

A Line With Of -10 Passes Through The Points $(4, 8)$ And $(5, R)$ What Is The Valu Of R

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Understanding the relationship between points on a line and the slope of that line is fundamental in coordinate geometry. When given two points through which a line passes, and the slope of that line, you can determine unknown coordinates by applying the slope formula. In this article, we will explore how to find the value of R when a line with a slope of -10 passes through the points $(4, 8)$ and $(5, R)$. We will delve into the concepts of slope, the use of the slope formula, and step-by-step calculations to solve this problem.

Understanding the Problem

Before we compute the value of R , it is essential to understand the components of the problem:

- The line passes through two points: $(4, 8)$ and $(5, R)$.
- The slope (m) of the line is given as -10 .
- The goal: Find the value of R .

This problem combines the concepts of coordinate points, slope calculation, and algebraic manipulation, making it a classic example of applying basic geometry principles.

What Is the Slope of a Line?

Definition of Slope

The slope of a line measures its steepness and is expressed as the ratio of the vertical change to the horizontal change between two points on the line. It is often denoted as 'm' and calculated using the formula:

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

where:

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

Significance of Slope

- A positive slope indicates the line rises from left to right.
- A negative slope indicates the line falls from left to right.
- Zero slope indicates a horizontal line.
- An undefined slope indicates a vertical line.

In our problem, the slope is defined as -10, indicating a line that decreases steeply from left to right.

Applying the Slope Formula to Find R

Given the two points:

$$- P_1 = (4, 8)$$

$$- P_2 = (5, R)$$

and the slope $m = -10$, we can set up the equation:

$$-10 = \frac{R - 8}{5 - 4}$$

Since the denominator $(5 - 4 = 1)$, the equation simplifies to:

$$-10 = R - 8$$

Now, solving for R:

$$R = -10 + 8$$

$$R = -2$$

This straightforward calculation reveals that the value of R is -2.

Step-by-Step Solution Summary

To summarize, here are the steps taken to find R:

1. Identify the points and slope:

- Points: (4, 8) and (5, R)

- Slope: -10

2. Apply the slope formula:

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

3. Substitute known values:

$$\text{[} -10 = \frac{R - 8}{5 - 4} \text{]}$$

4. Simplify the denominator:

$$\text{[} -10 = R - 8 \text{]}$$

5. Solve for R:

$$\text{[} R = -10 + 8 = -2 \text{]}$$

Additional Considerations and Related Concepts

Verifying the Solution

It's good practice to verify the solution by plugging R back into the slope formula:

$$\text{[} m = \frac{-2 - 8}{5 - 4} = \frac{-10}{1} = -10 \text{]}$$

which confirms the slope matches the given value.

Graphical Representation

Plotting the points:

- (4, 8)
- (5, -2)

and drawing the line between them visually demonstrates the steepness corresponding to a slope of -10.

Real-World Applications of Slope Calculations

Understanding how to compute the value of R given the slope and points has practical applications:

- Engineering: Designing roads with specific inclines.
- Economics: Analyzing the rate of change in cost or revenue.
- Physics: Calculating velocity or acceleration from position data.
- Navigation: Plotting courses with known gradients.

Common Mistakes to Avoid

When solving similar problems, be mindful of the following:

- Incorrect order of points: Always ensure the points are correctly assigned as (x_1, y_1) and (x_2, y_2) .

- Misinterpretation of the slope sign: Remember that a negative slope indicates a decreasing line.
- Forgetting to simplify the denominator: In this problem, $(5 - 4 = 1)$, but for other problems, the denominator may be different.
- Neglecting to verify the solution: Always substitute your R back into the formula to confirm.

Conclusion

In summary, given a line passing through points (4, 8) and (5, R) with a slope of -10, the value of R can be precisely calculated using the slope formula. The calculation shows that $R = -2$. This problem exemplifies fundamental principles of coordinate geometry and the importance of understanding slope in analyzing linear relationships. Whether solving academic problems or applying these concepts in real-world situations, mastering the process of determining unknown coordinates through slope calculations is essential for students and professionals alike.

Additional Resources for Learning

- Khan Academy's Coordinate Geometry Lessons:

<https://www.khanacademy.org/math/geometry/line-geometry>

- Mathisfun: Slope of a Line:

<https://www.mathsisfun.com/geometry/slope.html>

- Purplemath's Slope and Equations of Lines:

<https://www.purplemath.com/modules/lines.htm>

By understanding and practicing these concepts, you can confidently solve for unknowns in linear equations and deepen your comprehension of coordinate geometry.

Frequently Asked Questions

What is the general form of the line passing through the points (4, 8) and (5, R)?

The line passing through these points can be expressed using the slope-intercept form $y = mx + c$, where m is the slope and c is the y-intercept, or using the two-point form of a line.

How do you find the value of R if the line has a slope of -10 passing through (4, 8) and (5, R)?

Use the slope formula: $m = (R - 8) / (5 - 4)$. Since the slope is -10, set $(-10) = (R - 8) / 1$, then solve for R: $R - 8 = -10$, so $R = -2$.

What is the value of R for the line with a slope of -10 passing through (4, 8) and (5, R)?

The value of R is -2.

Can you verify the point (4, 8) and (5, -2) lie on the line with slope -10?

Yes. The slope between these points is $(-2 - 8) / (5 - 4) = -10 / 1 = -10$, confirming they lie on the line with slope -10.

What is the equation of the line passing through (4, 8) and (5, R) with $R = -2$?

Using point-slope form: $y - 8 = -10(x - 4)$. Simplifying, $y = -10x + 48 + 8 = -10x + 56$.

Why is the value of R important in understanding the line's equation with a slope of -10 ?

The value of R determines the second point through which the line passes, ensuring the line's equation accurately reflects both points and the given slope.

Additional Resources

A line with slope -10 passes through the points (4, 8) and (5, R). What is the value of R? This question is a classic example of applying the fundamental principles of coordinate geometry, specifically the concept of slope. Understanding how to determine an unknown coordinate based on the slope of a line passing through two points is an essential skill in algebra and analytical geometry. In this article, we will explore the process step-by-step, providing a comprehensive guide to solving such problems, along with insights into the underlying concepts.

Understanding the Problem

At its core, the problem asks us to find the value of R given:

- A line with a slope of -10 .
- The line passes through the known point (4, 8).
- The line also passes through an unknown point (5, R).

The key mathematical concept involved here is the slope of a line, which measures the steepness and direction of the line. The slope (m) between any two points $((x_1, y_1))$ and $((x_2, y_2))$ on a line is given by:

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

Given the slope and the coordinates of one point, we can find the unknown coordinate, in this case, (R) .

Step-by-Step Breakdown

1. Recall the Slope Formula

The general formula for the slope between two points $((x_1, y_1))$ and $((x_2, y_2))$ is:

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

In this scenario:

- $((x_1, y_1) = (4, 8))$
- $((x_2, y_2) = (5, R))$
- $(m = -10)$

2. Set Up the Equation

Plug the known values into the slope formula:

$$\begin{aligned} & \backslash \\ -10 &= \frac{R - 8}{5 - 4} \\ & \backslash \end{aligned}$$

Note that $(x_2 - x_1 = 5 - 4 = 1)$, which simplifies the calculation.

3. Solve for (R)

Since the denominator is 1, the equation reduces to:

$$\begin{aligned} & \backslash \\ -10 &= R - 8 \\ & \backslash \end{aligned}$$

Adding 8 to both sides:

$$\begin{aligned} & \backslash \\ R &= -10 + 8 \\ & \backslash \\ & \backslash \\ R &= -2 \\ & \backslash \end{aligned}$$

Thus, the value of R is -2 .

Additional Insights and Considerations

The Significance of the Slope

The slope of -10 indicates a line that is decreasing steeply, meaning as x increases, y decreases rapidly. This steepness is reflected in the magnitude of the slope, which is 10, a relatively large number in the context of coordinate geometry.

Verifying the Result

It's always good practice to verify your solution:

- Check the slope between the two points:

$$\begin{aligned} \left[\frac{R - 8}{5 - 4} = \frac{-2 - 8}{1} = \frac{-10}{1} = -10 \right] \end{aligned}$$

- Matches the given slope. So, the calculation is correct.

Real-World Applications

Understanding how to find the missing coordinate when given a slope and a point is useful in various fields:

- Physics: Determining the rate of change of a variable.
- Economics: Calculating marginal rates.
- Engineering: Designing lines or trajectories with specified slopes and points.

Common Mistakes to Avoid

- Incorrectly swapping points: Remember that the order of points affects the sign of the slope.
- Forgetting to subtract the coordinates in the numerator and denominator: Always carefully perform the subtraction.
- Ignoring the sign of the slope: A negative slope indicates a decreasing line; ensure this is consistent with your calculations.
- Assuming the points are ordered differently: Confirm which point is which, especially if the problem states points in a specific order.

Summary

To summarize, the problem "A line with slope -10 passes through the points $(4, 8)$ and $(5, R)$. What is the value of R ?" hinges on understanding the slope formula and applying basic algebra to solve for the unknown coordinate. The key steps are:

1. Write the slope formula with known points.
2. Plug in the known values.
3. Simplify and solve for (R) .

The solution reveals that $(R = -2)$. This straightforward approach demonstrates how fundamental concepts in coordinate geometry can be used to solve real-world problems involving lines, slopes, and points. Mastery of these techniques provides a solid foundation for more advanced topics in mathematics and related disciplines.

Final Thoughts

Problems like this highlight the importance of understanding the relationship between coordinates and slopes. Whether you're working on graphing lines, analyzing data trends, or designing geometric

shapes, these principles are foundational. Regular practice with similar problems enhances problem-solving skills and deepens your understanding of the geometry underlying many mathematical concepts.

Remember, the key to success is to systematically approach each problem, verify your calculations, and understand the reasoning behind each step. With these tools, you'll be well-equipped to tackle a wide range of coordinate geometry challenges.

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