Select All Of The Given Points In The Coordinate Plane That Lie On The Graph Of The Linear Equation 4x

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Understanding how to identify points that lie on a particular graph is a fundamental aspect of algebra and coordinate geometry. When dealing with linear equations, such as *4x*, it becomes essential to know how to determine whether specific points in the coordinate plane are part of the graph. This process not only enhances problem-solving skills but also deepens comprehension of the relationship between algebraic equations and their geometric representations.

In this article, we will explore the process of selecting points that lie on the graph of the linear equation $y = 4x$. We will discuss the nature of this line, how to test points, and strategies for efficiently identifying the correct points from a list. Whether you're a student preparing for exams or someone interested in mastering coordinate geometry, this detailed guide will provide clarity and practical insights.

Understanding the Linear Equation y = 4x

What Does the Equation y = 4x Represent?

The equation $y = 4x$ describes a straight line in the coordinate plane. It is a linear equation because it can be expressed in the slope-intercept form $y = mx + b$, where m is the slope and b is the y-intercept.

In the case of $y = 4x$, the slope $m = 4$, and the y-intercept $b = 0$. This means:

- The line passes through the origin (0, 0).
- For every unit increase in x, the value of y increases by 4 units.

Characteristics of the Graph of y = 4x

- **Line Type:** Straight line
- **Slope:** 4 (steepness of the line)
- **Y-intercept:** 0 (the line crosses the y-axis at the origin)
- **Direction:** From bottom-left to top-right, indicating a positive slope

How To Determine If A Point Lies On The Graph

Method Overview

To determine whether a point (x, y) lies on the line given by *y = 4x*, you substitute the x-coordinate into the equation and see if the resulting y-value matches the y-coordinate of the point.

Step-by-step process:
1. Take the x-coordinate of the point.
2. Multiply it by 4 (the coefficient of x).
3. Compare the result to the y-coordinate of the point.
4. If both are equal, the point lies on the line; otherwise, it does not.

Example

Suppose you are given the point (2, 8).
- Substitute x = 2 into the equation:
y = 4 2 = 8
- Since y = 8 matches the y-coordinate of the point, (2, 8) lies on the graph.

Conversely, for the point (3, 12):
- Substitute x = 3:
y = 4 3 = 12
- The y-value matches, so (3, 12) also lies on the graph.

If a point is (1, 5):
- Substitute x = 1:
y = 4 1 = 4
- Since 5 ≠ 4, this point does not lie on the line.

Listing Points and Testing Their Inclusion

Sample Points in the Coordinate Plane

Let's consider a list of points that are commonly tested or provided in problems:

- (0, 0)
- (1, 4)
- (-1, -4)
- (2, 8)
- (3, 12)
- (5, 20)
- (-2, -8)
- (4, 16)
- (6, 24)
- (7, 28)
- (1, 5)
- (2, 9)
- (3, 11)

Testing Each Point

Applying the substitution method:

1. (0, 0):
$y = 4\ 0 = 0$ → Lies on the line.

2. (1, 4):
$y = 4\ 1 = 4$ → Lies on the line.

3. (-1, -4):
$y = 4\ (-1) = -4$ → Lies on the line.

4. (2, 8):
$y = 4\ 2 = 8$ → Lies on the line.

5. (3, 12):
$y = 4\ 3 = 12$ → Lies on the line.

6. (5, 20):
$y = 4\ 5 = 20$ → Lies on the line.

7. (-2, -8):
$y = 4\ (-2) = -8$ → Lies on the line.

8. (4, 16):
$y = 4\ 4 = 16$ → Lies on the line.

9. (6, 24):
$y = 4 \; 6 = 24$ → Lies on the line.

10. (7, 28):
$y = 4 \; 7 = 28$ → Lies on the line.

11. (1, 5):
$y = 4 \; 1 = 4$
Since 5 ≠ 4, does not lie on the line.

12. (2, 9):
$y = 4 \; 2 = 8$
9 ≠ 8, not on the line.

13. (3, 11):
$y = 4 \; 3 = 12$
11 ≠ 12, not on the line.

Strategies for Efficiently Selecting Points

Focus on the Equation’s Pattern

Since the equation is y = 4x, the y-values are always four times the x-values. Recognizing this pattern helps quickly eliminate points that don’t fit.

Prioritize Points with Clear x-values

Points with integer x-values are easier to test. For instance, points with x = 0, 1, 2, 3, etc., can be quickly checked.

Use the Graph’s Visualization

Plotting a few points can provide a visual reference, making it easier to see which points align along the line, especially in graph-based questions.

Create a Table for Verification

Constructing a simple table with x-values, calculated y-values, and the given y-values can streamline the testing process.

Point	x	y (given)	y from equation	On the line?
(0, 0)	0	0	40=0	Yes
(1, 4)	1	4	41=4	Yes

(-1, -4)	-1	-4	4(-1)=-4	Yes
(2, 8)	2	8	42=8	Yes
(3, 12)	3	12	43=12	Yes
(5, 20)	5	20	45=20	Yes
(1, 5)	1	5	41=4	No
(2, 9)	2	9	8	No
(3, 11)	3	11	12	No

Additional Considerations and Common Mistakes

Beware of Sign Errors

Ensure correct substitution and multiplication, especially with negative x-values.

Pay Attention to the Equation’s Form

Remember that the equation y = 4x is linear and passes through the origin. Points far from this pattern are unlikely to lie on the line unless explicitly calculated.

Understanding Graph Symmetry

Since y = 4x is symmetric with respect to the origin, points

Frequently Asked Questions

How do you determine which points lie on the graph of the linear equation 4x?

To determine if a point lies on the graph of 4x, substitute the x-coordinate of the point into the equation and see if the resulting y-value matches the point's y-coordinate. Since 4x is a function of x only, points with y equal to 4 times their x-coordinate lie on the graph.

Given the points (1, 4), (2, 8), and (3, 12), which ones lie on the graph of 4x?

All three points—(1, 4), (2, 8), and (3, 12)—lie on the graph of 4x, because their y-values are equal to 4 times their x-values.

What is the general form of points that satisfy the equation y = 4x?

Any point (x, y) where y equals 4 times x lies on the graph of the linear equation y = 4x. For example, (x, 4x) for any real number x.

If a point (x, y) does not satisfy y = 4x, does it lie on the graph?

No, if the y-value of the point does not equal 4 times its x-value, then the point does not lie on the graph of y = 4x.

Can all points with y = 4x be considered solutions to the equation?

Yes, all points where the y-coordinate is exactly 4 times the x-coordinate are solutions and lie on the graph of y = 4x.

How does the graph of y = 4x look in the coordinate plane?

The graph is a straight line passing through the origin with a slope of 4, rising 4 units vertically for every 1 unit moved horizontally.

Are points like (0, 0), (-1, -4), and (2, 8) on the graph of 4x?

Yes, all these points satisfy y = 4x: (0, 0) because 40=0, (-1, -4) because 4(-1)=-4, and (2, 8) because 42=8, so they all lie on the graph.

Additional Resources

Understanding the Problem: Selecting Points on the Graph of the Equation 4x in the Coordinate Plane

When exploring the coordinate plane, one of the fundamental tasks is to identify points that satisfy a given linear equation. The equation in question here is 4x, which is a simple linear function, and the task involves selecting all points from a given list that lie on the graph of this equation. This review will thoroughly analyze what it means for a point to be on the graph of 4x, how to determine it, and how to approach such questions systematically.

Introduction to the Equation 4x and Its Graph

Understanding the nature of the graph of the equation y = 4x is crucial before selecting points. Let’s break down the key elements:

- Linear Equation: The equation y = 4x is linear, representing a straight line on the coordinate plane.
- Slope: The coefficient of x, which is 4, indicates the slope of the line. The slope tells us how steeply the line inclines:
- A slope of 4 means that for every increase of 1 in x, y increases by 4.
- The line rises sharply, reflecting a steep incline.
- Y-intercept: Since the equation is y = 4x, and there is no constant term added, the y-intercept is at (0, 0). This means the line passes through the origin.

Graphically, the line y = 4x is a straight diagonal line passing through the origin with a positive slope. It extends infinitely in both directions, with points lying precisely where the y-coordinate equals 4 times the x-coordinate.

Criteria for a Point to Lie on the Graph of y = 4x

To determine whether a specific point (x, y) lies on the line y = 4x, the fundamental check involves verifying whether the coordinates satisfy the equation:

- Substitute the x and y coordinates into the equation.
- Compare the left-hand side (LHS) and right-hand side (RHS):
- If y = 4x, then the point (x, y) is on the line.
- If y ≠ 4x, then the point does not lie on the line.

Mathematically, for each point (x, y):

> Check if y == 4x

If true, the point is on the graph. If false, it isn't.

Methodical Approach to Selecting Points

When presented with multiple points, the process becomes systematic:

1. List all points for evaluation.
2. For each point, perform the substitution:
- Calculate 4 times the x-value.
- Compare with the y-value.
3. Identify points where y equals 4x exactly.
4. Select all such points as lying on the graph.

This approach ensures accuracy and efficiency, especially when dealing with several points.

Practical Examples and Step-by-Step Analysis

Let’s analyze some example points to illustrate the process:

Example 1: Point (2, 8)

- Calculate 4x: 4 2 = 8
- Compare with y: 8
- Since y = 8, and 4x = 8, the point (2, 8) lies on the graph.

Example 2: Point (0, 0)

- Calculate 4x: 4 0 = 0
- Compare with y: 0
- Since y = 0, and 4x = 0, the point (0, 0) lies on the graph.

Example 3: Point (-1, -4)

- Calculate 4x: 4 (-1) = -4
- Compare with y: -4
- Since y = -4, and 4x = -4, the point (-1, -4) lies on the graph.

Example 4: Point (3, 10)

- Calculate 4x: 4 3 = 12
- Compare with y: 10
- Since y ≠ 12, the point (3, 10) does not lie on the graph.

Example 5: Point (5, 20)

- Calculate 4x: 4 5 = 20
- Compare with y: 20
- Since y = 20, and 4x = 20, the point (5, 20) lies on the graph.

Common Pitfalls and Misconceptions

While the process seems straightforward, learners often encounter misconceptions that can lead to errors:

- Assuming points are on the line without verification: Always substitute to verify.
- Confusing the equation form: Remember that the general form $y = mx + b$ is what you check against. The equation $y = 4x$ has $b = 0$.
- Ignoring negative values: Negative x-values will produce negative y-values, so include them in evaluations.
- Misreading coordinates: Ensure to correctly interpret the x and y values of the point.

Extending the Concept: Points Not Given

In some cases, you will be asked to generate points that lie on $y = 4x$. This involves choosing x-values and calculating corresponding y-values:

- For $x = -2$: $y = 4 (-2) = -8$ → point (-2, -8)
- For $x = 1$: $y = 4 1 = 4$ → point (1, 4)
- For $x = 3.5$: $y = 4 3.5 = 14$ → point (3.5, 14)

This process helps visualize the line and understand the relationship between x and y.

Graphing the Equation y = 4x

Visual representation is a powerful tool:

- Plot the y-intercept at (0, 0).
- Use the slope to find other points:
- From (0, 0), move up 4 units and right 1 unit to reach (1, 4).
- Move down 4 units and left 1 unit to reach (-1, -4).
- Draw a straight line through these points, extending across the coordinate plane.

This visual aids in confirming whether specific points lie on the line.

Applications and Real-World Contexts

Understanding which points lie on the graph of y = 4x has numerous applications:

- Physics: Modeling constant rates of change, such as velocity or acceleration.
- Economics: Representing linear relationships between costs and units produced.
- Engineering: Analyzing relationships between variables in systems.

Being able to select points accurately ensures proper modeling and analysis.

Practice Problems and Practice Strategies

To master this concept, learners should engage with a variety of problems:

- Given a list of points, identify which lie on y = 4x.
- Generate points for the line y = 4x for various x-values.
- Sketch the graph of y = 4x and verify points.
- Create real-world scenarios where this line models a relationship.

Practice tips:

- Always substitute and verify rather than assuming.
- Use graphing tools or plotting by hand for visualization.
- Practice with both positive and negative values.

Summary and Final Thoughts

In conclusion, selecting all points in the coordinate plane that lie on the graph of y = 4x involves understanding the fundamental relationship between x and y, performing substitution, and verifying whether the point satisfies the equation.

Key takeaways include:

- The line y = 4x passes through the origin with a steep slope of 4.
- To check if a point (x, y) lies on this line, verify whether y equals 4 times x.
- Systematic substitution ensures accuracy.

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- Visualizing the line aids in understanding and verification.
- Applying these concepts in real-world contexts enhances comprehension.

Mastering this concept builds a strong foundation in linear functions,
coordinate geometry, and algebraic reasoning, essential skills for further
mathematical learning and practical problem-solving.

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Final note: Always double-check your work when selecting points; small errors
can lead to incorrect conclusions. Developing a habit of verification will
ensure confidence and precision in your mathematical endeavors.
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