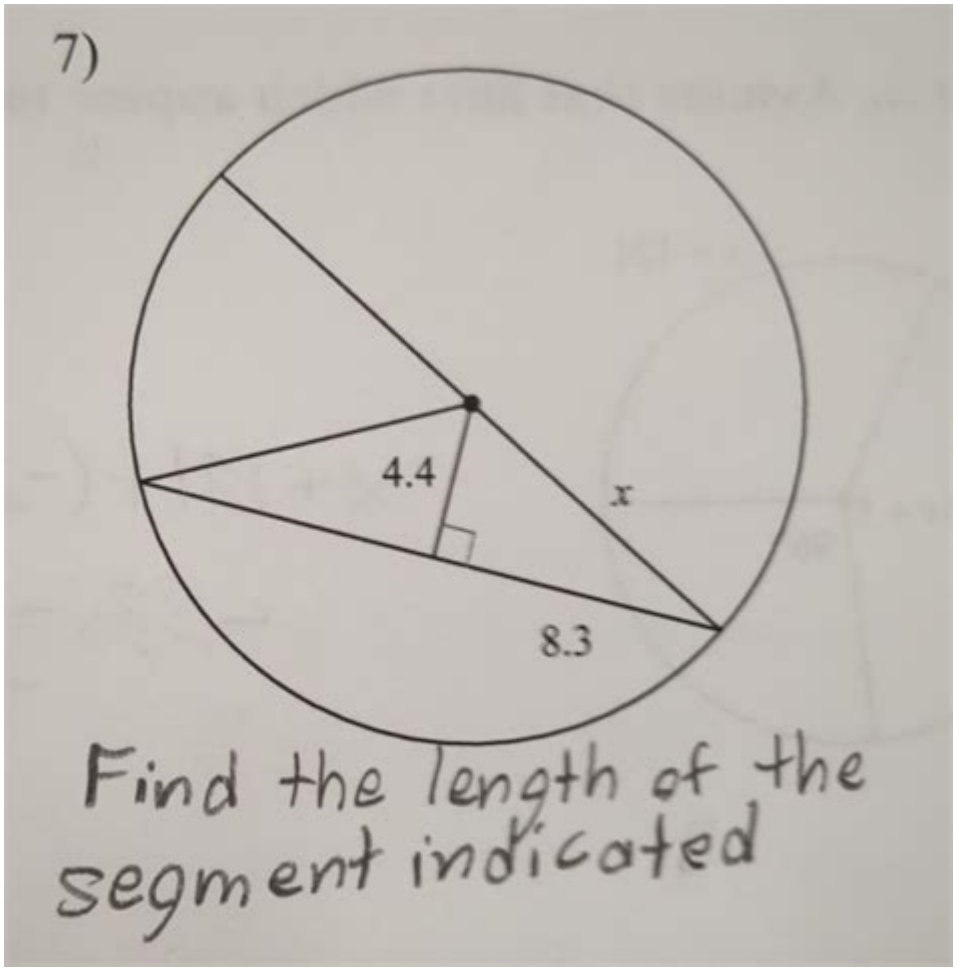
Find The Length Of The Segment Indicated



Find the length of the segment indicated is a common phrase encountered in geometry, particularly when dealing with line segments on a coordinate plane or within geometric figures. Understanding how to calculate the length of a segment is essential for students and professionals alike, as it serves as a foundational concept in mathematics. In this article, we will explore the various methods to find the length of a segment, provide examples, and discuss its applications in real-world scenarios.

Understanding Line Segments

A line segment is defined as a part of a line that is bounded by two distinct endpoints. Unlike a line, which extends infinitely in both directions, a line segment has a measurable length. To calculate this length, we often rely on the distance formula, especially when dealing with segments on a coordinate plane.

Coordinate Plane Basics

In a two-dimensional space, points are represented using ordered pairs (x, y). For example, point A

can be represented as (x_1, y_1) and point B as (x_2, y_2). The distance between these two points can be calculated using the distance formula:

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

Where:
- d is the length of the segment,
- x_1 and y_1 are the coordinates of the first endpoint,
- x_2 and y_2 are the coordinates of the second endpoint.

Steps to Find the Length of the Segment

To find the length of a segment indicated between two points on a coordinate plane, follow these steps:

1. **Identify the coordinates:** Determine the coordinates of the two endpoints. For example, let's say point A is (2, 3) and point B is (5, 7).
2. **Substitute the values:** Plug the coordinates into the distance formula:

   $d = \sqrt{(5 - 2)^2 + (7 - 3)^2}$
3. **Calculate the differences:** Compute the differences:

   $d = \sqrt{(3)^2 + (4)^2}$
4. **Square the differences:** Square each difference:

   $d = \sqrt{9 + 16}$
5. **Add the squares:** Add the squared values:

   $d = \sqrt{25}$
6. **Find the square root:** Finally, take the square root:

   $d = 5$

Thus, the length of the segment between points A and B is 5 units.

Examples of Finding Lengths of Segments

Let’s look at a few more examples to solidify our understanding of how to find the length of segments.

Example 1: Horizontal Segment

Consider two points, C(1, 2) and D(6, 2). Since both points share the same y-coordinate, this segment lies horizontally.

1. Identify the coordinates: C(1, 2) and D(6, 2)
2. Use the distance formula:
$$
d = \sqrt{(6 - 1)^2 + (2 - 2)^2}
$$
3. Calculate:
$$
d = \sqrt{(5)^2 + (0)^2} = \sqrt{25} = 5
$$

The length of segment CD is 5 units.

Example 2: Vertical Segment

Now, consider points E(3, 4) and F(3, 10). Here, both points have the same x-coordinate, indicating a vertical segment.

1. Identify the coordinates: E(3, 4) and F(3, 10)
2. Use the distance formula:
$$
d = \sqrt{(3 - 3)^2 + (10 - 4)^2}
$$
3. Calculate:
$$
d = \sqrt{(0)^2 + (6)^2} = \sqrt{36} = 6
$$

The length of segment EF is 6 units.

Applications of Segment Lengths

Understanding how to find the length of the segment indicated has numerous applications across various fields:

1. Architecture and Engineering

In architecture and engineering, calculating distances and lengths is crucial for designing structures. Accurate measurements ensure that buildings are built safely and to specifications.

2. Computer Graphics

In computer graphics, finding the length of segments is essential for rendering shapes and animations accurately. It helps in determining the relationships between different objects in a scene.

3. Navigation and Mapping

In navigation, calculating distances between points helps in route planning. Maps often require accurate segment lengths to provide users with the best travel routes.

Conclusion

In conclusion, **finding the length of the segment indicated** is an essential skill in geometry that can be applied in many real-world scenarios. By using the distance formula, one can easily calculate the length of any line segment on a coordinate plane. With practice, this skill can become second nature, allowing for quick calculations in various fields such as architecture, engineering, computer graphics, and navigation. Whether you're a student or a professional, mastering this concept will undoubtedly enhance your mathematical proficiency.

Frequently Asked Questions

What is the length of a line segment with endpoints at (2, 3) and (5, 7)?

The length of the segment is 5 units.

How do you calculate the length of a segment between points A(1, 1) and B(4, 5)?

Use the distance formula: length = $\sqrt{((4-1)^2 + (5-1)^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5$.

If a segment has endpoints (-3, 2) and (1, -4), what is its length?

The length of the segment is $\sqrt{((1 - (-3))^2 + (-4 - 2)^2)} = \sqrt{(16 + 36)} = \sqrt{52} \approx 7.21$.

What is the distance between points (-2, -3) and (3, 1)?

The distance is $\sqrt{((3 - (-2))^2 + (1 - (-3))^2)} = \sqrt{(25 + 16)} = \sqrt{41} \approx 6.4$.

Given points P(0, 0) and Q(6, 8), how do you find the segment length?

Apply the distance formula: length = $\sqrt{((6-0)^2 + (8-0)^2)} = \sqrt{(36 + 64)} = \sqrt{100} = 10$.

What is the length of a segment connecting (7, 3) and (7, 10)?

The length of the segment is $|10 - 3| = 7$ units (vertical line segment).

How do you determine the length of a segment with endpoints (4, 5) and (-1, 1)?

Use the distance formula: length = $\sqrt{((-1 - 4)^2 + (1 - 5)^2)} = \sqrt{(25 + 16)} = \sqrt{41} \approx 6.4$.

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