope is 0 because both points have the same y-coordinate, indicating a horizontal line.

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

Use the slope formula to find the slope, then apply the point-slope form or slope-intercept form to find the equation.

What is the equation of the line passing through (0, 2) and (5, 2)?

Since the line is horizontal with $y = 2$, its equation is $y = 2$.

What is the significance of the point (0, 2) in the line's equation?

The point (0, 2) is the y-intercept, indicating where the line crosses the y-axis.

How does the point (5, 2) relate to the line's equation?

The point (5, 2) confirms that the line crosses the y-value 2 at $x = 5$, consistent with the equation $y = 2$.

What are the key features of a horizontal line like this one?

A horizontal line has a constant y-value for all x, and its slope is zero.

In Part (a), what is the primary step in finding the equation?

Identify that the line is horizontal and determine the constant y-value from the given points.

In Part (b), how can you verify the equation of the line?

Substitute the given points into the equation $y = 2$ to check if they satisfy it.

What general principle can be applied to find the equation of any line passing through two points with the same y-coordinate?

Any two points with the same y-coordinate define a horizontal line, and its equation is $y =$ that y-value.

Additional Resources

Finding the Equation of a Line Passing Through Two Points

Understanding the fundamentals of coordinate geometry is essential for solving numerous mathematical problems, especially those involving lines and their equations. One of the foundational concepts is determining the equation of a line when given two points through which it passes. This process not only reinforces algebraic skills but also deepens comprehension of the geometric relationships in a coordinate plane. In this article, we will explore how to find the equation of a line passing through the points (0, 2) and (5, 2), analyze its characteristics, and discuss related mathematical principles in detail.

Introduction to the Problem

The problem at hand is to find the equation of a line that passes through two specific points: (0, 2) and (5, 2). These points are given in coordinate form, with each point represented as (x, y). The task involves understanding what it means for a line to pass through these points and how to derive its algebraic equation based on this information.

Significance of the Points

Before proceeding with calculations, it's important to interpret what these points signify:

- Point (0, 2): This point lies on the y-axis at $y=2$ when $x=0$.
- Point (5, 2): This point is located at $x=5$, and importantly, it shares the same y-coordinate as the first point ($y=2$).

The fact that both points have the same y-coordinate immediately suggests that the line passing through them is horizontal. This observation simplifies the process of finding the line's equation because horizontal lines have a straightforward algebraic representation.

Understanding the Concept of a Line in Coordinate Geometry

The General Equation of a Line

In coordinate geometry, the equation of a line can be expressed in several forms, with the most common being:

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

Here, 'm' represents the slope of the line, which indicates its steepness and direction.

Slope of a Line

The slope m between two points (x_1, y_1) and (x_2, y_2) is calculated as:

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

This ratio tells us how much y changes for a unit change in x .

Horizontal and Vertical Lines

- Horizontal lines: Have a slope of 0 because y remains constant regardless of x .
- Vertical lines: Have an undefined slope because x remains constant regardless of y .

In our case, since both points share the same y-coordinate, the line is necessarily horizontal.

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

Step 1: Calculate the Slope

Given points:

- (0, 2)
- (5, 2)

Applying the slope formula:

$$m = (2 - 2) / (5 - 0) = 0 / 5 = 0$$

The slope m is zero, confirming the line is horizontal.

Step 2: Write the Equation in Slope-Intercept Form

Since the slope is zero, the line's equation simplifies to:

$$y = b$$

To find b , substitute one of the points into the equation:

- Using (0, 2):

$$y = b \rightarrow 2 = b$$

Thus, the equation of the line is:

$$y = 2$$

Step 3: Interpret the Equation

The line $y=2$ is a horizontal line crossing the y -axis at 2, extending infinitely to the left and right. It passes through all points where $y=2$, including our given points. The simplicity of this equation reflects the nature of the line's orientation.

Analyzing the Characteristics of the Line

1. Type of Line

The line $y=2$ is a horizontal line. Horizontal lines are characterized by constant y -values across all x -coordinates.

2. Graphical Representation

Graphically, this line runs parallel to the x -axis and crosses the y -axis at 2. It intersects the coordinate plane at every point with $y=2$, regardless of the x -value, which can be any real number.

3. Implications in Geometry

- The line forms a boundary between regions in the plane.
- It is perpendicular to vertical lines.
- Its equation is simple but fundamental in understanding coordinate geometry.

4. Equation in Other Forms

- Standard form: $y - 2 = 0$
- General form: $0x + y - 2 = 0$

5. Real-World Applications

Horizontal lines are often used in real-world contexts, such as representing constant levels (e.g., elevation, temperature), financial thresholds, or other conditions where a constant value applies across a range.

Extending the Analysis: Parts (a) and (b)

In many educational contexts, once the main problem is solved, additional parts often ask for further analysis or application of the line's equation. Although not explicitly provided here, typical extensions might include:

Part (a): Identify the Slope and Confirm the Equation

This involves reiterating the calculation of the slope and confirming the line's equation, which we have already established as $y=2$.

Part (b): Determine the Length of the Segment Between the Two Points

Given the points $(0, 2)$ and $(5, 2)$, find the distance between them.

Calculation:

Distance, d , between points (x_1, y_1) and (x_2, y_2) :

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

Since $y_1=y_2=2$:

$$d = \sqrt{(5 - 0)^2 + (2 - 2)^2} = \sqrt{25 + 0} = \sqrt{25} = 5$$

Thus, the segment length is 5 units.

Additional Considerations

- Line segments vs. lines: The points define a segment of length 5, but the entire line extends infinitely.
- Applications in real-world problems: For example, if these points represent positions along a road or boundary, the segment length could represent physical distance.

Summary and Conclusion

The process of finding the equation of a line passing through two points is foundational in coordinate geometry. In our specific case, the points (0, 2) and (5, 2) lie on a horizontal line, which simplifies the task significantly. The key steps involved calculating the slope, recognizing the special case of a zero slope, and deriving the equation in slope-intercept form as $y=2$.

This line is characterized by its constant y-value, extending infinitely in both directions, and is fundamental in understanding the geometric relationships within the coordinate plane. Its straightforward equation makes it an ideal example for illustrating the concepts of line equations, slopes, and points in a plane.

In broader terms, mastering these techniques enables students and professionals alike to analyze and interpret geometrical data effectively, whether in academic settings, engineering designs, or real-world problem-solving scenarios. The simplicity of the line $y=2$ underscores the elegance and utility of coordinate geometry in translating spatial relationships into algebraic expressions.

Find The Equation Of The Line That Passes Through 0 2 And 5 2 Then Complete Parts A And B Below A

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