lesson 7 homework practice distance on the coordinate plane

Lesson 7 Homework Practice Distance on the Coordinate Plane is an essential topic in mathematics that helps students understand how to measure distances between points in a two-dimensional space. This skill is not only crucial for geometry but also serves as a foundation for more advanced topics in algebra and calculus. The coordinate plane, consisting of an x-axis and a y-axis, allows us to plot points using ordered pairs (x, y). In this article, we will explore the concept of distance on the coordinate plane, review the distance formula, and provide practical examples and exercises to enhance understanding.

Understanding the Coordinate Plane

Before diving into the distance formula, it is vital to understand the structure of the coordinate plane itself.

The Axes

The coordinate plane is divided into four quadrants by two perpendicular lines:

1. X-axis: The horizontal line that runs left to right.
2. Y-axis: The vertical line that runs up and down.

The intersection of these two axes is called the origin, denoted as (0, 0). Points on the coordinate plane are represented as ordered pairs (x, y), where:
- x denotes the horizontal position relative to the origin.
- y denotes the vertical position relative to the origin.

Quadrants of the Coordinate Plane

The coordinate plane is divided into four quadrants:

1. Quadrant I: Both x and y are positive ($x > 0, y > 0$).
2. Quadrant II: x is negative, and y is positive ($x < 0, y > 0$).
3. Quadrant III: Both x and y are negative ($x < 0, y < 0$).
4. Quadrant IV: x is positive, and y is negative ($x > 0, y < 0$).

Understanding these quadrants is essential when calculating distances, as it helps in identifying the location of points.

The Distance Formula

The distance between any two points on the coordinate plane can be calculated using the distance formula. This formula is derived from the Pythagorean theorem, which relates the lengths of the sides of a right triangle.

The Formula

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

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

Where:
- (x_1, y_1) are the coordinates of the first point.
- (x_2, y_2) are the coordinates of the second point.

Understanding the Components

- Difference in x-coordinates: $(x_2 - x_1)$ measures the horizontal distance between the two points.
- Difference in y-coordinates: $(y_2 - y_1)$ measures the vertical distance between the two points.
- Squaring: Squaring these differences ensures that we always get a positive value, which is necessary for calculating the distance.
- Square root: The final square root gives us the actual distance between the points.

Examples of Calculating Distance

To better understand how to use the distance formula, let's explore a few examples.

Example 1

Calculate the distance between the points $A(3, 4)$ and $B(7, 1)$.

1. Identify the coordinates:
- $x_1 = 3, y_1 = 4$
- $x_2 = 7, y_2 = 1$

2. Apply the distance formula:
$$

$$
d = \sqrt{(7 - 3)^2 + (1 - 4)^2}
$$
$$
d = \sqrt{(4)^2 + (-3)^2}
$$
$$
d = \sqrt{16 + 9}
$$
$$
d = \sqrt{25}
$$
$$
d = 5
$$

The distance between points A and B is 5 units.

Example 2

Find the distance between the points $C(-2, -3)$ and $D(4, 1)$.

1. Identify the coordinates:
- $x_1 = -2, y_1 = -3$
- $x_2 = 4, y_2 = 1$

2. Apply the distance formula:
$$
d = \sqrt{(4 - (-2))^2 + (1 - (-3))^2}
$$
$$
d = \sqrt{(4 + 2)^2 + (1 + 3)^2}
$$
$$
d = \sqrt{(6)^2 + (4)^2}
$$
$$
d = \sqrt{36 + 16}
$$
$$
d = \sqrt{52}
$$
$$
d \approx 7.21
$$

The distance between points C and D is approximately 7.21 units.

Practice Problems

Now that we have covered the distance formula and worked through examples, it’s time for some practice problems. Solve the following exercises using the distance formula:

1. Calculate the distance between the points $E(1, 2)$ and $F(4, 6)$.
2. Find the distance between the points $G(-1, -1)$ and $H(2, 3)$.
3. Determine the distance between the points $I(0, 0)$ and $J(-5, -5)$.
4. Calculate the distance between the points $K(3, 7)$ and $L(3, 2)$.
5. Find the distance between the points $M(-4, 2)$ and $N(1, -3)$.

Conclusion

Understanding how to calculate distance on the coordinate plane is a fundamental skill in mathematics. By mastering the distance formula, students can tackle various problems in geometry, algebra, and beyond. With practice, the application of the distance formula will become intuitive, allowing students to focus on more complex mathematical concepts. The exercises provided in this lesson reinforce the understanding of the topic and encourage further exploration of the coordinate plane. Whether in academic settings or real-world applications, knowing how to measure distance is an invaluable tool in a student's mathematical toolkit.

Frequently Asked Questions

What is the formula to calculate the distance between two points on the coordinate plane?

The distance formula is given by $d = \sqrt{(x2 - x1)^2 + (y2 - y1)^2}$, where $(x1, y1)$ and $(x2, y2)$ are the coordinates of the two points.

How do you find the distance between the points (3, 4) and (7, 1)?

Using the distance formula: $d = \sqrt{(7 - 3)^2 + (1 - 4)^2} = \sqrt{(16 + 9)} = \sqrt{25} = 5$.

What is the significance of using absolute values in the distance formula?

Absolute values ensure that the distance is always a non-negative quantity, as distance cannot be negative regardless of the order of the points.

Can the distance formula be applied in three-dimensional space?

Yes, in three-dimensional space, the distance formula is $d = \sqrt{((x2 - x1)^2 + (y2 - y1)^2 + (z2 - z1)^2)}$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the two points.

How does the distance between points relate to the Pythagorean theorem?

The distance formula is derived from the Pythagorean theorem, as it calculates the hypotenuse of a right triangle formed by the horizontal and vertical distances between the points.

What common mistakes should be avoided when calculating distance on the coordinate plane?

Common mistakes include forgetting to square the differences, not taking the square root, or mixing up the coordinates of the points.

Lesson 7 Homework Practice Distance On The Coordinate Plane

Lesson 7 Homework Practice Distance On The Coordinate Plane

Related Articles

- lenovo thinkplus lp1s manual
- liu cixin the three body problem
- lights will guide you home meaning

Back to Home