Find The Distance Between (-2, 3) And (4, -5)A. -10 B. 10 C. -2 D. 2

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Understanding how to calculate the distance between two points on the coordinate plane is a fundamental skill in mathematics, especially in geometry and algebra. Whether you're a student preparing for an exam or someone working with spatial data, mastering this concept can significantly enhance your problem-solving abilities. In this article, we will explore the method to find the distance between the points (-2, 3) and (4, -5), discuss the significance of such calculations, and address common questions related to this topic.

Introduction to the Distance Formula

The distance formula is derived from the Pythagorean theorem, which relates the lengths of the sides of a right triangle. When given two points in a coordinate plane, their positions can be represented as (x_1, y_1) and (x_2, y_2). The goal is to find the straight-line distance between these points, often called the Euclidean distance.

The distance d between the points (x_1, y_1) and (x_2, y_2) is given by the formula:

$$
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}
$$

This formula essentially measures how far apart the points are along the x-axis and y-axis, then combines these differences using the Pythagorean theorem to find the direct distance.

Step-by-Step Calculation for the Given Points

Let's apply the distance formula to the specific points provided:

- Point A: $(-2, 3)$
- Point B: $(4, -5)$

Step 1: Identify the coordinates

$$
x_1 = -2,\quad y_1 = 3
$$
$$
x_2 = 4,\quad y_2 = -5
$$

Step 2: Compute the differences

$$
\Delta x = x_2 - x_1 = 4 - (-2) = 4 + 2 = 6
$$
$$
\Delta y = y_2 - y_1 = -5 - 3 = -8
$$

Step 3: Square the differences

$$
(\Delta x)^2 = 6^2 = 36
$$
$$
(\Delta y)^2 = (-8)^2 = 64
$$

Step 4: Calculate the sum of squares

$$
36 + 64 = 100
$$

Step 5: Take the square root

$$
d = \sqrt{100} = 10
$$

Thus, the distance between the points $(-2, 3)$ and $(4, -5)$ is 10 units.

Interpreting the Results and Answer Choices

Based on the calculation, the correct answer is:

- B. 10

This matches the result obtained through the direct application of the distance formula.

The other options—-10, -2, and 2—are either negative or incorrect based on the geometric calculation:

- Negative distances are not meaningful in this context because distance is always a non-negative quantity.
- The options -2 and 2 are too small given the coordinate differences.
- The value -10 is simply the negative of the correct distance and does not represent the actual measurement.

Therefore, the correct choice is B. 10.

The Significance of Calculating Distance Between Two Points

Understanding how to calculate the distance between two points has numerous practical applications:

- Navigation and GPS: Determining the shortest route between two locations.
- Computer Graphics: Calculating distances between pixels or objects.
- Robotics: Measuring the proximity of objects in space.
- Physics: Computing displacement vectors.
- Mathematical Proofs: Validating geometric properties and theorems.

Additionally, mastering this calculation enhances spatial reasoning skills and helps in problem-solving across various STEM fields.

Related Concepts and Extensions

Beyond calculating the distance between two points, several related topics extend this fundamental idea:

1. Distance in Different Geometries

While the Euclidean distance is most common, other geometries use different metrics:

- Manhattan Distance: Sum of the absolute differences of the coordinates, used in grid-like paths.

$$
d_{Manhattan} = |x_2 - x_1| + |y_2 - y_1|
$$

- Chebyshev Distance: The maximum of the absolute differences, relevant in chess king moves.

2. Distance in Higher Dimensions

The distance formula generalizes to three or more dimensions:

$$
d = \sqrt{\sum_{i=1}^n (x_{i} - y_{i})^2}
$$

For example, in three dimensions, with points (x_1, y_1, z_1) and (x_2, y_2, z_2), the distance becomes:

$$
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}
$$

3. Applications in Data Science and Machine Learning

Distance calculations underpin clustering algorithms, nearest neighbor searches, and similarity measures in high-dimensional data analysis.

Common Mistakes and Tips for Accurate Calculation

While calculating the distance between points seems straightforward, some common errors can occur:

- Incorrect subtraction: Always subtract the coordinates in the correct order, but since the squares negate any sign issues, the order is less critical for the final distance.
- Neglecting to square differences: Remember to square the differences before summing.
- Ignoring the square root: The final step involves taking the square root to get the actual distance.
- Confusing coordinate labels: Keep track of which coordinate is x and which is y.

Tips for accuracy:

- Write down each step clearly.
- Double-check the differences before squaring.
- Use a calculator for square roots and squares to avoid arithmetic errors.

Summary

Calculating the distance between two points in the coordinate plane involves applying the Euclidean distance formula, which is derived from the Pythagorean theorem. For the points $(-2, 3)$ and $(4, -5)$, the distance is 10 units. This fundamental skill is essential in many areas of mathematics, science, engineering, and technology, providing a basis for understanding spatial relationships and solving real-world problems.

In conclusion, the correct answer to the question is B. 10. Mastery of the distance formula not only helps in academic settings but also in practical applications involving spatial analysis, navigation, and data analysis.

Meta Description: Learn how to calculate the distance between the points (-2, 3) and (4, -5) with step-by-step instructions, understanding the importance of the distance formula, and exploring related concepts in geometry and applied mathematics.

Frequently Asked Questions

What is the distance between the points (-2, 3) and (4, -5)?

The distance is 10.

Which option correctly represents the distance between (-2, 3) and (4, -5)?

Option B. 10

How do you calculate the distance between two points in a coordinate plane?

Use the distance formula: $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$.

Calculate the distance between (-2, 3) and (4, -5).

$\sqrt{[(4 - (-2))^2 + (-5 - 3)^2]} = \sqrt{[(6)^2 + (-8)^2]} = \sqrt{(36 + 64)} = \sqrt{100} = 10$.

Is the distance between (-2, 3) and (4, -5) positive or negative?

It is positive, specifically 10.

What is the value of (4 - (-2))?

It is 6.

What is the value of (-5 - 3)?

-8.

Why is the answer 10 and not a negative number?

Distance is always a positive value, representing the length between points.

Which option incorrectly lists the distance as -10?

Option A. -10

What is the correct choice for the distance between the two

points?

Option B. 10

Additional Resources

Find The Distance Between (-2, 3) And (4, -5) is a fundamental problem in coordinate geometry that often appears in high school math curricula and standardized tests. Understanding how to determine the distance between two points on the Cartesian plane is essential not only for academic purposes but also for practical applications in fields such as engineering, navigation, and computer graphics. In this guide, we will explore the step-by-step process to accurately find the distance between the points (-2, 3) and (4, -5), clarify common misconceptions, and provide a clear explanation suitable for learners at various levels.

Understanding the Distance Formula

Before diving into the calculations, it’s important to grasp the underlying concept behind the distance formula. The distance between two points in a plane is essentially the length of the straight line segment connecting them. This length can be calculated using the Pythagorean theorem, which relates the sides of a right triangle.

The Distance Formula:

Given two points, (x_1, y_1) and (x_2, y_2), the distance d between them is:

$$
d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}
$$

This formula derives from the Pythagorean theorem, where the differences in x-coordinates and y-coordinates form the two legs of a right triangle, and the distance is the hypotenuse.

Step-by-Step Guide to Find the Distance

Let's apply the distance formula to our specific points: (-2, 3) and (4, -5).

1. Identify the Coordinates:

- Point 1: $(x_1, y_1) = (-2, 3)$
- Point 2: $(x_2, y_2) = (4, -5)$

2. Calculate the Differences:

- Difference in x-coordinates: $x_2 - x_1 = 4 - (-2) = 4 + 2 = 6$
- Difference in y-coordinates: $y_2 - y_1 = -5 - 3 = -8$

Notice how subtracting negative numbers effectively adds, which is a common source of confusion. Always be careful with signs.

3. Square the Differences:

- $(x_2 - x_1)^2 = 6^2 = 36$
- $(y_2 - y_1)^2 = (-8)^2 = 64$

Squaring eliminates any negative signs and ensures the distance is positive, aligning with the fact that distance cannot be negative.

4. Sum the Squares:

$$
36 + 64 = 100
$$

5. Take the Square Root:

$$
d = \sqrt{100} = 10
$$

Final Answer

The distance between the points (-2, 3) and (4, -5) is 10 units.

Common Misconceptions and Clarifications

While the calculation appears straightforward, students often encounter pitfalls or misconceptions. Understanding these can help prevent errors:

- Misinterpreting the differences: Remember to subtract the coordinates in the correct order. The formula uses $x_2 - x_1$ and $y_2 - y_1$, but since these differences are squared, the order doesn’t affect the result. Still, for clarity, follow the standard order.
- Forgetting to square the differences: Ensure each difference is squared before summing.
- Neglecting the square root: The final step involves taking the square root of the sum of squares; missing this step leads to incorrect answers.

Practice Problems and Applications

To solidify understanding, try applying the distance formula to other pairs of points, such as:

- $(1, 2)$ and $(4, 6)$
- $(-3, -4)$ and $(0, 0)$

- $(7, 2)$ and $(2, -3)$

In real-world contexts, calculating distances between points is crucial—for example, determining the shortest path between two locations, designing computer graphics, or analyzing spatial data.

Summary of the Multiple-Choice Options

Given the options:

- A. -10
- B. 10
- C. -2
- D. 2

Our calculation shows that the correct answer is B. 10. Distance, being a measure of length, is always non-negative, which aligns with option B.

Final Thoughts

Mastering the technique of finding the distance between two points is a foundational skill in coordinate geometry. It reinforces understanding of the Pythagorean theorem and prepares students for more advanced topics like coordinate transformations, vector analysis, and geometric proofs. Always double-check your calculations, pay attention to signs, and remember that the distance formula is a direct application of a simple yet powerful mathematical principle.

In conclusion, the process of finding the distance between the points (-2, 3) and (4, -5) demonstrates the elegance and utility of coordinate geometry. With a clear understanding of the formula and careful execution, solving such problems becomes both straightforward and rewarding.

Find The Distance Between 2 3 And 4 5 A 10 B 10 C 2 D 2

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