Use The Equation Of A Line To Identify A Point The Line Passes Through The Slope Of The Line Y-6=2(x-9)

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Understanding the equation of a line is fundamental in algebra and coordinate geometry. Whether you're solving for unknown points, graphing lines, or analyzing geometric relationships, knowing how to interpret and manipulate line equations is essential. In this article, we will explore how to use the equation of a line to identify a point that the line passes through, with a specific focus on the given line: Y - 6 = 2(x - 9). This process involves understanding the structure of the line's equation, converting it into different forms, and applying algebraic techniques to find points that satisfy the equation.

Understanding the Equation of a Line

Before delving into the specifics of the provided line equation, it's important to understand the general forms of a line's equation and what each form represents.

Common Forms of a Line's Equation

There are several standard ways to express the equation of a line:

- **Slope-Intercept Form:** $y = mx + b$
- **Point-Slope Form:** $y - y_1 = m(x - x_1)$
- **Standard Form:** $Ax + By = C$
- **Two-Point Form:** $y - y_1 = ((y_2 - y_1)/(x_2 - x_1))(x - x_1)$

Each form is useful in different contexts. The given equation, Y - 6 = 2(x - 9), is in point-slope form, which directly relates to a specific point on the line and its slope.

Understanding Point-Slope Form

The point-slope form is written as:

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

Where:

- (x_1, y_1) is a known point on the line.
- m is the slope of the line.

In our case:

- $Y - 6 = 2(x - 9)$

This indicates that the line passes through the point (9, 6) and has a slope of 2.

Analyzing the Given Equation: Y - 6 = 2(x - 9)

The primary goal is to find a point that the line passes through, other than the known point (9, 6). To do this, we need to understand the structure of the line's equation fully.

Rewriting the Equation in Slope-Intercept Form

Converting the point-slope form to the slope-intercept form makes it easier to analyze and identify points:

Starting with:

$Y - 6 = 2(x - 9)$

Distribute the 2:

$Y - 6 = 2x - 18$

Add 6 to both sides:

$Y = 2x - 18 + 6$

$Y = 2x - 12$

Now, the slope-intercept form is:

$Y = 2x - 12$

This form clearly shows:

- The slope m = 2
- The y-intercept b = -12

Knowing this, we can now find any point on the line by choosing values for x and calculating Y.

Finding Points on the Line

To identify a point that the line passes through, select a value for x and compute Y:

x	Y = 2x - 12	Point (x, Y)
0	2(0) - 12 = -12	(0, -12)
5	2(5) - 12 = 10 - 12 = -2	(5, -2)
10	2(10) - 12 = 20 - 12 = 8	(10, 8)

Thus, the line passes through the points:

- (0, -12)
- (5, -2)
- (10, 8)

Any of these points satisfy the equation and lie on the line.

Using the Equation to Find Specific Points

Suppose the goal is to find a point other than the initial known point (9,6) that the line passes through. Here’s a step-by-step process:

Step 1: Choose a value for x

Select any value for x that is different from 9 to find a new point.

For example, choose x = 4.

Step 2: Calculate y using the slope-intercept form

Y = 2(4) - 12 = 8 - 12 = -4

Therefore, the point is (4, -4).

Step 3: Verify that the point satisfies the original equation

Substitute x = 4 into the original equation:

Y - 6 = 2(x - 9)

Y - 6 = 2(4 - 9) = 2(-5) = -10

Add 6 to both sides:

Y = -10 + 6 = -4

This confirms the point (4, -4) lies on the line.

General Approach to Using the Equation of a Line to Find Points

The process of identifying points on a line from its equation involves:

1. Rewriting the equation in a convenient form (typically slope-intercept or standard form).
2. Choosing values for x (or y in some cases).
3. Calculating corresponding y (or x) values using the equation.
4. Verifying the points satisfy the original equation.

This method is useful in many contexts, including graphing, solving geometric problems, and understanding the relationships between variables.

Application: Finding a Point on a Line Given in Point-Slope Form

Let's look at a practical example of how to find a point on the line given in point-slope form, such as Y - 6 = 2(x - 9).

Example Problem:

Find an additional point on the line other than the known point (9, 6).

Solution Steps:

1. Choose an arbitrary value for x; for simplicity, select x = 7.
2. Calculate Y using the equation:

   Y - 6 = 2(7 - 9)

   Y - 6 = 2(-2) = -4

   Y = -4 + 6 = 2

3. Thus, the point (7, 2) is on the line.
4. Verify by plugging into the original equation:

   Y - 6 = 2(x - 9)

   2 - 6 = 2(7 - 9)

   -4 = 2(-2) = -4

   Confirmed!

The point (7, 2) lies on the line.

Understanding the Slope and Its Significance

The slope of the line, m = 2, indicates the steepness and direction of the line.

Interpreting the Slope

- Positive slope (like 2) means the line rises as x increases.
- Magnitude of the slope indicates steepness; larger absolute values mean steeper lines.

- In this case, for every 1 unit increase in x, Y increases by 2 units.

Using the Slope to Find Points

Knowing the slope, you can also find points relative to a known point:

- Starting at (9, 6), moving 1 unit right (increase x by 1):

Y = 2(9 + 1) - 12 = 2(10) - 12 = 20 - 12 = 8

Point: (10, 8), which matches our earlier calculation.

- Moving 1 unit left (decrease x by 1):

Y = 2(8) - 12 = 16 - 12 = 4

Point: (8, 4)

This demonstrates how to generate points along the line based on the slope and a known point.

Graphing the Line Using Its Equation

Graphing is an effective way to visualize the line and verify points.

Steps to Graph the Line:

1. Plot the known point (9, 6).
2. Use the slope 2 to find additional points:
    - From (9,6), move 1 unit right to x=10, y=8.
    - From (9,6), move 1 unit left to x=8, y=4.
3. Draw a straight

Frequently Asked Questions

What is the slope of the line given by the equation y - 6 = 2(x - 9)?

The slope of the line is 2.

How do you rewrite the equation y - 6 = 2(x - 9) into slope-intercept form?

Distribute the 2: y - 6 = 2x - 18; then add 6 to both sides: y = 2x - 12.

What is the y-intercept of the line y = 2x - 12?

The y-intercept is -12.

How can you find a point that the line passes through using the equation?

Choose any value for x, then substitute it into y = 2x - 12 to find the corresponding y-coordinate.

What is the point on the line when x = 0?

When x = 0, y = 2(0) - 12 = -12; so the point is (0, -12).

How do you determine if a specific point lies on the line y = 2x - 12?

Substitute the point's x and y values into the equation and check if the equation holds true.

Using the equation y - 6 = 2(x - 9), what point lies on the line when x = 9?

Substitute x = 9: y - 6 = 2(9 - 9) → y - 6 = 0 → y = 6. The point is (9, 6).

How does the point (9, 6) relate to the original equation y - 6 = 2(x - 9)?

It satisfies the equation, so (9, 6) is on the line.

What is the general method to find a point on a line given its equation in point-slope form?

Choose any x-value, then plug it into the equation to find the corresponding y-value, thus identifying a specific point.

Additional Resources

Use The Equation Of A Line To Identify A Point The Line Passes Through The Slope Of The Line Y-6=2(x-9)

Understanding how to use the equation of a line to identify a point the line passes through is a fundamental skill in algebra and coordinate geometry. Whether you're solving for specific points, analyzing linear relationships, or preparing for more advanced topics like calculus or analytic geometry, mastering this process is essential. In this comprehensive guide, we'll explore step-by-step how to interpret the given equation, find key features such as the slope and intercepts, and ultimately identify points that satisfy the line's equation.

Decoding the Equation of the Line

The given line is expressed as:

Y - 6 = 2(x - 9)

At first glance, this looks like the point-slope form of a line. Recognizing the form and understanding its components will facilitate the process of identifying points on the line.

What is the Point-Slope Form?

The point-slope form of a line's equation is:

$Y - Y_1 = m(x - X_1)$

Where:
- (X_1, Y_1) is a specific point on the line.
- m is the slope of the line.

In our problem, the equation $Y - 6 = 2(x - 9)$ matches this form, with:
- $X_1 = 9$
- $Y_1 = 6$
- $m = 2$

Understanding this allows us to interpret the line's characteristics and find points that lie on it.

Step 1: Identify the Slope of the Line

The coefficient 2 in the equation indicates the slope:

$m = 2$

This tells us that for every 1 unit increase in x, y increases by 2 units.

Why is the slope important?

- It defines the steepness and direction of the line.
- It helps in predicting the value of y for a given x.
- It aids in determining points that lie on the line.

Step 2: Find the Coordinates of the Known Point

From the point-slope form, the point $(X_1, Y_1) = (9, 6)$ is explicitly given. This is a point on the line.

Significance:

- The point (9, 6) lies exactly on the line.
- It can serve as a reference point to find additional points.

Step 3: Convert the Equation to Slope-Intercept Form (Optional)

Converting the equation to slope-intercept form $Y = mX + b$ makes it easier to find specific points.

Starting with:

Y - 6 = 2(x - 9)

Distribute the 2:

Y - 6 = 2x - 18

Add 6 to both sides:

Y = 2x - 18 + 6

Simplify:

Y = 2x - 12

Now, the equation is in the form:

Y = 2x - 12

This form makes it straightforward to find points by choosing any x value.

Step 4: Find Points on the Line

Using the slope-intercept form, Y = 2x - 12, we can select various x values and compute corresponding Y values.

List of steps to find points:

1. Choose any x value (preferably integers for simplicity).
2. Substitute x into the equation.
3. Calculate Y.
4. Record the point (x, y).

Example points:

x	Y = 2x - 12	Coordinates (x, y)
0	2(0) - 12 = -12	(0, -12)
3	2(3) - 12 = -6	(3, -6)
6	2(6) - 12 = 0	(6, 0)
9	2(9) - 12 = 6	(9, 6)	(known point)

By selecting different x values, you can generate as many points as needed.

Step 5: Use The Equation To Find Specific Points

Suppose we want to find a point where x = 12:

- Plug into the slope-intercept form:

Y = 2(12) - 12 = 24 - 12 = 12

- Therefore, the point (12, 12) lies on the line.

Similarly, for x = -3:

Y = 2(-3) - 12 = -6 - 12 = -18

- The point (-3, -18) is also on the line.

Step 6: Visualize the Line and Points

Plotting these points on a coordinate plane helps visualize the line's trajectory:

- The line passes through points like (0, -12), (3, -6), (6, 0), (9, 6), (12, 12).
- The slope of 2 indicates the line rises 2 units vertically for each 1 unit horizontally.

Step 7: Confirm the Points Satisfy the Original Equation

To ensure your points are correct, substitute their coordinates back into the original point-slope equation:

Y - 6 = 2(x - 9)

Example: point (0, -12)

- Y - 6 = -12 - 6 = -18
- 2(x - 9) = 2(0 - 9) = 2(-9) = -18

Since both sides equal -18, the point (0, -12) lies on the line.

Repeat this for other points to confirm they satisfy the equation.

Practical Applications and Further Insights

Understanding how to use the equation of a line to identify a point is practical in numerous contexts:

- Graphing lines in coordinate geometry.
- Solving real-world problems involving linear relationships (e.g., distance, speed, cost).
- Analyzing data trends and fitting lines to data points.

Additional tips:

- Always verify points by substituting into the original equation.
- When converting between forms, check your algebra carefully.
- Use the slope to predict or extend the line beyond known points.

Summary

In this guide, we've navigated the process of using the equation of a line to identify a point the line passes through. Starting from recognizing the point-slope form, identifying the slope and a known point, converting to slope-intercept form, and calculating new points, you now have a systematic approach to analyze linear equations.

Remember:

- The point (9, 6) is explicitly on the line.
- The slope m = 2 indicates the line's steepness.
- Any x value can generate a corresponding y to find points on the line.
- Confirm points satisfy the original equation for accuracy.

With these skills, you're well-equipped to interpret linear equations and apply them to various mathematical and real-world scenarios. Practice with different equations to solidify your understanding and become confident in navigating the world of lines and points.

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