In The Graph Below, Line K With Equation Y = -k Makes A 45 Angle With The X- And Y-Axes.Rx: (2, 5) 1.

In The Graph Below, Line K With Equation Y = -k Makes A 45 Angle With The X- And Y-Axes.Rx: (2, 5) 1.

Understanding the geometric and algebraic properties of lines is fundamental in coordinate geometry. In particular, the line described by the equation $y = -k$ that makes a 45° angle with the X- and Y-axes offers an intriguing case for analysis. This article explores the characteristics of such a line, how to determine the value of k when a specific point lies on the line, and the broader implications in mathematical and real-world contexts. We will delve into the concepts step-by-step, providing a comprehensive guide to understanding and solving problems related to this line.

Understanding the Basic Equation: $y = -k$

The equation $y = -k$ represents a horizontal line in the Cartesian plane. Here, k is a constant, and the negative sign indicates the line is positioned below the x-axis when $k > 0$.

Key points:

- Since the equation is $y = \text{constant}$, the line is horizontal.
- All points on this line have the same y-coordinate, equal to $-k$.
- The line is parallel to the X-axis.

However, the problem introduces the condition that the line makes a 45° angle with both the X- and Y-axes, which suggests a more nuanced interpretation.

Interpreting the 45° Angle with the Axes

When a line makes a 45° angle with the axes, it is related to its slope and orientation.

Angles with axes:

- The angle a line makes with the X-axis is called its inclination, often denoted by θ.
- The slope m of a line is related to its angle with the X-axis by $m = \tan \theta$.

Line making a 45° angle:

- If the line makes a 45° angle with the X-axis, then its slope m is $\tan 45° = 1$.
- If it also makes a 45° angle with the Y-axis, which is perpendicular to the X-axis, the interpretation depends on the line's orientation.

Considering the line's slope:

- For a line to form a 45° angle with both axes, it must be symmetrical in some way.
- Typically, a line making a 45° angle with the axes will have a slope of either $+1$ or -1.

Clarification:

- The phrase "makes a 45° angle with the axes" can imply the line's inclination θ is 45°, resulting in $m = \tan 45° = 1$.
- Alternatively, because the line is given as $y = -k$, which is horizontal, the initial statement may refer to the angle between the line and the axes in a different context.

Conclusion:

Given the equation $y = -k$, a horizontal line, it cannot itself make a 45° angle with the axes unless we consider the line's inclination. Therefore, the actual problem likely involves the line's inclination rather than its equation directly.

Deriving the Relationship Between the Line and the 45° Angle

To understand how the line $y = -k$ can make a 45° angle with the axes, we need to consider the slope of the line's inclination.

Step 1: Recognize the slope m of the line

- The slope m of the line is zero since the line is horizontal ($y = \text{constant}$).

Step 2: Angle between the line and the axes

- The angle ϕ that a line makes with the positive X-axis is given by:

$$
\phi = \arctan(m)
$$

- For $m=0$:

$$
\phi=0^\circ
$$

- The angle between the line and the X-axis is 0°, so it does not make a 45° angle with the X-axis.

Step 3: Reinterpretation

Given this, the initial statement may refer to a different line or a different aspect, such as the line's perpendicular or the angle between the line and some other reference.

Clarifying the Role of k and the Point $(2, 5)$

The problem mentions:

- The line $y = -k$ makes a 45° angle with the axes.
- The point $(2, 5)$ lies on the line.
- The notation "1." perhaps indicates this is the first part of a multi-step problem.

Let's analyze these elements systematically.

Step 1: Find k using the point $(2, 5)$.

Since the line is $y = -k$, and the point $(2, 5)$ lies on it:

$$
5 = -k \Rightarrow k = -5
$$

So, the line’s equation is:

$$
y = 5
$$

which is a horizontal line at $y=5$.

Step 2: Check the line's angle with axes

- The line $y=5$ is horizontal, with slope 0.
- The angle it makes with the X-axis is 0°, not 45°.

Reconciling the 45° Condition with the Line Equation

Given the conflicting information, perhaps the problem is about a different line K that is related to the line $y = -k$.

Possible interpretation:

- The line K has the equation $y = -k$.
- It makes a 45° angle with the axes, meaning its inclination θ is 45°, so:

$$
m = \tan 45^\circ = 1
$$

- The general form of such a line could be:

$$
y = x + c
$$

or

$$
y = -x + c
$$

depending on the orientation.

Alternatively:

- The problem may be asking about a line with a negative slope $-k$ that makes a 45° angle with the axes, and passes through a point $(2, 5)$.

Determining the Slope k for the Line Making a 45° Angle

Suppose the line K has the form:

$$
y = m x + c
$$

and makes a 45° angle with the axes.

Step 1: Find the slope m

- To make a 45° angle with the X-axis:

$$
m = \tan 45^\circ = 1
$$

- To make a 45° angle with the Y-axis, which is perpendicular:

$$
\text{angle with Y-axis} = 45^\circ
$$
which implies:

$$
m = -1
$$

since the line would be inclined at 45° in the opposite direction.

Therefore:

- The line making a 45° angle with both axes has slope:

$$
m = \pm 1
$$

Using the Point $(2, 5)$ to Find the Equation

Assuming the slope $m = -1$, because the problem states $y = -k$, and the line has negative slope:

$$
y = -x + c
$$

Plugging in the point $(2, 5)$:

$$
5 = - (2) + c \Rightarrow c = 5 + 2 = 7
$$

So, the line’s equation:

$$
y = -x + 7
$$

Check the slope:

- Slope is -1, which corresponds to a line making a 45° angle with the Y-axis, downward.

Alternatively, if $m=1$:

$$
y = x + c
$$

Plug in $(2, 5)$:

$$
5 = 2 + c \Rightarrow c=3
$$

Equation:

$$
y= x + 3
$$

which makes a 45° angle with the X-axis, inclined upward.

Summary of Key Findings

- The line $y = -k$ is horizontal and has slope 0.
- To make a 45° angle with the axes, the line must have slope ± 1.
- The point $(2, 5)$ lies on the line $y = -x + 7$, which has slope -1.
- The constant k associated with this line is $k = - (\text{coefficient of } x)$, but since the line is not of the form $y = -k$, this indicates the problem may be asking for the line passing through $(2, 5)$ with slope -1.

Conclusion and Practical Implications

This analysis reveals the importance of carefully interpreting the problem statement, especially when dealing with geometric angles and algebra

Frequently Asked Questions

What is the value of 'k' in the line equation Y = -k if it makes a 45-degree angle with the axes?

Since the line makes a 45-degree angle with both axes, the absolute value of the slope is 1, so k = 1.

How does the slope of the line relate to the angle it makes with the axes?

The slope of the line is the tangent of the angle it makes with the x-axis; for 45 degrees, the slope is 1.

Given the point (2, 5) lies on the line Y = -k, how can we determine the value of k?

Substitute the point into the equation: 5 = -k, so k = -5.

Is the line passing through the point (2, 5) with the equation Y = -k consistent with it making a 45-degree angle with axes?

Yes, because with k = -5, the slope is 1, which corresponds to a 45-degree angle.

What is the significance of the point (2, 5) in relation to the line's equation?

It confirms the value of k by satisfying the line's equation, ensuring the line passes through this point.

How do you interpret the negative sign in the equation Y = -k?

It indicates the line has a negative slope if k is positive; however, in this context, it aligns with the slope being 1 when k = -5.

If the line makes a 45-degree angle with the axes, what is its slope?

The slope is 1, since tan(45°) = 1.

What is the relationship between the slope and the angle for lines making equal angles with axes?

For lines making a 45-degree angle with the axes, the slope equals 1 or -1, corresponding to the angles with axes.

How can we verify that the calculated k value correctly describes the line's slope and position?

By substituting the point (2, 5) into Y = -k with k = -5, which satisfies the equation, confirming the line passes through the point.

What is the final equation of the line K passing through (2, 5) and making a 45-degree angle with axes?

The equation is Y = -(-5) or Y = 5, which is a horizontal line; however, since the line makes a 45-degree angle, its slope is 1, so the corrected equation is Y = -X + c, and with the point (2,5), c = 7, so the line is Y = -X + 7.

Additional Resources

In-Depth Analysis of the Graph and Line K with Equation Y = -k: Examining the 45° Inclination with Respect to the Axes

---

Introduction to the Problem

Understanding the geometric and algebraic properties of lines on the coordinate plane is a fundamental aspect of analytic geometry. The given problem involves a line, referred to as Line K, which follows the equation Y = -k and makes a 45° angle with both the x-axis and y-axis. The line passes through the point (2, 5).

This exploration aims to dissect the details of this scenario thoroughly, interpreting the geometric implications, deriving relevant equations, and understanding how the given point influences the line's properties. We will analyze the core concepts involved, including the slope, the angle with axes, and the equation of the line, supported by graphical intuition and algebraic validation.

Understanding the Basic Concepts

What Does the Equation Y = -k Represent?

- The equation Y = -k describes a horizontal line in the coordinate plane.
- The variable k is a constant, so the line's position depends on the value of k.
- The line is parallel to the x-axis, since it has a constant y-value across all x.
- When rewritten as Y = constant, the line's slope is 0.

Implication for the Line's Orientation:

- Horizontal lines with equations like Y = c (where c is a constant) are inclined at 0° with respect to the x-axis.
- These lines do not make any angle other than 0° with the x-axis.
- Consequently, the statement that Line K makes a 45° angle with both axes appears contradictory if

the line is of the form Y = -k.

Clarifying the Geometry: Does Y = -k Fit the 45° Inclination?

Given the standard form, lines of the form Y = -k are horizontal, inclined at 0°. To make sense of the statement that Line K makes a 45° angle with both axes, we need to consider:

- The possibility that the problem refers to the line's slope related to a specific parameter k, which introduces a different form.
- Alternatively, perhaps Line K is not strictly Y = -k, but a line with a slope that results in a 45° inclination, with Y = -k being a part of the general equation.

Possible interpretation:

- The phrase "Line K with Equation Y = -k makes a 45° angle with the X- and Y- axes" suggests that Line K is not necessarily horizontal or vertical, but rather has a slope that causes it to form a 45° angle with both axes.

Key Point:

- A line making a 45° angle with the x-axis has a slope m = tan(45°) = 1.
- Similarly, making a 45° angle with the y-axis (considering the line's inclination from the y-axis) would imply a similar slope or complementary angles.

Reassessing the Equation and the Slope

General Equation of a Line Making a 45° Angle

- The slope m of a line making an angle θ with the x-axis is m = tan(θ).
- For θ = 45°, m = 1.
- The general form of such a line is: Y = mX + c, or Y = X + c.

Inclusion of the Equation Y = -k

- The line Y = -k is horizontal, slope 0, which does not make a 45° angle with axes.
- Therefore, perhaps the problem involves a different form, such as:

Y = mX + c, with m = 1, for a 45° inclination.

- Alternatively, the problem may be describing a line with the form Y = -k that intersects or relates to the line making a 45° angle, with the constant k being linked to the point (2, 5).

Detailed Mathematical Exploration

Step 1: Determining the Slope Corresponding to the 45° Inclination

- Since the line makes a 45° angle with the x-axis, its slope m is:

$$
m = \tan(45^\circ) = 1
$$

- The equation of such a line passing through a point (x_0, y_0) is:

$$
y - y_0 = m(x - x_0)
$$

- Plugging in (2, 5):

$$
y - 5 = 1 \times (x - 2) \Rightarrow y = x + 3
$$

- Therefore, the line L passing through (2, 5) and inclined at 45° has the equation:

$$
y = x + 3
$$

Step 2: Connecting the Line Y = -k to Line L

- The line Y = -k is horizontal with y-intercept at -k.

- To find the relation between Y = -k and y = x + 3, note:

- The horizontal line Y = -k intersects the line y = x + 3 at some point (x, y) where:

$$
y = -k
$$
$$
y = x + 3
$$

- Equating:

$$
-k = x + 3 \Rightarrow x = -k - 3
$$

- The intersection point is:

$$
\left(-k - 3, -k \right)
$$

- Since the line Y = -k is horizontal, the family of such lines are characterized by different k values.

Step 3: Incorporating the Point (2, 5) into the Analysis

- The point (2, 5) lies on the line L with equation y = x + 3, as:

$$
5 = 2 + 3
$$

- Is this point also on Y = -k? For that to be true:

$$
5 = -k \Rightarrow k = -5
$$

- The horizontal line Y = -k that passes through (2, 5) is:

$$
y = 5
$$

which corresponds to k = -5.

- But, the problem states that Line K with equation Y = -k makes a 45° angle with the axes. Given that Y = -k is horizontal, it cannot make a 45° angle with the axes unless k is such that the line is not horizontal.

Reconciling the Contradictions: Possible Clarifications

Given the initial statement, there are two main interpretations:

Interpretation 1: The line is not strictly Y = -k

- The line Line K may have an equation of the form:

$$
y = mx + c
$$

with m = ±1 (since 45° inclination), and passing through (2, 5).

- The mention of Y = -k could be a specific case or an auxiliary line, perhaps representing the y-intercept form.

Interpretation 2: The line is inclined at 45°, and Y = -k represents a family of horizontal lines that intersect with the inclined line at some point.

Deriving the Equation of Line K Based on the 45° Inclination

Given:

- The line Line K makes a 45° angle with both axes.
- It passes through (2, 5).
- The slope m = 1.

Equation of Line K:

$$
y - y_0 = m (x - x_0)
$$

$$
\Rightarrow y - 5 = 1 (x - 2)
$$

$$
\Rightarrow y = x + 3
$$

This line is inclined at 45°, passing through the point (2, 5).

Analyzing the Relationship Between Line K and Y = -k

When is the line Y = -k relevant?

- It can represent any horizontal line at y = -k.
- The point of intersection with Line K is at:

$$
x = -k - 3
$$

- The specific k for the line Y = -k that passes through (2, 5) is:

$$
5 = -k \Rightarrow k = -5
$$

- For k = -5, the horizontal line is:

$$
Y = 5
$$

which

In The Graph Below Line K With Equation Y K Makes A 45 Angle With The X And Y Axes Rx 2 5 1

In The Graph Below Line K With Equation Y K Makes A 45 Angle With The X And Y Axes Rx 2 5 1

Related Articles

- In The Major Course Requirement In A Math Department, A Student Needs To Choose One Each From Algebra,
- Harriet Needs To Ship A Small Vase. The Box She Will Use Has A Volume Of 216 Cubic Inches. If The Side
- Fifty Rounds Of A New Type Of Ammunition Were Fired From A Test Weapon, And The Muzzle Velocity Of The

Back to Home