

Show Work Pls What Is The Equation In Slope-intercept Form Of The Line That Passes Through The Point

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When working with linear equations, understanding how to find the equation of a line that passes through a specific point is a fundamental skill in algebra. The slope-intercept form of a line, expressed as $y = mx + b$, provides a straightforward way to describe a line using its slope (m) and y-intercept (b). In this article, we will explore how to determine the equation of a line in slope-intercept form given a particular point that the line passes through. We will walk through the step-by-step process, include examples, and clarify common questions to help you master this essential concept.

Understanding the Slope-Intercept Form of a Line

What Is the Slope-Intercept Form?

The slope-intercept form of a linear equation is written as:

$$y = mx + b$$

Where:

- m is the slope of the line — it indicates how steep the line is.
- b is the y-intercept — the point where the line crosses the y-axis.

This form is very useful because it immediately gives you the slope and the y-intercept, making graphing and analyzing the line easier.

Why Is It Important?

Knowing the slope-intercept form allows you to:

- Quickly graph lines.
- Understand how the line behaves based on the slope.
- Find the equation when given a point and the slope.
- Convert from other forms of linear equations.

Finding the Equation of a Line Passing Through a Point

Suppose you are given:

- A point $((x_1, y_1))$ through which the line passes.
- The slope (m) of the line.

The goal is to find the equation of the line in the form $(y = mx + b)$.

Step-by-Step Process

1. Identify the given point and slope.

For example, suppose the point is $((3, 4))$ and the slope is (2) .

2. Use the slope-intercept form as a template.

$$y = mx + b$$

3. Substitute the known point and slope into the equation to find (b) .

Replace (x) with (x_1) , (y) with (y_1) , and (m) with the given slope:

$$y_1 = m x_1 + b$$

Rearranged to solve for (b) :

$$b = y_1 - m x_1$$

4. Calculate (b) .

Plug in the values:

$$b = 4 - (2)(3) = 4 - 6 = -2$$

5. Write the final equation in slope-intercept form.

$$y = 2x - 2$$

This is the equation of the line passing through $((3,4))$ with a slope of 2.

General Formula for the Equation in Slope-Intercept Form

When given a point $((x_1, y_1))$ and slope (m) , the general approach is:

$$\boxed{y = m x + (y_1 - m x_1)}$$

This formula simplifies the process: find the y-intercept (b) by plugging in the known point and slope.

Alternative Approach: Using the Point-Slope Form

Sometimes, it's easier to start with the point-slope form:

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

Once you have this, you can convert it to slope-intercept form:

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

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

The slope-intercept form is then:

$$y = m x + \left(y_1 - m x_1 \right)$$

Example: Equation of a Line Through $((-2, 5))$ with Slope $(\frac{3}{2})$

1. Write the point-slope form:

$$y - 5 = \frac{3}{2} (x + 2)$$

2. Expand:

$$y - 5 = \frac{3}{2}x + 3$$

3. Add 5 to both sides:

$$y = \frac{3}{2}x + 3 + 5$$

$$y = \frac{3}{2}x + 8$$

Thus, the line's equation is:

$$\boxed{y = \frac{3}{2}x + 8}$$

Common Scenarios and Tips

Scenario 1: Given the Point and the Slope

- Use the point-slope form or the direct substitution method described above.
- Always substitute the known point into the slope-intercept formula to find (b) .

Scenario 2: Given Two Points

- When two points are given, first find the slope:

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

- Then choose one point to find (b) , or directly write the equation using the point-slope form.

Scenario 3: The Slope is Unknown

- Sometimes the slope is not given; you may need to calculate it from two points.
- Once the slope is known, proceed to find the equation as outlined.

Summary and Key Takeaways

- The slope-intercept form $(y = mx + b)$ is a powerful way to represent a line.
- To find the line passing through a specific point with a known slope:
 1. Use $(b = y_1 - m x_1)$ to find the y-intercept.
 2. Write the equation as $(y = m x + b)$.
- Alternatively, start with the point-slope form and convert to slope-intercept form.
- Always verify your final equation by plugging in the known point(s).

Additional Tips for Mastery

- Practice with different points and slopes to become comfortable with conversions.
- Remember that if the slope is zero, the line is horizontal: $(y = b)$.
- If the line passes through the origin $((0,0))$, then $(b=0)$, and the equation simplifies to $(y=mx)$.

Conclusion

Finding the equation of a line in slope-intercept form that passes through a given point is a fundamental skill in algebra that combines understanding of slope, intercepts, and algebraic manipulation. By following the step-by-step process—using the point-slope or direct substitution method—you can accurately derive the equation for any line given a point and a slope. Practice these techniques regularly to enhance your proficiency and confidence in solving linear equations.

Remember: When asked to "show work" for the equation, always document each step clearly, including plugging in values, calculating the intercept, and writing the final equation. This approach not only helps in understanding but also demonstrates your mathematical reasoning clearly.

Frequently Asked Questions

What is the general form of the equation in slope-intercept form?

The general form is $y = mx + b$, where m is the slope and b is the y-intercept.

How do I find the slope (m) of a line passing through two points?

You calculate the slope as $m = (y_2 - y_1) / (x_2 - x_1)$, using the coordinates of the two points.

Given a point (x1, y1) and the slope m, how do I write the equation in slope-intercept form?

Use the point-slope form $y - y_1 = m(x - x_1)$, then simplify to $y = m x + (y_1 - m x_1)$ to get the slope-intercept form.

Can you give an example of finding the equation of a line passing through (2, 3) with a slope of 4?

Yes. Using $y = m x + b$ and substituting $y=3$, $x=2$, $m=4$: $3 = 4(2) + b \rightarrow 3 = 8 + b \rightarrow b = -5$. So, the equation is $y = 4x - 5$.

What if I know only one point and the slope; how do I find the equation?

Plug the point and slope into $y = m x + b$ and solve for b : $b = y_1 - m x_1$. Then write the equation as $y = m x + b$.

What is the importance of the y-intercept in the slope-intercept form?

The y-intercept (b) indicates where the line crosses the y-axis, providing a starting point to graph the line.

How do I verify if a point lies on a line given in slope-intercept form?

Substitute the point's x and y coordinates into the equation $y = m x + b$. If both sides are equal, the point is on the line.

What are common mistakes to avoid when writing the equation in slope-intercept form?

Common mistakes include incorrect calculation of the slope, forgetting to solve for the y-intercept, and errors in substituting points into the equation.

Why is understanding the slope-intercept form important in graphing lines?

Because it provides a straightforward way to quickly plot the line using the slope and y-intercept,

making graphing simpler and more accurate.

Additional Resources

Show Work Pls What Is The Equation In Slope-intercept Form Of The Line That Passes Through The Point — if you've ever found yourself stuck on a math problem, especially when asked to find the equation of a line passing through a specific point, you're not alone. This common question can seem straightforward at first glance, but it's essential to understand the underlying concepts to accurately derive the equation in slope-intercept form. In this comprehensive guide, we'll walk through the step-by-step process, clarify key concepts, and provide practical tips to help you confidently solve similar problems.

Understanding the Basics: What Is the Slope-Intercept Form?

Before diving into the process, it's crucial to understand what the slope-intercept form of a line is and why it's used.

Definition

The slope-intercept form of a linear equation is written as:

$$y = mx + b$$

Where:

- m is the slope of the line (how steep it is),
- b is the y-intercept (the point where the line crosses the y-axis).

This form is particularly useful because it directly reveals the line's slope and y-intercept, making graphing and analysis convenient.

Why Use the Slope-Intercept Form?

- It provides an immediate understanding of the line's behavior.
- It makes it easier to graph the line.
- It simplifies the process of writing the equation given the slope and a point.

Key Concepts Needed to Find the Equation

Before solving, ensure you're clear about these foundational ideas:

1. Coordinates of a Point

- The point through which the line passes is given as (x_1, y_1) .
- These are specific values on the coordinate plane.

2. Slope (m)

- The rate of change of y with respect to x.
- Calculated if you have two points or given directly.

3. Deriving the Equation

- Typically, you'd use the point-slope form or the slope formula to find the line's equation passing through a point with a known or unknown slope.

Step-by-Step Guide: How to Find the Equation in Slope-intercept Form

Let's walk through the process systematically.

Step 1: Identify the Given Data

- The point, (x_1, y_1) , through which the line passes.
- The slope m , if given; otherwise, you need to find it.

Example:

Suppose the problem states: "Show work pls what is the equation in slope-intercept form of the line that passes through the point (3, 4) and has a slope of 2."

Step 2: Recall the Point-Slope Formula

The point-slope form is:

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

This form is handy because it directly uses the point and the slope.

Applying to our example:

$$y - 4 = 2(x - 3)$$

Step 3: Convert to Slope-Intercept Form

- Distribute the slope: $y - 4 = 2x - 6$
- Isolate y : $y = 2x - 6 + 4$
- Simplify: $y = 2x - 2$

Result:

The equation in slope-intercept form is $y = 2x - 2$

Alternative Scenario: When Slope Is Unknown

Suppose you're given only the point, (x_1, y_1) , and asked to find the line passing through it with an unknown slope. You'd need additional information (like another point or the slope) to proceed.

Practical Tips for Solving Similar Problems

- Always identify what data is given: point coordinates, slope, or both.
- Use the point-slope form as an initial step when the slope is known.
- Convert to slope-intercept form by distributing and isolating y .
- Check your work by verifying that the point satisfies the final equation.

Real-World Applications of Finding the Equation in Slope-Intercept Form

Understanding how to derive the line's equation has practical implications:

- Business and Economics: Modeling profit or cost functions.
- Science: Describing relationships between variables.
- Engineering: Analyzing linear systems and signals.
- Everyday life: Estimating trends, such as travel time or expenses.

Common Mistakes to Avoid

- Misreading the point or slope: Double-check coordinates and given data.
- Forgetting to distribute: Ensure correct algebraic steps when converting forms.
- Mixing up signs: Be attentive to positive and negative slopes or intercepts.
- Not verifying the point: Plug the point back into the final equation to confirm correctness.

Summary

To summarize, the process of showing work for "what is the equation in slope-intercept form of the line that passes through the point" involves:

1. Recognizing the given point and slope.
2. Applying the point-slope form: $y - y_1 = m(x - x_1)$.
3. Simplifying the equation to slope-intercept form: $y = mx + b$.
4. Verifying your solution by plugging in the point.

Final Thoughts

Mastering how to find the slope-intercept form from a point and slope is fundamental in algebra and beyond. It enhances your understanding of linear relationships and prepares you for more complex topics like systems of equations and linear inequalities. Remember, showing your work clearly not only helps you understand the process but also demonstrates your comprehension to teachers or colleagues.

If you're ever asked, "Show work pls what is the equation in slope-intercept form of the line that passes through the point," follow these steps, stay organized, and you'll confidently arrive at the correct answer every time. Practice with different points and slopes to strengthen your skills, and soon, deriving these equations will become second nature.

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