

lesson 7 distance on the coordinate plane answer key

lesson 7 distance on the coordinate plane answer key is a crucial topic for students learning about geometry and algebra. Understanding how to calculate the distance between points on a coordinate plane is fundamental in various mathematical applications. This article will provide a comprehensive overview of the concepts related to distance on the coordinate plane, including the distance formula, examples, and practice problems. Additionally, this piece will deliver an answer key for Lesson 7, which will help students verify their understanding and mastery of the subject. The following sections will systematically explore these key ideas, ensuring a thorough grasp of the topic.

- Understanding the Coordinate Plane
- The Distance Formula
- Examples of Distance Calculation
- Practice Problems
- Answer Key for Lesson 7

Understanding the Coordinate Plane

The coordinate plane, also known as the Cartesian plane, is a two-dimensional surface formed by the intersection of two perpendicular lines: the x-axis and the y-axis. Each point on this plane is defined by an ordered pair of numbers (x, y) , where 'x' represents the horizontal position and 'y' represents the vertical position. Understanding this system is essential for calculating distances between points.

The Quadrants of the Coordinate Plane

The coordinate plane is divided into four quadrants, each with its unique characteristics:

- **Quadrant I:** Both x and y coordinates are positive.
- **Quadrant II:** x coordinates are negative, and y coordinates are positive.
- **Quadrant III:** Both x and y coordinates are negative.
- **Quadrant IV:** x coordinates are positive, and y coordinates are negative.

Understanding the quadrants is important when determining the location of points and calculating distances, as it influences the signs of the coordinates involved in the calculations.

The Distance Formula

The distance formula is a mathematical equation used to determine the distance between two points in a coordinate plane. The formula is derived from the Pythagorean theorem and is expressed as follows:

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

In this formula, D represents the distance between the two points (x_1, y_1) and (x_2, y_2) . To utilize the distance formula effectively, it is essential to understand each component:

Components of the Distance Formula

- **(x_1, y_1) :** The coordinates of the first point.
- **(x_2, y_2) :** The coordinates of the second point.
- **$(x_2 - x_1)$:** The difference in the x-coordinates of the two points.
- **$(y_2 - y_1)$:** The difference in the y-coordinates of the two points.
- **$\sqrt{}$:** The square root symbol indicates that the sum of the squares of the differences is taken before applying the square root.

By applying this formula, students can easily calculate the length of a segment connecting two points, which is essential in both geometry and real-world applications.

Examples of Distance Calculation

To solidify understanding, let's go through a couple of examples that demonstrate how to use the distance formula effectively.

Example 1: Simple Calculation

Consider two points A(2, 3) and B(5, 7). To find the distance D between these two points, we will apply the distance formula:

1. Identify the coordinates: A(2, 3) where $x_1 = 2$ and $y_1 = 3$; B(5, 7) where $x_2 = 5$ and $y_2 = 7$.
2. Calculate the differences: $x_2 - x_1 = 5 - 2 = 3$ and $y_2 - y_1 = 7 - 3 = 4$.
3. Apply the distance formula: $D = \sqrt{(3)^2 + (4)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$.

Thus, the distance between points A and B is 5 units.

Example 2: Points in Different Quadrants

Now consider points C(-3, -4) and D(1, 2). These points are in different quadrants, which will affect the calculations:

1. Identify the coordinates: C(-3, -4) where $x_1 = -3$ and $y_1 = -4$; D(1, 2) where $x_2 = 1$ and $y_2 = 2$.
2. Calculate the differences: $x_2 - x_1 = 1 - (-3) = 4$ and $y_2 - y_1 = 2 - (-4) = 6$.
3. Apply the distance formula: $D = \sqrt{(4)^2 + (6)^2} = \sqrt{16 + 36} = \sqrt{52} = 2\sqrt{13}$.

Therefore, the distance between points C and D is approximately 7.21 units.

Practice Problems

To further deepen understanding of the distance formula, students can practice the following problems:

1. Find the distance between points E(0, 0) and F(3, 4).
2. Calculate the distance between points G(-1, 2) and H(3, -2).
3. Determine the distance from point I(7, -3) to point J(4, 2).
4. Evaluate the distance between points K(-2, -5) and L(5, 1).

Solving these problems will provide hands-on experience with the distance formula and reinforce the concepts discussed.

Answer Key for Lesson 7

Here are the answers to the practice problems provided earlier:

1. Distance between $E(0, 0)$ and $F(3, 4)$ is 5 units.
2. Distance between $G(-1, 2)$ and $H(3, -2)$ is 5 units.
3. Distance between $I(7, -3)$ and $J(4, 2)$ is approximately 5.83 units.
4. Distance between $K(-2, -5)$ and $L(5, 1)$ is approximately 7.81 units.

This answer key allows students to verify their calculations and gain confidence in their understanding of distance on the coordinate plane.

Conclusion

Mastering the concept of distance on the coordinate plane is an essential skill in mathematics, particularly in geometry and algebra. The distance formula provides a straightforward method for calculating the distance between two points, allowing students to tackle a variety of mathematical problems with confidence. By practicing the distance calculations and utilizing the answer key provided, students can ensure their comprehension and readiness for more advanced mathematical concepts.

Q: What is the distance formula used for?

A: The distance formula is used to calculate the distance between two points on the coordinate plane, derived from the Pythagorean theorem.

Q: How do you find the distance between points in different quadrants?

A: To find the distance between points in different quadrants, simply apply the distance formula, ensuring to account for the signs of the coordinates.

Q: Can the distance be negative?

A: No, distance cannot be negative. It is always a non-negative value representing the length between two points.

Q: What are the coordinates of a point?

A: The coordinates of a point are expressed as an ordered pair (x, y) , indicating its position on the coordinate plane relative to the x-axis and y-axis.

Q: How can I practice calculating distances?

A: You can practice by solving various problems involving the distance formula, as well as applying it to real-world scenarios such as determining distances on maps.

Q: What is an example of using the distance formula in real life?

A: An example would be calculating the distance between two locations on a map to determine travel distance or time.

Q: Why is the distance formula important in geometry?

A: The distance formula is crucial in geometry as it helps in finding lengths of sides in geometric figures and understanding the spatial relationships between points.

Q: How do you interpret the result of the distance calculation?

A: The result of the distance calculation represents the straight-line distance between the two points, which can be understood as the length of the line segment connecting them.

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