The Points (-5,13) And (-2,r) Lie On A Line With Slope -3. Find The Missing Coordinate R.

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Understanding how to find missing coordinates on a line with a given slope is a fundamental skill in coordinate geometry. In this article, we will explore the problem of locating the value of the coordinate R such that the points (-5, 13) and (-2, R) lie on a straight line with a slope of -3. We will break down the problem step-by-step, providing clear explanations and practical examples to help you master this concept.

Understanding the Slope and Its Significance

What Is a Slope?

The slope of a line, often represented by the letter 'm', measures the steepness or incline of the line. It is calculated as the ratio of the vertical change (rise) over the horizontal change (run) between two points on the line.

Mathematically:

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

Where:

- (x_1, y_1) and (x_2, y_2) are two points on the line.

Significance of the Slope Value -3

A slope of -3 indicates that for every unit increase in the x-coordinate, the y-coordinate decreases by 3 units. This negative slope suggests the line descends from left to right.

Understanding the slope helps us formulate the relationship between points on the line and allows us to find missing coordinates when given some points and the slope.

Given Data and the Problem Statement

- Known point A: (-5, 13)
- Unknown point B: (-2, R)

- Slope of the line (m): -3

Our goal is to find the value of R such that both points lie on the same line with a slope of -3.

Applying the Slope Formula to Find R

Step 1: Write the Slope Equation Using the Two Points

Since both points lie on the same line, the slope calculated between them should be equal to -3:

$$
\frac{R - 13}{-2 - (-5)} = -3
$$

Simplify the denominator:

$$
-2 - (-5) = -2 + 5 = 3
$$

So, the equation reduces to:

$$
\frac{R - 13}{3} = -3
$$

Step 2: Solve for R

Multiply both sides of the equation by 3 to isolate R - 13:

$$
R - 13 = -3 \times 3
$$

$$
R - 13 = -9
$$

Add 13 to both sides:

$$
R = -9 + 13
$$

$$
R = 4
$$

Therefore, the missing coordinate R is 4.

Verifying the Solution

Check the Slope Between the Two Points

Using the points (-5, 13) and (-2, 4):

$$
\frac{4 - 13}{-2 - (-5)} = \frac{-9}{3} = -3
$$

Since the calculated slope matches the given slope (-3), the solution is verified.

Real-World Applications of Finding Missing Coordinates on a Line

Understanding how to find missing coordinates is essential in various fields:

- **Engineering:** Designing structures where precise measurements are necessary.
- **Computer Graphics:** Calculating points along a line for rendering images.
- **Navigation:** Determining positions based on known waypoints and routes.
- **Data Analysis:** Filling in missing data points in datasets following a linear trend.

Additional Tips and Tricks for Solving Similar Problems

Use the Slope Formula Carefully

Always double-check your calculations, especially signs and differences, to avoid errors.

Understand the Relationship Between Coordinates and Slope

Remember that the difference in y-coordinates over the difference in x-coordinates gives the slope.

Practice With Different Values

Try solving problems with different known points and slopes to strengthen your understanding.

Summary

In this article, we tackled the problem of finding the missing coordinate R for the points (-5, 13) and (-2, R) lying on a line with slope -3. By applying the slope formula and solving for R, we determined that R equals 4. Remember, understanding the relationship between points, slope, and coordinates is key to mastering coordinate geometry problems. With practice, you'll become proficient at solving similar problems quickly and accurately.

Conclusion

Finding missing coordinates on a line with a given slope is a fundamental skill that combines algebra and geometry. By carefully applying the slope formula and verifying your results, you can confidently solve such problems. Keep practicing with different scenarios to build a strong foundation in coordinate geometry and enhance your problem-solving skills.

Frequently Asked Questions

How do you determine the missing coordinate when two points lie on a line with a given slope?

You use the slope formula ($m = (y_2 - y_1) / (x_2 - x_1)$) and set it equal to the given slope to solve for the missing coordinate.

What is the slope formula used to find the missing coordinate R in this problem?

The slope formula is $m = (y_2 - y_1) / (x_2 - x_1)$. Substituting the known points and slope helps solve for R.

How do you set up the equation to find R given points (-5, 13) and (-2, R) with slope -3?

Using the slope formula: $-3 = (R - 13) / (-2 - (-5))$. Simplify the denominator and solve for R.

What is the first step to find R when the points are (-5, 13) and (-2, R) with slope -3?

Calculate the denominator: $-2 - (-5) = 3$, then set up the equation: $-3 = (R - 13) / 3$.

How do you solve for R after setting up the equation -3 = (R - 13) / 3?

Multiply both sides by 3 to eliminate the denominator: $-3\ 3 = R - 13$, then solve for R by adding 13 to both sides.

What is the value of R after solving the equation for the missing coordinate?

$R = -9$.

Why is it important to verify your solution R = -9 in the context of the slope and points?

Verifying ensures that the calculated R maintains the given slope of -3 between the two points, confirming the solution's correctness.

Additional Resources

The Points (-5,13) And (-2,r) Lie On A Line With Slope -3. Find The Missing Coordinate R.

Understanding the relationship between points on a straight line is fundamental in algebra and coordinate geometry. When two points are known, and the slope of the line passing through them is given, it becomes possible to determine unknown coordinates using basic algebraic principles. In this context, we explore a classic problem where two points, (-5, 13) and (-2, r), are known to lie on a line with a slope of -3. Our task is to find the missing coordinate, r, which completes the pair of coordinates for the second point.

This problem not only underscores the importance of the concept of slope but also illustrates how algebraic techniques help us uncover unknowns in geometric contexts.

Understanding the Basic Concepts: Coordinates and Slope

Before diving into calculations, it's essential to clarify some foundational ideas:

Coordinates of a Point:
A point on the Cartesian plane is represented as an ordered pair (x, y), where x is the horizontal coordinate, and y is the vertical coordinate.

Slope of a Line:
The slope (m) indicates the steepness and direction of a line. It is calculated as the ratio of the vertical change (rise) to the horizontal change (run) between two points:

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

In this problem, the slope is given as -3, meaning the line descends as it moves from left to right.

Setting Up the Problem: Known and Unknown Values

From the problem statement, we know:

- The first point: $(-5, 13)$
- The second point: $(-2, r)$, where r is unknown
- The slope of the line passing through both points: -3

The goal is to find the value of r.

Applying the Slope Formula to Find R

Given two points, the slope formula becomes:

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

Plugging in the known values:

$$ -3 = \frac{r - 13}{-2 - (-5)} $$

Simplify the denominator:

$$ -2 - (-5) = -2 + 5 = 3 $$

So, the equation simplifies to:

$$ -3 = \frac{r - 13}{3} $$

Solving for R: Algebraic Manipulation

To isolate r, follow these steps:

1. Multiply both sides of the equation by 3 to eliminate the denominator:

$$ -3 \times 3 = r - 13 $$

$$ -9 = r - 13 $$

2. Add 13 to both sides to solve for r:

$$-9 + 13 = r$$

$$4 = r$$

Thus, the missing coordinate r is 4.

Verification: Confirming the Solution

To ensure the correctness of the result, we can verify by recalculating the slope with the found value:

- The points are $(-5, 13)$ and $(-2, 4)$.

Calculate the slope:

$$m = \frac{4 - 13}{-2 - (-5)} = \frac{-9}{3} = -3$$

The calculated slope matches the given slope, confirming our solution is correct.

Implications and Applications of the Problem

This problem showcases several key concepts in algebra and geometry:

- Understanding Linear Relationships: It demonstrates how the slope encapsulates the relationship between points on a line and how knowing the slope allows us to find missing coordinates.

- Real-World Applications: Such calculations are fundamental in fields like engineering, physics, computer graphics, and data analysis, where establishing relationships between variables is crucial.

- Educational Significance: It provides a straightforward example for students to practice algebraic manipulation and deepen understanding of the slope-intercept form of a line.

Extending the Concept: Other Related Problems

Once familiar with this type of problem, learners can explore related questions:

- Find the equation of the line passing through two points with a known slope.
Using the point-slope form: $y - y_1 = m(x - x_1)$.

- Determine the missing coordinate given a different slope or point.
Adjust the formula accordingly and solve algebraically.

- Graph the line to visualize the relationship between points.
Plotting helps in understanding the geometric interpretation of the algebraic calculations.

Conclusion: The Power of Algebra in Geometry

The problem of finding the missing coordinate r in the points $(-5, 13)$ and $(-2, r)$ demonstrates the elegance and utility of algebraic methods in solving geometric problems. By understanding the fundamental concept of slope and applying straightforward algebra, we can uncover unknown values with confidence. This approach not only solves specific problems but also reinforces critical thinking skills applicable across various disciplines. As the realm of mathematics continues to underpin technological and scientific advancements, mastering such foundational problems remains essential for students, educators, and professionals alike.

The Points 5 13 And 2 R Lie On A Line With Slope 3 Find The Missing Coordinate R

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