

Given The Coordinates Below, What Is AB? A(-6, - 10) B(2,5) A:5 B:25 C:17 D:7

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Understanding how to determine the length of a segment between two points on a coordinate plane is a fundamental skill in geometry and mathematics. In this article, we will explore the problem of calculating the length of segment AB given the coordinates of points A and B, analyze the provided options, and walk through the step-by-step process to arrive at the correct answer. Whether you're a student preparing for exams or someone interested in coordinate geometry, this comprehensive guide will clarify the concepts involved, provide detailed calculations, and answer common questions related to the topic.

Understanding Coordinates and the Distance Formula

What Are Coordinates in Geometry?

In coordinate geometry, each point in the plane is represented by an ordered pair of numbers, called coordinates. These coordinates specify the point's position relative to two perpendicular axes:

- The x-axis (horizontal axis)
- The y-axis (vertical axis)

A point A with coordinates (x_1, y_1) indicates it is located x_1 units along the x-axis and y_1 units along the y-axis.

For example, in the given problem:

- Point A has coordinates $(-6, -10)$
- Point B has coordinates $(2, 5)$

The Distance Formula

To find the length of the segment AB , we use the distance formula derived from the Pythagorean theorem:

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

\]

Where:

- $((x_1, y_1))$ are the coordinates of point (A)
- $((x_2, y_2))$ are the coordinates of point (B)

This formula calculates the straight-line (Euclidean) distance between two points in the coordinate plane.

Step-by-Step Calculation of AB

Identify Coordinates

Given:

- $(A(-6, -10))$
- $(B(2, 5))$

Compute Differences in Coordinates

Calculate the differences:

- $(\Delta x = x_2 - x_1 = 2 - (-6) = 2 + 6 = 8)$
- $(\Delta y = y_2 - y_1 = 5 - (-10) = 5 + 10 = 15)$

Apply the Distance Formula

Plug into the formula:

$$AB = \sqrt{(8)^2 + (15)^2} = \sqrt{64 + 225} = \sqrt{289}$$

Calculate the Square Root

$$AB = \sqrt{289} = 17$$

Thus, the length of segment $\overline{AB}$ is 17 units.

Analyzing the Multiple-Choice Options

The problem provides the following options:

- A: 5
- B: 25
- C: 17
- D: 7

Based on our calculation, the correct answer is C: 17.

Additional Insights and Related Concepts

Why Is the Distance Formula Important?

The distance formula is fundamental in various fields such as geometry, physics, engineering, and computer graphics. It helps determine lengths, distances between points, and is crucial in proofs and problem-solving involving coordinate planes.

Other Applications of Coordinates and Distance Calculation

- Finding the length of diagonals in polygons
- Calculating the shortest path between two points
- Determining the radius of circles when points are given
- Analyzing geometric figures in coordinate systems

Common Mistakes to Avoid

- Mixing up the coordinates of points A and B
- Forgetting to square the differences
- Not taking the square root after summing squares
- Confusing the order of subtraction (though it doesn't affect the result due to squaring)

Additional Practice Problems

Engaging with similar problems can reinforce understanding. Here are some practice questions:

1. Find the distance between points $C(3, -4)$ and $D(-1, 2)$.
2. Given points $E(0, 0)$ and $F(6, 8)$, what is the length of segment EF ?
3. If point $G(x, y)$ is at $(-3, 7)$ and point $H(4, -2)$, what is the distance between G and H ?

Summary and Key Takeaways

- The coordinates of points are essential in calculating distances in coordinate geometry.
- The distance formula is derived from the Pythagorean theorem and used to find the length of segments between two points.
- For the points $A(-6, -10)$ and $B(2, 5)$, the length of segment AB is 17 units.
- Accurate calculation involves careful handling of differences in x and y coordinates, squaring, summing, and square-rooting.

Conclusion

Understanding how to calculate the distance between two points using their coordinates is a vital skill in mathematics. The problem posed—finding the length of segment AB given specific coordinates—demonstrates how straightforward applying the distance formula can yield an exact answer. Remember, practice is key; working through similar problems will strengthen your grasp of coordinate geometry and prepare you for more complex applications.

Meta Description:

Learn how to calculate the length of segment AB given points $A(-6, -10)$ and $B(2, 5)$. Step-by-step guide to the distance formula, solving multiple-choice options, and related coordinate geometry concepts.

Frequently Asked Questions

What is the distance between points A(-6, -10) and B(2, 5)?

The distance AB is 17 units.

How do you calculate the length of segment AB with the given coordinates?

Use the distance formula: $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$, which gives $\sqrt{(2 - (-6))^2 + (5 - (-10))^2} = \sqrt{8^2 + 15^2} = \sqrt{64 + 225} = \sqrt{289} = 17$.

Which option correctly represents the length of segment AB?

Option C: 17.

Is the distance between points A and B greater than 15?

Yes, the distance is 17, which is greater than 15.

What is the significance of the coordinates given for points A and B?

They are used to calculate the distance between the two points in a coordinate plane.

Can the distance between points A and B be less than 7?

No, the calculated distance is 17, which is greater than 7.

What mathematical concept is used to find AB from the coordinates?

The distance formula derived from the Pythagorean theorem.

If the coordinates of A and B were changed, how would that affect the length of AB?

Changing the coordinates would alter the distance, which would need to be recalculated using the same distance formula.

Why is option C (17) the correct answer for the length

of AB?

Because calculating the distance between A(-6, -10) and B(2, 5) yields 17, matching option C.

Additional Resources

Given The Coordinates Below, What Is AB? A(-6, -10) B(2, 5) A:5 B:25 C:17 D:7

Understanding the length of segment AB based on coordinate points is a fundamental concept in coordinate geometry, often encountered in both academic settings and practical applications such as navigation, engineering, and computer graphics. The question "Given The Coordinates Below, What Is AB?" invites us to analyze the positions of points A and B—specifically A(-6, -10) and B(2, 5)—and determine the distance between them. This guide will provide a comprehensive breakdown of how to find the length of segment AB, interpret the associated options, and explore related geometric concepts in detail.

Introduction to Coordinate Geometry and Distance Calculation

Coordinate geometry, also known as analytic geometry, involves the study of geometric figures through the use of coordinate systems. Points are represented as ordered pairs (x, y), and the relationships between these points are analyzed mathematically.

Key concept: The distance between two points A(x₁, y₁) and B(x₂, y₂) can be found using the distance formula derived from the Pythagorean theorem:

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

This formula calculates the straight-line (Euclidean) distance between points A and B in the coordinate plane.

Step-by-Step Guide to Calculating AB

Step 1: Identify the Coordinates

Given points:

- A: (-6, -10)
- B: (2, 5)

Step 2: Compute the Differences in x and y Coordinates

Calculate the change in x and y:

$$\Delta x = x_2 - x_1 = 2 - (-6) = 2 + 6 = 8$$

$$- \Delta y = y_2 - y_1 = 5 - (-10) = 5 + 10 = 15$$

Step 3: Apply the Distance Formula

Plug the differences into the distance formula:

$$\sqrt{AB = \sqrt{(8)^2 + (15)^2}}$$

$$\sqrt{AB = \sqrt{64 + 225}}$$

$$\sqrt{AB = \sqrt{289}}$$

Step 4: Simplify the Square Root

Since 289 is a perfect square:

$$\sqrt{AB = 17}$$

Result: The length of segment AB is 17 units.

Interpreting the Multiple Choice Options

Given the options:

- A: 5
- B: 25
- C: 17
- D: 7

The correct answer based on the calculation is C: 17.

Additional Geometric Insights

1. The Significance of Coordinates in Geometry

Coordinates provide a precise way to analyze geometric figures. They allow for straightforward calculations of distances, slopes, midpoints, and areas without relying on purely visual or compass-based methods.

2. Understanding the Distance Formula

The distance formula is rooted in the Pythagorean theorem:

$$\sqrt{\text{Distance}} = \sqrt{(\text{horizontal change})^2 + (\text{vertical change})^2}$$

It models the hypotenuse of a right triangle formed between the two points.

3. Practical Applications

- Navigation: Determining straight-line distances between two locations.
- Computer Graphics: Calculating pixel distances in rendering.
- Engineering: Precise measurements in design plans.

Extending the Analysis to Other Points and Segments

The problem statement also mentions points C(17) and D(7), and perhaps the context involves more complex geometric figures, such as triangles or polygons. Here's how to approach similar problems:

Calculating Distance Between Additional Points

Suppose you need to find the distance between C(17) and D(7), but their full coordinates are not provided. If they are points along a number line, their positions are 17 and 7, and the distance is:

$$\lvert 17 - 7 \rvert = 10$$

Analyzing Multiple Segments

If the question involves multiple segments, understanding how to compute each length and then analyze their relationships (such as checking for congruence or similarity) is essential.

Visualizing the Points and Segment AB

Creating a mental or physical sketch can reinforce understanding:

- Plot point A at (-6, -10): located in the third quadrant.
- Plot point B at (2, 5): located in the first quadrant.
- The segment AB connects these two points, crossing quadrants, and measuring 17 units.

Visualizing helps in understanding the relative positions and the scale of distances.

Summary and Final Thoughts

Given The Coordinates Below, What Is AB? is a classic problem that demonstrates the power of coordinate geometry in calculating distances between points. By applying the distance formula, we determine that the length of segment AB with points A(-6, -10) and B(2, 5) is 17 units.

Key Takeaways:

- Coordinates allow precise calculations of geometric measures.
- The distance formula is a direct application of the Pythagorean theorem.

- Always carefully identify and substitute coordinate differences.
- Multiple-choice options often test your understanding of basic calculations.

Final Note:

Understanding how to analyze points and segments in the coordinate plane is foundational for advanced study in geometry, trigonometry, and calculus. Mastering these techniques enables problem-solving across various scientific and engineering disciplines.

End of Guide

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