30 POINTS. Given ABC With Coordinates A(−6,1), B(4,1), And C(4,−3). The Ordered Pair (9,y) Is On The

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Understanding the Problem: Coordinates and Geometric Context

When analyzing problems involving points and coordinates in the Cartesian plane, it's essential to comprehend the fundamental concepts of the coordinate system, lines, and how points relate to geometric figures such as triangles. The problem involves three given points — A(−6,1), B(4,1), and C(4,−3) — forming a triangle, and asking about the position of an ordered pair (9, y) on a specific geometric figure associated with these points.

In this case, the key objectives are to:

- Understand the nature of triangle ABC.
- Determine the equation of lines passing through the given points.
- Find the value of y for the point (9, y) that lies on a particular line or boundary related to triangle ABC.
- Explore the geometric relationships involved, such as line segments, slopes, and possibly the concept of line equations or the triangle's sides.

This comprehensive analysis will guide us through the steps necessary to find the value of y for the point (9, y) and understand its position relative to triangle ABC.

Analyzing the Coordinates of Triangle ABC

Plotting and Visualizing the Triangle

Given points:

- A(−6, 1): Located 6 units to the left of the origin, at a height of 1.
- B(4, 1): Located 4 units to the right of the origin, at the same height as A.
- C(4, −3): Located directly below B, 4 units to the right of the origin and 3 units below the x-axis.

Plotting these points:

- A is on the line y = 1, at x = -6.
- B is on the line y = 1, at x = 4.
- C is at x = 4, y = -3.

The figure formed by these points is a triangle with a base along the line segment AB and a vertex C below B and A.

Identifying the Triangle Sides

The sides of triangle ABC are:

1. AB: Connects points A(-6,1) and B(4,1). Since both have y = 1, AB is a horizontal line segment.
2. AC: Connects A(-6,1) and C(4,-3).
3. BC: Connects B(4,1) and C(4,-3). Since both have x = 4, BC is a vertical line segment.

Understanding the sides:

- AB is horizontal at y=1, spanning from x=-6 to x=4.
- BC is vertical at x=4, spanning from y=1 down to y=-3.
- AC is sloped, connecting A(-6,1) to C(4,-3).

Finding the Equations of Triangle Sides

To analyze where the point (9, y) lies relative to these lines, we need their equations.

Equation of Line AB

Since points A and B share y=1:

- Line AB: y = 1

It’s a horizontal line. Any point with y=1 lies on AB.

Equation of Line BC

Points:

- B(4,1)
- C(4,-3)

Since x=4 for both points:

- Line BC: x = 4

Any point with x=4 lies on BC.

Equation of Line AC

Points:

- A(−6,1)
- C(4,−3)

Calculate the slope (m):

$$
m_{AC} = \frac{-3 - 1}{4 - (-6)} = \frac{-4}{10} = -\frac{2}{5}
$$

Equation of line AC using point A(−6,1):

$$
y - 1 = -\frac{2}{5}(x - (-6))
$$

Simplify:

$$
y - 1 = -\frac{2}{5}(x + 6)
$$

$$
y - 1 = -\frac{2}{5}x - \frac{12}{5}
$$

Add 1 to both sides:

$$
y = -\frac{2}{5}x - \frac{12}{5} + 1
$$

Express 1 as 5/5:

$$
y = -\frac{2}{5}x - \frac{12}{5} + \frac{5}{5} = -\frac{2}{5}x - \frac{7}{5}
$$

Equation of AC:

$$
\boxed{ y = -\frac{2}{5}x - \frac{7}{5} }
$$

Determining the Position of the Point (9, y)

The question asks: "The Ordered Pair (9, y) Is On The..." — likely on a specific line or boundary associated with triangle ABC.

To find y for the point (9, y), we analyze whether (9, y) lies on any of the lines or inside the triangle.

Evaluating the Line Equations at x=9

- For the line AB (y=1):

At x=9:

$$
\text{y} = 1
$$

- For the line AC:

$$
y = -\frac{2}{5}(9) - \frac{7}{5} = -\frac{18}{5} - \frac{7}{5} = -\frac{25}{5} = -5
$$

- For line BC (x=4):

Since x=9 ≠ 4, the point is not on BC.

Locating the Point (9, y) Relative to Triangle ABC

Given that the x-coordinate is 9 (which is greater than 4), the point (9, y) lies to the right of the triangle's vertices B and C.

To determine whether (9, y) is inside the triangle, on its boundary, or outside, examine the position relative to the sides.

Position relative to line AB (y=1):

- Since the point has x=9, the y-coordinate of any point on AB at x=9 is 1.
- For (9, y), if y=1, it lies exactly on AB.

Position relative to line AC: y = − (2/5) x − 7/5

At x=9:

$$
y = -\frac{2}{5} \times 9 - \frac{7}{5} = -\frac{18}{5} - \frac{7}{5} = -\frac{25}{5} = -5
$$

- The point (9, y) will be above or below this line depending on y's value.

- Since the line AC at x=9 is y = −5, any point with y > −5 is above the line AC, and y < −5 is below.

Analyzing the region where (9, y) might lie

- If y > 1: The point is above AB.
- If y < −5: The point is below AC at x=9.

The triangle ABC occupies the region between:

- y=1 (line AB)
- y=-\frac{2}{5} x - \frac{7}{5} (line AC)
- x between −6 and 4 (for the base and side BC)

Since at x=9, the line AC is at y=−5, the region of the triangle extends only up to x=4. Beyond x=4, the interior of the triangle does not exist. Therefore, the point (9, y) is outside the triangle.

Interpreting the Meaning of the Question

Given the problem's wording, it seems to focus on the line or boundary that the point (9, y) lies on, relative to triangle ABC.

Possible interpretations include:

- The point (9, y) lies on the extension of side AC or AB.
- The point is on a line passing through the triangle.
- The question aims to find the specific y-value for the point (9, y) to lie on a boundary like the extension of AC.

Based on the previous calculations:

- To lie on the extension of AC at x=9, y must be −5.
- To lie on the extension of AB at x=9, y=1.

Conclusion: The Position of (9, y) on the Triangle or Its Boundary

Considering the calculations:

- The point (9, y) lies on the extension of line AC when y = −5.
- The point (9, y) lies on the extension of line AB when y=1.

Since the x-value is beyond the maximum x (which is 4) of the triangle, the point is outside the triangle itself but can be on the extended line AC at y=−5.

Therefore:

- The ordered pair

Frequently Asked Questions

What is the equation of the line passing through points B(4,1) and C(4,−3)?

The line is vertical with equation x = 4.

How do you determine the value of y for the point (9,y) on the line passing through points B and C?

Since the line x = 4 is vertical, the point (9,y) is not on the same line because its x-coordinate is 9, different from 4.

Is the point (9,y) on the line segment connecting A(−6,1), B(4,1), and C(4,−3)?

No, because the line segment between B and C is vertical at x=4, and (9,y) has x=9, which is outside this segment.

What is the significance of the coordinates A(−6,1), B(4,1), and C(4,−3) in the context of the question?

They define a triangle with points at specific locations, and the question involves determining if (9,y) lies on a specific line or segment related to these points.

Can the point (9,y) be on the same horizontal line as point B? Why or why not?

No, because point B is at y=1, and (9,y) would need to have y=1 to be on that same horizontal line, but the question does not specify y=1, so y can be any value.

Given that B(4,1) and C(4,−3) are on the same vertical line, what is the range of y-values for points on segment BC?

The y-values range from −3 to 1, inclusive, since those are the y-coordinates of points B and C.

Why is the point (9,y) not on the line segment between B and C?

Because the segment is vertical at x=4, and (9,y) has x=9, which lies outside the segment's x-range.

What is the key to determining whether (9,y) lies on the line defined by points A, B, or C?

The key is to check whether (9,y) satisfies the equation of the line passing

through these points; in this case, since x=9 is different from the x-coordinates of B and C, it is not on the same line.

Additional Resources

30 POINTS. Given ABC With Coordinates A(-6,1), B(4,1), And C(4,-3). The Ordered Pair (9,y) Is On The

Understanding the properties of triangles and their associated coordinate geometry is fundamental in mathematics, especially in topics such as analytic geometry, coordinate plane analysis, and problem-solving involving points and lines. The problem at hand involves a triangle ABC with vertices at specific coordinate points and an inquiry about the position and nature of a point (9, y) relative to this triangle. This detailed review aims to dissect the problem, analyze the geometric configurations, explore the methods to find the value of y, and discuss the broader concepts related to this scenario.

Analyzing Triangle ABC with Coordinates A(-6,1), B(4,1), and C(4,-3)

Understanding the Coordinate Points

The triangle ABC is defined by three vertices:

- Point A at (-6, 1)
- Point B at (4, 1)
- Point C at (4, -3)

This configuration presents a right triangle with specific characteristics:

- The points A and B share the same y-coordinate (1), indicating a horizontal line segment AB.
- The points B and C share the same x-coordinate (4), indicating a vertical line segment BC.

Features and Observations:

- Horizontal side AB: since y-coordinates are equal, AB is a horizontal segment from (-6, 1) to (4, 1).
- Vertical side BC: since x-coordinates are equal, BC is a vertical segment from (4, 1) to (4, -3).
- The third side, AC, connects points (-6, 1) and (4, -3), forming a sloped line.

Calculating side lengths:

- Length of AB = |x2 - x1| = |4 - (-6)| = 10 units.
- Length of BC = |y2 - y1| = |1 - (-3)| = 4 units.
- Length of AC can be found using the distance formula:

$$
AC = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(4 - (-6))^2 + (-3 - 1)^2} = \sqrt{10^2 + (-4)^2} = \sqrt{100 + 16} = \sqrt{116} \approx 10.77
$$

This analysis shows that triangle ABC is a scalene triangle with sides roughly 10, 4, and 10.77 units.

Locating the Point (9, y) on the Coordinate Plane

Interpreting the Problem Statement

The problem states: "The ordered pair (9, y) is on the..." and likely refers to the line or region associated with triangle ABC. The typical interpretations include:

- The point (9, y) lies on one of the sides of triangle ABC.
- The point (9, y) is inside or outside the triangle.
- The point lies on a specific line related to the triangle, such as an extension of a side or an altitude.

Given the context, the most common assumption is that (9, y) lies on a line associated with the triangle, perhaps on the extension of side AC or on the line passing through the triangle.

Why focus on x=9?

- The x-coordinate is 9, which is outside the x-range of the triangle, since the triangle's x-coordinates are from −6 to 4.
- This indicates that (9, y) is to the right of point B and C, possibly lying on an extension of side AC or on a line passing through the triangle.

Finding the Corresponding y-value for x=9

To determine the value of y for the point (9, y), we need to identify the line on which this point lies. Since the x-coordinate is outside the range of the triangle's vertices, it suggests that the point is on the extension of a side, most likely side AC.

Step 1: Find the equation of line AC

Points:

- A(−6, 1)
- C(4, −3)

Calculate the slope (m):

$$
m_{AC} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{4 - (-6)} = \frac{-4}{10} = -\frac{2}{5}
$$

Equation of line AC in point-slope form:

$$
y - y_1 = m (x - x_1)
$$

Using point A(−6, 1):

$$
y - 1 = -\frac{2}{5} (x + 6)
$$

Simplify:

$$
y = 1 - \frac{2}{5} (x + 6)
$$

Distribute:

$$
y = 1 - \frac{2}{5}x - \frac{12}{5}
$$

Express as a single fraction:

$$
y = \frac{5}{5} - \frac{2}{5}x - \frac{12}{5} = \frac{5 - 12 - 2x}{5} = \frac{-7 - 2x}{5}
$$

Step 2: Find y when x=9

$$
y = \frac{-7 - 2(9)}{5} = \frac{-7 - 18}{5} = \frac{-25}{5} = -5
$$

Result:

The point (9, −5) lies on the extension of side AC.

Conclusion:

- The ordered pair (9, y) on the extension of side AC corresponds to y = −5.

Geometric Implications and Context

Position of the Point (9, -5)

The point (9, -5) lies to the right of the triangle, on the extension of side AC. Given the slope and the extension, this point is outside the triangle but aligned along the same line as AC extended beyond point C.

Key features:

- Lies on the same straight line as side AC.
- Located to the right of point C, the endpoint of side AC.
- Has a y-coordinate of -5, which is below point C (-3), indicating the line continues downward.

Relation to Triangle ABC

This point's location illuminates several geometric concepts:

- Line extensions: Understanding how lines extend beyond their segments.
- Collinearity: Confirming that points A, C, and (9, -5) are collinear.
- Region considerations: Since x=9 is outside the x-bounds of the triangle, the point is outside the triangle's interior.

Broader Concepts and Applications

Coordinate Geometry Techniques

This problem exemplifies key methods in coordinate geometry:

- Calculating slopes to find line equations.
- Using point-slope form to derive line equations.
- Extending lines beyond segment endpoints.
- Substituting x-values into line equations to find corresponding y-values.

Advantages:

- Precise calculations.
- Clear geometric visualization.
- Ability to analyze points outside the triangle's immediate vertices.

Limitations:

- Assumes straight-line extensions.
- May not reflect the actual region (inside/outside) unless explicitly checked.

Applications in Real-World Contexts

Understanding how to extend lines and find points along them is crucial in

various fields:

- Engineering: Designing components and analyzing structural extensions.
- Navigation: Extending paths and routes beyond direct waypoints.
- Computer Graphics: Rendering extended lines and understanding object boundaries.

Pros and Cons of the Approach

Pros:

- Provides a systematic way to determine the position of points relative to geometric figures.
- Uses algebraic methods that are straightforward and reproducible.
- Clarifies the relationship between points and lines in the coordinate plane.

Cons:

- Assumes linear extension without considering curvature or other geometric complexities.
- May oversimplify in cases where the figure is not purely linear.
- Requires understanding of slope and line equations, which might be challenging for beginners.

Summary and Final Thoughts

The problem involving triangle ABC with vertices at A(−6, 1), B(4, 1), and C(4, −3), along with the point (9, y), provides a rich context to explore coordinate geometry concepts. By deriving the equation of side AC and extending it to x=9, we find that y = −5, indicating that the point (9, −5) is on the extension of side AC beyond point C.

This analysis highlights the importance of understanding line equations, slopes, and how points relate to geometric figures in the coordinate plane. The approach exemplifies the power of algebraic methods in geometry, enabling precise determination of point locations, extensions, and relationships.

Overall, this problem demonstrates foundational skills in coordinate geometry that are widely applicable across mathematics and related fields. It encourages critical thinking about line extensions, collinearity, and the spatial relationships within geometric figures, fostering a deeper understanding of the coordinate plane's structure.

In conclusion, the ordered pair (9, y) on the extension of side

30 Points Given Abc With Coordinates A 6 1 B 4 1 And C 4 3 The Ordered Pair 9 Y Is On The

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