Select The Correct Answer. A Linear Function On A Coordinate Plane Passes Through (minus 5, Minus 3),

Select The Correct Answer. A Linear Function On A Coordinate Plane Passes Through (minus 5, minus 3),

Understanding how a linear function behaves on a coordinate plane is fundamental in algebra and coordinate geometry. When given a specific point through which a linear function passes, such as $(-5, -3)$, we can analyze and derive various properties of the line, including its slope, y-intercept, and general equation form. This article aims to provide an in-depth exploration of these concepts, guiding you through the process of selecting correct answers related to linear functions passing through a given point.

Understanding Linear Functions and Their Equations

What Is a Linear Function?

A linear function is a function that graphs as a straight line on the coordinate plane. Its general form is:

$$
y = mx + b
$$

where:

- m is the slope of the line, indicating its steepness and direction.
- b is the y-intercept, the point where the line crosses the y-axis.

Understanding these components is essential for analyzing lines passing through specific points.

Key Properties of Linear Functions

- Slope (m): Determines the rate of change of y with respect to x.
- Y-intercept (b): The value of y when $x=0$.
- Line passes through specific points: This information can be used to find the line's equation.

Analyzing the Point (-5, -3)

What Does Passing Through $(-5, -3)$ Mean?

When a line passes through the point $(-5, -3)$, it means that substituting $x = -5$ into the line's equation will give $y = -3$. This point provides a crucial condition for the line's equation.

Implications for the Line's Equation

Knowing a point on the line allows us to:

- Find the y-intercept if the slope is known.
- Derive the equation using point-slope form if the slope is known.
- Generate possible equations that pass through this point for different slopes.

Finding the Equation of the Line

Using 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 known point on the line, here $(-5, -3)$.

Substituting:

$$
y - (-3) = m(x - (-5))
$$

which simplifies to:

$$
y + 3 = m(x + 5)
$$

This form is useful because it directly incorporates the known point.

Deriving the Slope (m)

To fully specify the line, we need the slope m. Without additional information, such as a second point or slope value, the line's equation can be expressed in terms of m:

$$
y = m(x + 5) - 3
$$

or equivalently,

$$
y = mx + 5m - 3
$$

This equation demonstrates that for any value of m, the line passes through $(-5, -3)$.

Special Cases of the Line

- Vertical Line: If the slope is undefined, then the line is vertical, passing through all points with $x = -5$. Its equation would be:

$$
x = -5
$$

- Horizontal Line: If the slope is zero, then the line is horizontal, crossing all points with $y = -3$. Its equation:

$$
y = -3
$$

Common Questions and Multiple-Choice Scenarios

Question 1: Which of the following equations passes through $(-5, -3)$ with a slope of 2?

- A) $y = 2x + 5$
- B) $y = 2x - 7$

- C) $y = 2x + 3$
- D) $y = 2x - 13$

Answer Explanation:

To verify, substitute $x = -5$ into each:

- Option A: $y = 2(-5) + 5 = -10 + 5 = -5 \neq -3$ (No)
- Option B: $y = 2(-5) - 7 = -10 - 7 = -17 \neq -3$ (No)
- Option C: $y = 2(-5) + 3 = -10 + 3 = -7 \neq -3$ (No)
- Option D: $y = 2(-5) - 13 = -10 - 13 = -23 \neq -3$ (No)

All options are incorrect, illustrating the importance of correctly substituting the point.

Correct Approach: To find the specific line passing through $(-5, -3)$ with a known slope m, use the point-slope form.

General Process for Selecting Correct Answers

Step 1: Identify Known Components

Determine what information is given:

- Is the point specified? (Yes, $(-5, -3)$)
- Is the slope provided? (Sometimes, sometimes not)

Step 2: Use Appropriate Equation Form

Depending on the information:

- Use point-slope form if the slope is known.
- Use slope-intercept form if the slope and y-intercept are known.
- Use the general form to check whether a given equation passes through the point.

Step 3: Substitute and Verify

- Substitute $x = -5$ and $y = -3$ into each candidate equation.

- Confirm which equations satisfy the point.

Step 4: Consider Special Cases

- Vertical lines: $x = -5$
- Horizontal lines: $y = -3$

Practical Applications and Additional Examples

Example 1: Finding the Equation of a Line with a Given Slope

Suppose the slope $m = 4$. Find the equation passing through $(-5, -3)$.

Solution:

Using point-slope form:

$$
y - (-3) = 4(x - (-5))
$$

$$
y + 3 = 4(x + 5)
$$

$$
y + 3 = 4x + 20
$$

$$
y = 4x + 17
$$

This line passes through $(-5, -3)$ and has a slope of 4.

Example 2: Equation of a Horizontal Line Through $(-5, -3)$

Horizontal lines have zero slope:

\[
y = -3
\]

which passes through the point \((-5, -3)\).

Summary and Key Takeaways

- A linear function passing through \((-5, -3)\) can be expressed in various forms, depending on additional information like slope.
- The point \((-5, -3)\) satisfies all lines passing through it, regardless of slope, including special cases like vertical (\(x=-5\)) and horizontal (\(y=-3\)) lines.
- To verify whether a given equation passes through \((-5, -3)\), substitute the point's coordinates into the equation.
- When multiple-choice options are provided, substitution is the key step in selecting the correct answer.

In conclusion, understanding the relationship between a point and the equation of a line is crucial for solving problems involving linear functions on a coordinate plane. Whether you're dealing with a specific slope or exploring all possible lines passing through a point, applying the fundamental principles of algebra and coordinate geometry will guide you to the correct solutions.

Remember: The key to mastering these concepts lies in practicing substitution, understanding the forms of line equations, and recognizing special cases.

Frequently Asked Questions

What is the slope of a linear function passing through the points (-5, -3) and (0, 2)?

The slope is (2 - (-3)) / (0 - (-5)) = (5) / (5) = 1.

Which of the following is the correct equation of a linear function passing through (-5, -3) with a slope of 2?

The equation is y = 2(x + 5) - 3 or y = 2x + 7.

If a linear function passes through (-5, -3), what is the value of

y when x = 0?

Using the point-slope form, y = m(x + 5) - 3. If slope m is known, plug in x=0 to find y.

How do you determine whether a given point lies on the line passing through (-5, -3)?

Substitute the point's coordinates into the line's equation; if the equation holds true, the point lies on the line.

What is the y-intercept of the linear function passing through (-5, -3) if the slope is 1?

Using point-slope form: y + 3 = 1(x + 5). When x=0, y = -3 + 1(0 + 5) = -3 + 5 = 2. So, the y-intercept is 2.

Which best describes the type of function passing through (-5, -3)?

It is a linear function, as it forms a straight line on the coordinate plane.

Additional Resources

Select The Correct Answer. A Linear Function On A Coordinate Plane Passes Through (−5, −3)

Understanding linear functions is fundamental in algebra and coordinate geometry, serving as a cornerstone for more advanced mathematical concepts. When analyzing a linear function that passes through a specific point, such as (−5, −3), students and learners are often tasked with selecting the correct equation or understanding how the point influences the function's graph. This process involves grasping the relationship between points, slope, and the general form of a linear equation. In this article, we will explore the key concepts related to this problem, break down the steps to determine the correct linear function passing through the point (−5, −3), and review common pitfalls to avoid.

Understanding Linear Functions and Their Equations

What Is a Linear Function?

A linear function is a function that graphs as a straight line on the coordinate plane. The general form of a linear equation in two variables, x and y, is:

\[y = mx + b \]

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

This form makes it straightforward to identify key characteristics of the line, such as its steepness and where it intersects the axes.

Key Features of a Linear Function

- Slope (m): Determines the line's steepness and direction.
- Y-intercept (b): The point where the line crosses the y-axis.
- Points on the Line: Any point (x, y) that satisfies the equation.

Knowing these, a common task is to find the equation given a point and a slope, or to verify if a point lies on a particular line.

Given Point (−5, −3): Significance and Usage

The point (−5, −3) provides a specific location through which the line passes. When constructing the equation of a line, this point acts as a critical anchor. To determine the line's equation, one typically needs:

- The point itself (−5, −3),
- The slope of the line (if known).

If the slope is not provided, other information or conditions are necessary to identify the correct equation.

Methods to Find the Correct Linear Function Passing Through (−5, −3)

1. Using the Slope-Intercept Form $y = mx + b$

If the slope m is known, you can substitute the point into the equation to find b:

$$-3 = m \times (-5) + b$$
$$-3 = -5m + b$$
$$b = -3 + 5m$$

Once b is calculated, the equation becomes:

$$ y = mx + (-3 + 5m) $$

This equation is valid for any slope m. To select the correct answer, compare the options provided with this form, substituting the point to verify which matches.

2. Using the Point-Slope Form $y - y_1 = m(x - x_1)$

This form is especially useful when the slope m is known:

$$ y - (-3) = m(x - (-5)) $$
$$ y + 3 = m(x + 5) $$
$$ y = m(x + 5) - 3 $$

Again, substituting different values of m can help identify the correct line.

3. When the Slope Is Unknown

In some problems, the slope isn't given. Instead, multiple options are provided, making the task to pick the line that passes through $(-5, -3)$. You can verify each option by substituting the point into the candidate equations and checking if the equality holds.

Analyzing Multiple Choice Options: Step-by-Step

Suppose you're presented with several options, such as:

a) $y = 2x + 7$
b) $y = -x - 2$
c) $y = 3x + 12$
d) $y = \frac{1}{2}x - 0.5$

To determine which one passes through $(-5, -3)$, follow these steps:

Step 1: Substitute the x-value into each equation

For each option, plug in $x = -5$:

- Option a) $y = 2(-5) + 7 = -10 + 7 = -3$
- Option b) $y = -(-5) - 2 = 5 - 2 = 3$
- Option c) $y = 3(-5) + 12 = -15 + 12 = -3$
- Option d) $y = \frac{1}{2}(-5) - 0.5 = -2.5 - 0.5 = -3$

Step 2: Check if the resulting y-value matches the y-coordinate of the point

- For options a), c), and d), the y-value is −3, matching the point (−5, −3).
- For option b), y = 3, which does not match.

Step 3: Confirm the point satisfies the original equation

Since options a), c), and d) produce y = -3 when x = -5, these are potential correct answers. Further, verify the original point:

- The point (−5, −3) satisfies options a), c), and d):

- For a) $y = 2x + 7$:

$y = 2(-5) + 7 = -10 + 7 = -3$ □

- For c) $y = 3x + 12$:

$y = 3(-5) + 12 = -15 + 12 = -3$ □

- For d) $y = \frac{1}{2}x - 0.5$:

$y = \frac{1}{2}(-5) - 0.5 = -2.5 - 0.5 = -3$ □

If only one answer is expected, additional context or slope information might help narrow it down. Otherwise, multiple options can be correct based on the point passing through the line.

Common Pitfalls and Tips for Selecting the Correct Line

Pitfalls to Avoid:
- Ignoring the given point: Always verify whether the point satisfies the candidate equations.
- Assuming the slope without information: Do not assume slopes; verify with the options.
- Misreading signs or coefficients: Small errors in signs can lead to selecting incorrect options.
- Overlooking multiple correct options: Sometimes, more than one equation passes through the point; clarify the problem's expectations.

Tips:
- Always substitute the point into the candidate equations.
- Use the point-slope form if the slope is known or can be deduced.
- Cross-verify with multiple options if multiple-choice.
- Practice converting between different forms of linear equations to build flexibility.

Features and Pros/Cons of Different Approaches

Point-Slope Form:

Features:
- Useful when the slope is known.
- Directly incorporates a specific point.
- Easy to manipulate into slope-intercept form.

Pros:
- Simplifies the process when slope is given.
- Clear visualization of the line through the point.

Cons:
- Less straightforward if the slope is unknown.

Slope-Intercept Form:

Features:
- Expresses the line directly via slope and y-intercept.
- Suitable when the slope and intercept are known.

Pros:
- Easy to graph once parameters are known.
- Convenient for verifying if a point lies on the line.

Cons:
- Requires calculating the y-intercept when only a point and slope are known.

Verifying Candidate Equations:

Features:
- Involves substitution to test points.
- Useful in multiple-choice scenarios.

Pros:
- Helps quickly eliminate incorrect options.
- Reinforces understanding of the equation's meaning.

Cons:
- Can be tedious with many options if not systematic.

Summary and Final Recommendations

When given a point such as (−5, −3) and asked to select the correct linear function passing through it, the key steps involve understanding the forms of linear equations, substituting the point to verify candidates, and carefully analyzing the options. Always remember to verify the point on each candidate line, especially when multiple options seem plausible.

In conclusion:

- Use the point-slope form if the slope is known.
- Convert to slope-intercept form for easier visualization.
- Substitute the point directly into options to verify correctness.
- Be cautious with signs and coefficients to avoid errors.
- Practice with various problems to build confidence in quickly identifying the correct line.

Mastering this process enhances overall understanding of linear functions and strengthens problem-solving skills in algebra. By adopting a systematic approach, learners can confidently select the correct linear function passing through any given point, such as (−5, −3), and deepen their comprehension of coordinate geometry fundamentals.

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