What Is The Length Of Lines UV, VW, WX, And VU When The Points U(7,9), V(0,5), W(-6,-3)U(7,9),V(0,5),W(6,3),

What Is The Length Of Lines UV, VW, WX, And VU When The Points U(7,9), V(0,5), W(-6,-3)U(7,9),V(0,5),W(6,3),

Understanding the lengths of line segments between points in a coordinate plane is fundamental in geometry. When given specific points with their coordinates, calculating the distances between them allows us to analyze geometrical relationships, such as the size of triangles, the lengths of sides, or the properties of polygons. In this article, we will explore the lengths of lines UV, VW, WX, and VU, given the points U(7, 9), V(0, 5), and W(-6, -3), as well as a second W point at (6, 3). We will delve into the calculations step-by-step, interpret the results, and understand the significance of these line segments.

Understanding the Coordinates and Points Involved

Points U, V, and W

The points provided are:

- U at (7, 9)
- V at (0, 5)
- W at (-6, -3)

These points reside in a Cartesian coordinate plane with x and y axes, each point uniquely identified by their x and y coordinates.

Additional W Point

The second W point is at (6, 3). This suggests that W may be considered in two different positions or that the problem involves multiple W points, possibly for different line segment calculations.

Calculating the Length of Line Segments

Distance Formula

The distance d between two points (x_1, y_1) and (x_2, y_2) in the coordinate plane is given by the Euclidean distance formula:

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

This formula derives from the Pythagorean theorem and calculates the straight-line distance between two points.

Calculating Line Segment UV

Points U and V

- $U(7, 9)$
- $V(0, 5)$

Distance Calculation for UV

Applying the distance formula:

$$
UV = \sqrt{(0 - 7)^2 + (5 - 9)^2}
$$

Calculate the differences:
- $\Delta x = 0 - 7 = -7$
- $\Delta y = 5 - 9 = -4$

Square the differences:
- $(-7)^2 = 49$
- $(-4)^2 = 16$

Sum and take the square root:

$$
UV = \sqrt{49 + 16} = \sqrt{65} \approx 8.062
$$

Result: The length of segment UV is approximately 8.062 units.

Calculating Line Segment VW

Points V and W (First W at -6, -3)

- $V(0, 5)$
- $W(-6, -3)$

Distance Calculation for VW (First W)

Applying the distance formula:

$$
VW = \sqrt{(-6 - 0)^2 + (-3 - 5)^2}
$$

Differences:
- $\Delta x = -6 - 0 = -6$
- $\Delta y = -3 - 5 = -8$

Squares:
- $(-6)^2 = 36$
- $(-8)^2 = 64$

Sum and square root:

$$
VW = \sqrt{36 + 64} = \sqrt{100} = 10
$$

Result: The length of segment VW (with W at -6, -3) is 10 units.

Calculating Line Segment WX

Points W and X (Assuming W at 6, 3)

- $W(6, 3)$
- X is not explicitly provided; assuming we consider the second W point as X at (6, 3) or perhaps W at (6, 3).

If W at (6, 3) is used as point X, then we need to specify which W points are being used. For clarity, let's assume:

- $W_1(-6, -3)$
- $W_2(6, 3)$

If the line segment WX refers to the segment connecting these two W points, then:

Distance Calculation for W1W2

Points:
- $W_1(-6, -3)$
- $W_2(6, 3)$

Applying the distance formula:

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

Calculate differences:
- $\Delta x = 6 - (-6) = 12$
- $\Delta y = 3 - (-3) = 6$

Squares:
- $12^2 = 144$
- $6^2 = 36$

Sum and square root:
\[
WX = \sqrt{144 + 36} = \sqrt{180} \approx 13.416
\]

Result: The length of segment WX (between W at -6, -3 and W at 6, 3) is approximately 13.416 units.

Calculating Line Segment VU

Points V and U

- \(V(0, 5) \)
- \(U(7, 9) \)

Distance Calculation for VU

Applying the distance formula:

\[
VU = \sqrt{(7 - 0)^2 + (9 - 5)^2}
\]

Differences:
- \(\Delta x = 7 - 0 = 7 \)
- \(\Delta y = 9 - 5 = 4 \)

Squares:
- \(7^2 = 49 \)
- \(4^2 = 16 \)

Sum and square root:
\[
VU = \sqrt{49 + 16} = \sqrt{65} \approx 8.062
\]

Result: The length of segment VU is approximately 8.062 units.

Summary of Calculated Lengths

To recap, based on the points provided:

- UV: approximately 8.062 units
- VW (with W at -6, -3): exactly 10 units
- WX (between W at -6, -3 and W at 6, 3): approximately 13.416 units
- VU: approximately 8.062 units

Interpreting the Results and Geometrical Significance

Understanding the Distances

The calculations reveal the spatial relationships among the points:
- The segments UV and VU both measure approximately 8.062 units, indicating symmetry in their lengths, which may suggest that points U and V are positioned in a way that makes these segments equal, possibly hinting at a specific geometric shape like an isosceles triangle.
- The segment VW (with W at -6, -3) is 10 units long, which is longer than UV and VU, indicating the points are spaced out distinctly.
- The segment WX between W points at (-6, -3) and (6, 3) is approximately 13.416 units, signifying a substantial distance across the plane.

Implications for Geometric Figures

If these points are vertices of a polygon or triangle, their side lengths can help analyze:
- The nature of the triangle—whether it is scalene, isosceles, or equilateral.
- The potential for forming specific geometric shapes, such as parallelograms or rectangles.
- The distances can be used to calculate angles through the Law of Cosines or to verify congruency.

Application in Coordinate Geometry

Knowing the lengths of segments is crucial in various applications:
- Calculating perimeters and areas.

- Determining whether points are collinear or form specific geometric configurations.
- Analyzing the symmetry or congruency of figures.

Conclusion

The process of calculating line segment lengths between points in the coordinate plane involves straightforward application of the Euclidean distance formula. By identifying the coordinates, computing differences in x and y, squaring, summing, and taking the square root, we obtain the precise lengths of segments such as UV, VW, WX, and VU. These measurements are foundational in understanding the geometric relationships between points, analyzing shapes, and solving complex problems in coordinate geometry. Whether used for academic purposes, engineering, or computer graphics, mastering these calculations is essential for spatial reasoning and geometric analysis

Frequently Asked Questions

How do you find the length of line UV given points U(7, 9) and V(0, 5)?

Use the distance formula: $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$. For UV, it is $\sqrt{[(0 - 7)^2 + (5 - 9)^2]} = \sqrt{[(-7)^2 + (-4)^2]} = \sqrt{[49 + 16]} = \sqrt{65}$.

What is the length of line VW between points V(0, 5) and W(-6, -3)?

Apply the distance formula: $\sqrt{[(-6 - 0)^2 + (-3 - 5)^2]} = \sqrt{[(-6)^2 + (-8)^2]} = \sqrt{[36 + 64]} = \sqrt{100} = 10$.

How do you calculate the length of line WX with points W(-6, -3) and X(6, 3)?

Use the distance formula: $\sqrt{[(6 - (-6))^2 + (3 - (-3))^2]} = \sqrt{[(12)^2 + (6)^2]} = \sqrt{[144 + 36]} = \sqrt{180} = 6\sqrt{5}$.

What is the length of line VU when points V(0, 5) and U(7, 9) are given?

Calculate using the distance formula: $\sqrt{[(7 - 0)^2 + (9 - 5)^2]} = \sqrt{[7^2 + 4^2]} = \sqrt{[49 + 16]} = \sqrt{65}$.

Are the lengths of lines UV and VU the same, given their points?

Yes, since the distance formula is symmetric, the lengths UV and VU are equal, both $\sqrt{65}$.

What is the approximate numerical value of the length of line WX?

$\sqrt{180}$ simplifies to $6\sqrt{5}$, which is approximately 13.416.

How do the lengths of lines UV, VW, WX, and VU compare to each other?

UV and VU both measure $\sqrt{65}$ (~8.062), VW is 10, and WX is $6\sqrt{5}$ (~13.416), so WX is the longest among them, followed by VW, with UV and VU being equal shortest lengths.

Additional Resources

What Is The Length Of Lines UV, VW, WX, And VU When The Points U(7,9), V(0,5), W(-6,-3)?

Understanding the lengths of various line segments connecting specific points in a coordinate plane is fundamental in geometry, especially when analyzing shapes, solving problems involving distances, or preparing for more advanced topics such as vector algebra or coordinate geometry proofs. In this guide, we will explore what is the length of lines UV, VW, WX, and VU when the points U(7,9), V(0,5), and W(-6,-3) are given, providing a detailed, step-by-step calculation process, explanations, and insights to deepen your understanding of distance formulas and their applications.

Introduction

When working with points on the Cartesian plane, the ability to determine the length of segments connecting these points is essential. The given points:

- U(7, 9)
- V(0, 5)
- W(-6, -3)

form the basis for calculating segments such as UV, VW, WX, and VU. Although some segments like UV and VU are straightforward, others like WX require us to understand how to find missing points or interpret the problem correctly.

Clarifying the Problem and Coordinates

Before diving into calculations, it’s crucial to interpret the problem accurately:

- The points U(7,9), V(0,5), and W(-6,-3) are clearly defined.
- The segments UV, VW, and VU involve these points directly.
- The segment WX, however, introduces a new point, W(6,3), which seems to differ from W(-6,-3).

This suggests that the problem might involve two different W points or perhaps a typo or an intentional comparison. For clarity, we will assume:

- The first W is at W(-6, -3)
- The second W mentioned is W(6, 3)

Similarly, the segment WX might connect point W(6,3) to some other point, possibly X. Since no explicit coordinates for X are provided, it's common in such problems that W and X are points on the same line or that X is another point with specific coordinates.

However, given the context, it appears the problem is asking for the lengths of:

- UV (connecting U and V)
- VW (connecting V and W)
- WX (connecting W and X)
- VU (connecting V and U)

with the points:

- U(7,9)
- V(0,5)
- W(-6,-3)
- W(6,3) (possibly W' to distinguish)
- X (unknown, possibly at a specific coordinate)

To resolve this, we will assume:

- The first set of W is W(-6, -3)
- The second W, W(6,3), is a different point, perhaps W' or a typo
- The point X is at (some coordinate), but since none is provided, the problem might involve W(6,3) as point X or similar.

Step-by-Step Calculations

1. Calculating the Length of Line UV

Coordinates:

- U(7, 9)
- V(0, 5)

Distance Formula:

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

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

Applying to UV:

$$d_{UV} = \sqrt{(0 - 7)^2 + (5 - 9)^2}$$
$$d_{UV} = \sqrt{(-7)^2 + (-4)^2}$$
$$d_{UV} = \sqrt{49 + 16}$$
$$d_{UV} = \sqrt{65}$$

Result:

$$
\boxed{
d_{UV} = \sqrt{65} \approx 8.06
}
$$

---

2. Calculating the Length of Line VW

Coordinates:

- V(0, 5)
- W(-6, -3)

Distance Calculation:

$$d_{VW} = \sqrt{(-6 - 0)^2 + (-3 - 5)^2}$$
$$d_{VW} = \sqrt{(-6)^2 + (-8)^2}$$
$$d_{VW} = \sqrt{36 + 64}$$
$$d_{VW} = \sqrt{100}$$
$$d_{VW} = 10$$

Result:

\[
\boxed{
d_{VW} = 10
}
\]

---

3. Clarifying and Calculating the Length of Line WX

Potential interpretations:

- If W is at \((-6, -3)\) and X is at \((x, y) \), but no coordinates are provided, perhaps the W here is W(6,3), which is a different point, possibly the point X or a new W.

Assumption: Suppose W is at \((6, 3) \), and X is at some other point, or W and X are the same points.

Given the context, perhaps WX connects:

- W at \((6, 3) \)
- X at an unknown coordinate, or W and X are the same point.

Alternatively, perhaps the problem intends W(6,3) to be the point X, i.e., W and X are at (6,3), making the segment WX a point with zero length.

If W(6,3) and X(6,3):

\[d_{WX} = 0 \]

Otherwise, if W and X are different, we need coordinates for X.

---

4. Calculating the Length of Line VU

Coordinates:

- V(0, 5)
- U(7, 9)

This is the same as UV but in reverse.

\[d_{VU} = \sqrt{(7 - 0)^2 + (9 - 5)^2} \]

$$ d_{VU} = \sqrt{7^2 + 4^2} $$
$$ d_{VU} = \sqrt{49 + 16} $$
$$ d_{VU} = \sqrt{65} $$

Result:

$$
\boxed{
d_{VU} = \sqrt{65} \approx 8.06
}
$$

Summary of Calculated Lengths

Segment	Calculation Result	Approximate Value
UV	$\sqrt{65}$	8.06
VW	10	10
WX	Depends on points; possibly 0 if W and X coincide	0 or unknown
VU	$\sqrt{65}$	8.06

Additional Insights and Geometric Context

Understanding the Spatial Relationships

- Points U, V, and W form a triangle with side lengths approximately 8.06, 10, and depending on W and X, possibly more.
- The segments UV and VU are equal, as expected, since the distance formula is symmetric.
- The segment VW is longer, indicating W is farther from V than U is.
- The length of WX hinges on the precise coordinates of X, which are not specified. If W(6,3) is meant to be X, then WX is zero, implying W and X are the same point.

Visualizing the Points

Plotting these points on a coordinate plane can help visualize the distances:

- U at (7,9): near the upper right.
- V at (0,5): somewhat central.
- W at (-6,-3): lower left.

- W at (6,3): to the right and slightly up, if W(6,3) is considered.

Understanding their positions can help in comprehending the relationships and potential geometric figures they form, such as triangles or polygons.

Conclusion

Determining the length of line segments given points in the coordinate plane involves straightforward application of the distance formula. For the points provided:

- UV and VU are both approximately 8.06 units.
- VW measures exactly 10 units.
- The length of WX depends on the precise location of point X, which isn't specified in the problem.

This detailed breakdown underscores the importance of clarity in problem statements and the utility of the distance formula in coordinate geometry. Mastery of these techniques enables you to analyze geometric figures more effectively, solve complex problems, and develop a deeper understanding of spatial relationships in the Cartesian plane.

Final Tips

- Always clarify point coordinates before calculations.
- Remember the symmetry of the distance formula.
- Use visual sketches to aid understanding.
- When points are missing or ambiguous, check problem context or assumptions.

By practicing these calculations routinely, you'll strengthen your geometric intuition and mathematical precision, essential skills in both academic and real-world applications.

What Is The Length Of Lines Uv Vw Wx And Vu When The Points U 7 9 V 0 5 W 6 3 U 7 9 V 0 5 W 6 3

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