A Polygon Has Its Vertices At The Following Points.(2,5), (4,7), (7,7) And (9,5) What Is The Name Of

A Polygon Has Its Vertices At The Following Points.(2,5), (4,7), (7,7) And (9,5) What Is The Name Of this polygon? This question invites us to explore fundamental concepts in geometry, particularly the classification and properties of polygons based on their vertices. Understanding the shape formed by these specific points involves analyzing their coordinates, plotting them, and examining how they connect to form a particular type of polygon. In this comprehensive article, we will delve into the steps to identify the shape, explore the properties of polygons, and clarify how to determine the name of a polygon given its vertices.

Understanding the Coordinates and Plotting the Points

What Are Coordinates in Geometry?

Coordinates are numerical values that specify the position of a point in a two-dimensional space. The format (x, y) indicates the point's horizontal and vertical position relative to a fixed origin, typically (0, 0). In our case, the points are:
- (2, 5)
- (4, 7)
- (7, 7)
- (9, 5)

Plotting these points on a coordinate plane helps visualize the shape they form.

Plotting the Points

To visualize:
- Draw two perpendicular axes: the x-axis (horizontal) and y-axis (vertical).
- Mark the points:
- (2, 5): 2 units right of the origin, 5 units up.
- (4, 7): 4 units right, 7 units up.
- (7, 7): 7 units right, 7 units up.
- (9, 5): 9 units right, 5 units up.

Connecting these points in order will help determine the shape.

Connecting the Points: Visualizing the Polygon

Drawing the Polygon

Connect the points sequentially:
- From (2, 5) to (4, 7)
- From (4, 7) to (7, 7)
- From (7, 7) to (9, 5)
- From (9, 5) back to (2, 5)

This forms a closed figure with four sides.

Observing the Shape

By examining the connections:
- The top side runs from (4, 7) to (7, 7), which is horizontal.
- The bottom side runs from (2, 5) to (9, 5), also horizontal.
- The sides connecting these are sloped, forming a quadrilateral.

This shape appears to be a quadrilateral with two horizontal parallel sides, suggesting it could be a trapezoid or parallelogram.

Analyzing the Shape’s Properties

Determining Side Lengths

Calculating the lengths of sides using the distance formula:

Distance between points (x_1, y_1) and (x_2, y_2):
$$ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} $$

Calculations:
- Side 1: (2, 5) to (4, 7)
$$ d_1 = \sqrt{(4 - 2)^2 + (7 - 5)^2} = \sqrt{2^2 + 2^2} = \sqrt{4 + 4} = \sqrt{8} \approx 2.83 $$
- Side 2: (4, 7) to (7, 7)
$$ d_2 = \sqrt{(7 - 4)^2 + (7 - 7)^2} = \sqrt{3^2 + 0} = 3 $$
- Side 3: (7, 7) to (9, 5)
$$ d_3 = \sqrt{(9 - 7)^2 + (5 - 7)^2} = \sqrt{2^2 + (-2)^2} = \sqrt{4 + 4} = \sqrt{8} \approx 2.83 $$
- Side 4: (9, 5) to (2, 5)
$$ d_4 = \sqrt{(2 - 9)^2 + (5 - 5)^2} = \sqrt{(-7)^2 + 0} = 7 $$

Observations:
- Opposite sides (1 and 3) are equal in length (~2.83).

- Side 2 and side 4 are different lengths (3 and 7).

Assessing Parallel Sides

Calculate the slopes to determine if any sides are parallel:

- Slope of (2, 5) to (4, 7):
$$ m_1 = \frac{7 - 5}{4 - 2} = \frac{2}{2} = 1 $$
- Slope of (4, 7) to (7, 7):
$$ m_2 = \frac{7 - 7}{7 - 4} = 0 $$
- Slope of (7, 7) to (9, 5):
$$ m_3 = \frac{5 - 7}{9 - 7} = \frac{-2}{2} = -1 $$
- Slope of (9, 5) to (2, 5):
$$ m_4 = \frac{5 - 5}{2 - 9} = 0 $$

Since sides (4,7) to (7,7) and (9,5) to (2,5) both have a slope of 0, they are horizontal and parallel.

Thus, the shape has at least one pair of parallel sides—indicating it could be a trapezoid or parallelogram.

Summary of properties:
- Parallel sides: (4,7) to (7,7) and (2,5) to (9,5).
- Opposite sides are not equal in length, but the parallel sides are.

Identifying the Shape: What Type of Polygon Is It?

Classification Based on Sides and Angles

Given the properties:
- Quadrilateral
- Two sides are parallel (top and bottom)
- The other two sides are not necessarily parallel and are of different lengths

This strongly suggests the shape is a trapezoid (also called a trapezoid in American English or a trapezium in British English).

What Is a Trapezoid?

A trapezoid is a four-sided polygon with exactly one pair of parallel sides. The parallel sides are called bases, and the non-parallel sides are called legs. The shape in question fits this description because:
- It has two parallel sides: the top from (4,7) to (7,7) and the bottom from

(2,5) to (9,5).
- The non-parallel sides are (2,5) to (4,7) and (7,7) to (9,5), which are non-equal in length and have slopes of 1 and -1, respectively.

Therefore, the shape formed by these four points is a trapezoid.

Additional Considerations and Variations

Is It a Right Trapezoid?

A right trapezoid has at least one right angle. To check, assess the slopes of the sides meeting at each vertex:
- At (4,7), the sides are from (2,5) to (4,7) and from (4,7) to (7,7). The slopes are 1 and 0, respectively. Since the slopes are negative reciprocals (1 and 0 are not), the angles are not right angles.
- Similarly, at (7,7), the sides are from (4,7) to (7,7) and from (7,7) to (9,5). Their slopes are 0 and -1, which are perpendicular (since their product is -1). Thus, there is a right angle at (7,7).

Hence, this trapezoid is an isosceles trapezoid with one right angle at (7,7).

The Significance of Identifying the Shape

Knowing the specific type of polygon helps in calculating its area, perimeter, and understanding its properties better. For instance:
- Area of a trapezoid:
$$ \text{Area} = \frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height} $$
- Perimeter: Sum of all four side lengths.

Understanding these properties is crucial in practical applications like architecture, engineering, and computer graphics.

Conclusion: The Name of the Polygon

Based on the analysis of the vertices (2,5), (4,7), (7,7), and (9,5), the figure they form is a trapezoid. The shape features exactly one pair of parallel sides—horizontal in this case—and the other two sides are non-parallel, sloped, and of different lengths. Recognizing such

Frequently Asked Questions

What is the shape formed by the points (2,5), (4,7), (7,7), and (9,5)?

The shape is a trapezoid because it has one pair of parallel sides.

Are the points (2,5), (4,7), (7,7), and (9,5) vertices of a square or rectangle?

No, these points do not form a square or rectangle; they form a trapezoid.

How can we determine the type of polygon formed by these four points?

By plotting the points and analyzing the lengths of sides and angles, we find that it forms a trapezoid due to one pair of parallel sides.

What is the significance of the points (2,5), (4,7), (7,7), and (9,5) in identifying the polygon?

These points serve as the vertices that define the shape, which, when connected, form a trapezoid.

Is the polygon formed by these points convex or concave?

The polygon is convex because all interior angles are less than 180 degrees and the vertices are outward.

Additional Resources

Polygon Identification and Analysis: A Comprehensive Exploration of Vertices (2,5), (4,7), (7,7), and (9,5)

Introduction

Understanding the nature of geometric figures is a fundamental aspect of mathematics, particularly in the study of polygons. When given a set of vertices, the task of identifying the specific type of polygon they form involves careful analysis of their coordinates, shape, and properties. In this article, we delve deep into the question: What is the name of the polygon with vertices at (2,5), (4,7), (7,7), and (9,5)? Through systematic examination of the vertices, their arrangement, and geometric principles, we aim to provide a clear, detailed answer that not only identifies the polygon but also explores its characteristics.

Overview of the Given Vertices

Let's first restate the vertices for clarity:

- $A = (2, 5)$
- $B = (4, 7)$
- $C = (7, 7)$
- $D = (9, 5)$

These four points are plotted on a Cartesian coordinate plane, forming the basis for our analysis. The primary goal is to determine the nature of the polygon they form—whether it's a rectangle, square, parallelogram, trapezoid, or some other quadrilateral.

Step 1: Plotting and Visualizing the Points

Before diving into calculations, visual intuition is essential. Plotting these points on a coordinate grid reveals the following:

- Points A and D are both at a y-coordinate of 5.
- Points B and C are both at a y-coordinate of 7.
- The x-coordinates increase from 2 to 9, creating a shape that appears to be a quadrilateral.

This preliminary visualization suggests the points could form a shape resembling a trapezoid or parallelogram, but we need precise calculations to confirm.

Step 2: Calculating the Distances Between Vertices

To understand the shape's sides, we compute the distances between consecutive vertices. Using the distance formula:

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

Side AB:

$$
AB = \sqrt{(4 - 2)^2 + (7 - 5)^2} = \sqrt{2^2 + 2^2} = \sqrt{4 + 4} = \sqrt{8} \approx 2.83
$$

Side BC:

$$
BC = \sqrt{(7 - 4)^2 + (7 - 7)^2} = \sqrt{3^2 + 0^2} = \sqrt{9} = 3
$$

Side CD:

$$
CD = \sqrt{(9 - 7)^2 + (5 - 7)^2} = \sqrt{2^2 + (-2)^2} = \sqrt{4 + 4} = \sqrt{8} \approx 2.83
$$

Side DA:

$$
DA = \sqrt{(9 - 2)^2 + (5 - 5)^2} = \sqrt{7^2 + 0^2} = \sqrt{49} = 7
$$

Step 3: Analyzing Side Lengths and Opposite Sides

From the calculations:

Side	Length	Notes
AB	≈ 2.83	Equal in length to CD
BC	3	Slightly longer than AB and CD
CD	≈ 2.83	Same as AB
DA	7	Significantly longer

Observation:

- Opposite sides AB and CD are equal in length.
- Sides AB and CD are shorter than DA.
- Side BC is slightly longer than AB and CD, indicating the shape isn't a perfect rectangle or square, but potentially a trapezoid.

Step 4: Determining Parallelism of Sides

To classify the polygon precisely, we need to analyze the slopes of the sides. Parallel sides have identical slopes, so calculating the slopes helps us identify whether the shape is a trapezoid, parallelogram, or rectangle.

The slope formula:

$$
m = \frac{y_2 - y_1}{x_2 - x_1}
$$

Slope of AB:

$$
m_{AB} = \frac{7 - 5}{4 - 2} = \frac{2}{2} = 1
$$

Slope of BC:

$$
m_{BC} = \frac{7 - 7}{7 - 4} = \frac{0}{3} = 0
$$

Slope of CD:

$$
m_{CD} = \frac{5 - 7}{9 - 7} = \frac{-2}{2} = -1
$$

Slope of DA:

$$
m_{DA} = \frac{5 - 5}{9 - 2} = \frac{0}{7} = 0
$$

Now, check for parallel sides:

- AB and CD: slopes are 1 and -1, respectively — not parallel.
- BC and DA: slopes are 0 and 0 — parallel.

Conclusion:

- Sides BC and DA are parallel.
- Sides AB and CD are not parallel, but have different slopes.

Thus, the shape is a quadrilateral with one pair of parallel sides—a characteristic of a trapezoid.

Step 5: Confirming the Shape as a Trapezoid

Based on the slopes and side lengths, the figure appears to be an isosceles trapezoid, given that:

- It has exactly one pair of parallel sides (BC and DA)
- The non-parallel sides (AB and CD) are equal in length (~2.83 units), which is characteristic of an isosceles trapezoid.

Additional verification:

- Are the non-parallel sides equal? Yes, AB and CD both measure

approximately 2.83 units.
- Are the bases parallel? Sides BC and DA are parallel, with slopes 0, indicating horizontal bases.

What Is the Name of the Polygon?

Considering all the above analysis, the polygon formed by points $(2,5)$, $(4,7)$, $(7,7)$, and $(9,5)$ is a trapezoid, specifically an isosceles trapezoid.

Summary:

- It is a quadrilateral because it has four sides.
- It has exactly one pair of parallel sides (BC and DA).
- The non-parallel sides (AB and CD) are equal, indicating symmetry.

In-Depth Features and Properties of This Polygon

Geometric Characteristics

- Vertices Coordinates:

Vertex	Coordinates
A	(2, 5)
B	(4, 7)
C	(7, 7)
D	(9, 5)

- Type: Isosceles trapezoid

- Properties:
- One pair of parallel sides (BC and DA)
- Equal non-parallel sides (AB and CD)
- Symmetric about the perpendicular bisector of the bases

Area Calculation

To determine the area, we need the lengths of the bases and the height.

- Base 1 (BC):

$$
BC = 3
$$

- Base 2 (DA):

$$
DA = 7
$$

- Height (h):

Since BC and DA are horizontal (slopes 0), the height is the difference in y-coordinates:

$$
h = 7 - 5 = 2
$$

- Area Formula for Trapezoid:

$$
\text{Area} = \frac{1}{2} \times (\text{Base}_1 + \text{Base}_2) \times \text{height}
$$

$$
\text{Area} = \frac{1}{2} \times (3 + 7) \times 2 = \frac{1}{2} \times 10 \times 2 = 10
$$

Result: The area of the polygon is 10 square units.

Conclusion and Final Remarks

Through meticulous analysis of the vertices' coordinates, side lengths, and

A Polygon Has Its Vertices At The Following Points 2 5 4 7 7 7 And 9 5 What Is The Name Of

A Polygon Has Its Vertices At The Following Points 2 5 4 7 7 7 And 9 5 What Is The Name Of

Related Articles

- A Recent Survey Identified The Top Accounting Firms Within 10 Geographical Regions Across Country X.
- (PLEASE HELP) How Does Paragraph 9 Develop The Authors Purpose Of Exploring The Origin Of Rock-a-Bye
- 10. [0/10 Points) Content Material Aluminum Brass Concreta Copper Class Gold Iron Lead Nickel Silver

Back to Home