What Is The Distance Between (-2,3) And (6,1)? A. Sq Root Of 10 Units B. Sq Root Of 68 UnitsC. 10 Units

What Is The Distance Between (-2,3) And (6,1)? A. Sq Root Of 10 Units B. Sq Root Of 68 Units C. 10 Units

Understanding the distance between two points in a coordinate plane is a fundamental concept in geometry and mathematics. Whether you're a student preparing for exams, a teacher creating lesson plans, or a math enthusiast exploring the principles of coordinate geometry, grasping how to calculate the distance between points is essential. In this article, we will explore the process of calculating the distance between the points (-2, 3) and (6, 1), analyze the possible answers provided, and explain the reasoning behind the correct choice.

Introduction to Coordinate Geometry and Distance Formula

Coordinate geometry, also known as analytic geometry, involves studying geometric figures using a coordinate system. Points are represented as ordered pairs (x, y), where x denotes the horizontal position and y denotes the vertical position.

Calculating the distance between two points in a plane relies on the distance formula, which is derived from the Pythagorean theorem. Given two points, $P_1(x_1, y_1)$ and $P_2(x_2, y_2)$, the distance d between these points is given by:

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

This formula calculates the length of the hypotenuse of a right triangle formed by the differences in x and y coordinates.

Applying the Distance Formula to (-2,3) and (6,1)

Let's analyze the specific points given:

- First point: $P_1(-2, 3)$
- Second point: $P_2(6, 1)$

Using the distance formula:

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

Plugging in the values:

$$
d = \sqrt{(6 - (-2))^2 + (1 - 3)^2}
$$

Simplify each component:

- $6 - (-2) = 6 + 2 = 8$
- $1 - 3 = -2$

Now, square these differences:

$$
d = \sqrt{8^2 + (-2)^2} = \sqrt{64 + 4}
$$

Add the squares:

$$
d = \sqrt{68}
$$

Therefore, the exact distance between the points (-2, 3) and (6, 1) is $\sqrt{68}$ units.

Understanding the Options and Correct Answer

The question provides three options:

- A. $\sqrt{10}$ units
- B. $\sqrt{68}$ units
- C. 10 units

From our calculations, the correct answer aligns with option B: $\sqrt{68}$ units.

Let's analyze why the other options are incorrect:

- Option A: $\sqrt{10}$ units

This would imply a calculation such as $(x_2 - x_1)^2 + (y_2 - y_1)^2 = 10$. Since our actual sum is 68, this option is incorrect.

- Option C: 10 units

This suggests the distance is a whole number, but our calculation shows the distance as an irrational number, approximately 8.246 units (since $\sqrt{68} \approx 8.246$). Therefore, this option is not accurate.

How to Approximate the Distance

While $\sqrt{68}$ is the exact distance, sometimes approximating the value is helpful, especially in practical scenarios.

- To approximate $\sqrt{68}$, recognize that:

$$
8^2 = 64 \quad \text{and} \quad 9^2 = 81
$$

Since 68 is between 64 and 81, $\sqrt{68}$ is between 8 and 9.

- Using a calculator or estimating:

$$
\sqrt{68} \approx 8.246
$$

- This approximation provides a clearer idea of the actual distance in real-world measurements.

Practical Applications of Distance Calculations

Calculating distances between points isn't just an academic exercise; it has numerous real-world applications, such as:

- Navigation and GPS: Determining the straight-line distance between two locations.
- Urban Planning: Calculating the shortest path between two points in city layouts.
- Computer Graphics: Measuring distances between objects in a coordinate space.
- Robotics: Navigating robots from one point to another efficiently.
- Physics: Analyzing particle movements and distances in space.

Understanding how to compute these distances accurately is crucial in all these fields.

Additional Tips for Calculating Distance

- Always carefully identify the coordinates of the points.
- Remember to subtract the x-coordinates and y-coordinates correctly—pay attention to the order.
- Square the differences before summing to avoid mistakes.

- Use a calculator for square roots, especially with larger numbers or irrational results.
- When approximating, recognize perfect squares near your number to estimate the square root.

Summary and Conclusion

To conclude, the distance between the points (-2, 3) and (6, 1) is $\sqrt{68}$ units. This calculation involves applying the distance formula derived from the Pythagorean theorem, which is fundamental in coordinate geometry. The options provided in the question highlight common misconceptions or approximations, but only option B accurately reflects the precise calculation.

Understanding these principles enhances your ability to solve various geometric problems and applies to many practical fields. Remember, mastering the coordinate plane and the distance formula opens doors to more advanced mathematical concepts and real-world applications.

Final Remarks

In summary:

- The coordinate points are (-2, 3) and (6, 1).
- The differences are 8 in the x-direction and -2 in the y-direction.
- The distance is $\sqrt{8^2 + (-2)^2} = \sqrt{64 + 4} = \sqrt{68}$.
- The approximate value is about 8.246 units.
- Correct answer: B. $\sqrt{68}$ units.

By understanding how to compute this distance, you strengthen your grasp of coordinate geometry, an essential component of mathematics education and numerous technological applications.

Frequently Asked Questions

How do you calculate the distance between the points (-2, 3) and (6, 1)?

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

What is the value of the distance between (-2, 3) and (6, 1)?

The distance is $\sqrt{68}$ units, which corresponds to option B.

Is the distance between (-2, 3) and (6, 1) equal to √10 units?

No, the actual distance is √68 units, not √10.

Which option correctly represents the distance between (-2, 3) and (6, 1)?

Option B: √68 units.

Can the distance between two points be expressed as a decimal? If so, what is it approximately?

Yes, $\sqrt{68} \approx 8.25$ units.

Why is the answer √68 units for the distance between these points?

Because applying the distance formula results in $\sqrt{[(6 + 2)^2 + (1 - 3)^2]} = \sqrt{(8^2 + (-2)^2)} = \sqrt{(64 + 4)} = \sqrt{68}$.

What is the significance of choosing √68 over the other options?

Because √68 precisely matches the calculated distance, while √10 and 10 units are incorrect.

If the distance between two points is √68 units, which of the following options is correct?

Option B: √68 Units.

Additional Resources

Understanding the Distance Between Two Points: (-2, 3) and (6, 1)

When exploring the fundamental concepts of coordinate geometry, one of the most essential topics is calculating the distance between two points on a Cartesian plane. This concept not only helps in understanding basic geometric principles but also serves as a foundation for more advanced topics such as vector calculus, physics, computer graphics, and navigation systems. In this detailed analysis, we will examine the question: What is the distance between the points (-2, 3) and (6, 1)? and evaluate the possible answer choices:

- A. Square Root Of 10 Units
- B. Square Root Of 68 Units
- C. 10 Units

Let's delve into the geometric and algebraic principles involved in solving this problem, thereby reinforcing a comprehensive understanding of how to approach and compute distances between points in a plane.

Foundations of Distance in the Cartesian Plane

The Coordinate System and Points

In the Cartesian coordinate system, any point in a plane is represented by an ordered pair (x, y), where:

- x is the horizontal coordinate (abscissa)
- y is the vertical coordinate (ordinate)

Given two points, $P_1 = (x_1, y_1)$ and $P_2 = (x_2, y_2)$, their positions are specified within this two-dimensional space.

In our case:
- $P_1 = (-2, 3)$
- $P_2 = (6, 1)$

Understanding the spatial placement of these points allows us to visualize the problem and prepare for the application of the distance formula.

The Distance Formula: Derivation and Significance

The distance between two points in a plane can be derived from the Pythagorean theorem, which states that in a right-angled triangle, the square of the hypotenuse (the side opposite the right angle) is the sum of the squares of the other two sides.

Applying this to the coordinate plane:

- The difference in x-coordinates: $\Delta x = x_2 - x_1$
- The difference in y-coordinates: $\Delta y = y_2 - y_1$

The actual distance d between the points is the hypotenuse of a right-angled triangle with sides of lengths $|\Delta x|$ and $|\Delta y|$:

\[d = \sqrt{(\Delta x)^2 + (\Delta y)^2} \]

This formula is a direct consequence of the Pythagorean theorem and provides a reliable method for calculating the straight-line distance between two points.

Step-by-Step Calculation of the Distance

Let's now explicitly calculate the distance between the points (-2, 3) and (6, 1) using the formula.

Step 1: Identify the coordinate differences

- $\Delta x = x_2 - x_1 = 6 - (-2) = 6 + 2 = 8$
- $\Delta y = y_2 - y_1 = 1 - 3 = -2$

Note that the absolute values are not necessary when squaring, but understanding the differences is crucial.

Step 2: Apply the distance formula

$$ d = \sqrt{(\Delta x)^2 + (\Delta y)^2} $$
$$ d = \sqrt{(8)^2 + (-2)^2} $$
$$ d = \sqrt{64 + 4} $$
$$ d = \sqrt{68} $$

Step 3: Simplify the radical if possible

- The radical $\sqrt{68}$ can be simplified because 68 factors into 4 and 17:

$$ \sqrt{68} = \sqrt{4 \times 17} = \sqrt{4} \times \sqrt{17} = 2 \sqrt{17} $$

Therefore, the exact distance between the points is $2\sqrt{17}$ units.

Interpreting the Multiple Choice Options

The options provided are:

- A. Square Root Of 10 Units
- B. Square Root Of 68 Units
- C. 10 Units

From our calculations, the exact distance is $\sqrt{68}$ units, which matches option B.

Let's analyze each option:

Option A: $\sqrt{10}$ Units

- $\sqrt{10} \approx 3.16$ units
- This is not the correct distance, as our calculation yields $\sqrt{68}$.

Option B: $\sqrt{68}$ Units

- $\sqrt{68} \approx 8.246$ units
- This matches our computed value, confirming it as the correct answer.

Option C: 10 Units

- This is an approximate numerical value, and it does not match the exact calculation of $\sqrt{68}$.

Conclusion: The correct choice based on our calculation is Option B: Square Root Of 68 Units.

Deeper Insights Into the Distance Calculation

Geometric Interpretation

Visualize the points on the Cartesian plane:

- The point (-2, 3) is located 2 units left of the origin and 3 units above.
- The point (6, 1) is located 6 units to the right of the origin and 1 unit above.

Drawing a right triangle with these points:

- Horizontal side: 8 units (from -2 to 6)
- Vertical side: 2 units (from 3 down to 1)

The hypotenuse of this triangle is the straight-line distance between the points, which confirms our earlier calculation.

Importance of Sign and Direction

While the signs of the differences in coordinates matter in vector calculations, when computing the distance, only the magnitude (absolute value) of these differences is relevant because distance is always non-negative.

Practical Applications

Understanding how to compute distances between points is fundamental across various disciplines:

- Navigation: Calculating the shortest path between two locations.
- Physics: Determining displacement between objects.
- Computer Graphics: Measuring distances between pixels or objects.
- Data Analysis: Computing Euclidean distances in multi-dimensional data.

Extending the Concept: Distance in Higher Dimensions

While our focus is on two-dimensional space, the distance formula extends naturally into higher dimensions:

$$ d = \sqrt{\sum_{i=1}^n (x_{i2} - x_{i1})^2} $$

For example, in three dimensions:

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

This generalization is crucial in fields like machine learning, physics, and engineering, where multi-dimensional data is common.

Common Mistakes and Clarifications

- Confusing coordinate differences: Remember that the order matters; always subtract the coordinates of the second point from the first when applying the formula.
- Neglecting the square: Squaring the differences ensures negative values don't affect the distance calculation.
- Simplification of radicals: Always look for perfect square factors to simplify radicals, but recognize that $\sqrt{68}$ cannot be simplified further than $2\sqrt{17}$.

Summary and Final Remarks

To recapitulate:

- The two points involved are (-2, 3) and (6, 1).
- The differences in coordinates are $\Delta x = 8$ and $\Delta y = -2$.
- Applying the distance formula gives: $d = \sqrt{68}$.
- The radical $\sqrt{68}$ simplifies to $2 \sqrt{17}$, but both forms are acceptable.
- Among the provided options, Option B: Square Root Of 68 Units correctly corresponds to our calculated distance.

In conclusion, understanding the process of calculating the distance between two points is a cornerstone of coordinate geometry, vital for practical applications and theoretical exploration alike.

Additional Resources for Deepening Understanding:

- Textbooks: "Coordinate Geometry" chapters in high school mathematics textbooks.
- Online Tools: Geogebra, Desmos, or other graphing calculators to visualize points and distances.
- Practice Problems: Regularly solve similar problems to build intuition and speed.

Final Thought: Mastery of such fundamental concepts not only improves mathematical proficiency but also enhances problem-solving skills applicable across a myriad of scientific and engineering disciplines.

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