

3. What Is The Perimeter Of P Q R ? Show Your Work. Answer=___

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Understanding the Concept of Perimeter

The perimeter of a geometric figure is the total length of its boundary or outer edge. In simpler terms, it's the distance around the figure. Calculating the perimeter is fundamental in geometry as it helps in understanding the size and scope of various shapes, especially polygons like triangles, rectangles, and other multi-sided figures.

In the context of the triangle P Q R, the perimeter involves summing up the lengths of its three sides: P Q, Q R, and R P. Before diving into calculations, it's important to understand what information we have about these sides and how to approach the problem systematically.

Deciphering the Triangle P Q R

Suppose you are given the coordinates of the points P, Q, and R in a coordinate plane. For example:

- P at (x_1, y_1)
- Q at (x_2, y_2)
- R at (x_3, y_3)

Alternatively, you might have the lengths of sides directly, or some angles and other measurements. The method to find the perimeter depends on the data provided.

Common Data Scenarios:

1. Coordinates of the vertices: $P(x_1, y_1)$, $Q(x_2, y_2)$, $R(x_3, y_3)$
2. Side lengths: $PQ = a$, $QR = b$, $RP = c$
3. Angles and sides: Using Law of Cosines or Law of Sines

For the purpose of this article, we'll focus on the coordinate method, which is widely applicable and often used in coordinate geometry problems.

Calculating the Lengths of the Sides

If the coordinates of the points are known, the length of each side can be calculated using the distance formula:

$$\text{Distance between two points } (X_1, Y_1) \text{ and } (X_2, Y_2) = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2}$$

This formula derives from the Pythagorean theorem and allows us to find the straight-line distance between any two points in the plane.

Step-by-step example:

Suppose the points are:

- P at (2, 3)
- Q at (7, 7)
- R at (4, 1)

Let's find the lengths of P Q, Q R, and R P.

1. Length of P Q

$$PQ = \sqrt{(7 - 2)^2 + (7 - 3)^2} = \sqrt{5^2 + 4^2} = \sqrt{25 + 16} = \sqrt{41} \approx 6.40$$

2. Length of Q R

$$QR = \sqrt{(4 - 7)^2 + (1 - 7)^2} = \sqrt{(-3)^2 + (-6)^2} = \sqrt{9 + 36} = \sqrt{45} \approx 6.71$$

3. Length of R P

$$RP = \sqrt{(2 - 4)^2 + (3 - 1)^2} = \sqrt{(-2)^2 + 2^2} = \sqrt{4 + 4} = \sqrt{8} \approx 2.83$$

Summing the sides gives the perimeter:

$$\text{Perimeter} = PQ + QR + RP \approx 6.40 + 6.71 + 2.83 = 16.94$$

Thus, the perimeter of triangle P Q R is approximately 16.94 units.

General Formula and Approach

In a more formal sense, if the coordinates are known, the perimeter P is:

$$P = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} + \sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2} + \sqrt{(x_1 - x_3)^2 + (y_1 - y_3)^2}$$

This formula can be applied to any triangle in the coordinate plane to find its perimeter.

Importance of Accurate Work and Showing Your Work

When solving geometric problems, especially in educational settings, showing your work clearly is crucial. It demonstrates your understanding of the concepts, allows teachers or examiners to follow your reasoning, and helps you identify any mistakes.

Steps to show your work effectively:

- Write down the coordinates clearly.
- State the distance formula you are using.
- Show each step of the calculation explicitly.
- Sum up the side lengths carefully.
- Use appropriate units and rounding.

Alternative Methods for Different Data Sets

If you do not have coordinate data but have side lengths or angles, different methods are used:

Using Side Lengths:

- Simply add the three side lengths:

$$\text{Perimeter} = a + b + c$$

Using Angles and Law of Cosines:

- If two sides and the included angle are known, Law of Cosines helps find the third side:

$$c^2 = a^2 + b^2 - 2ab \cos C$$

- Once all sides are known, add them up.

For example:

Suppose you know:

- $PQ = 5$ units
- $QR = 7$ units
- $RP = 8$ units

Then,

$$\text{Perimeter} = 5 + 7 + 8 = 20 \text{ units}$$

Conclusion: Putting It All Together

Determining the perimeter of triangle PQR involves understanding the shape's dimensions and applying appropriate formulas. Whether through coordinate geometry, side lengths, or angles, the core idea remains: sum all the side lengths.

Final Answer Format:

Once you've calculated the total length of sides, you can write:

Answer = [total perimeter in units]

For example:

Answer = 16.94 units

or rounded appropriately depending on the context.

Additional Tips for Students

- Always double-check your calculations, especially when working with square roots.
- Use a calculator for complex square root calculations to ensure accuracy.
- Keep your work organized to avoid mistakes and to make your reasoning clear.
- Understand the significance of each step; don't just perform calculations blindly.

Summary

In summary, finding the perimeter of triangle PQR involves:

1. Identifying the coordinates or side lengths.
2. Applying the distance formula for coordinate points.
3. Calculating each side's length carefully.
4. Adding all three side lengths together to find the perimeter.
5. Presenting your work clearly and accurately.

By mastering these steps, you'll confidently solve perimeter problems for various triangles and other polygons, enhancing your overall understanding of geometry.

If specific coordinate points or side lengths are provided, I can help you perform the calculations step-by-step for a precise answer.

Frequently Asked Questions

What is the formula to find the perimeter of triangle PQR?

The perimeter of triangle PQR is the sum of the lengths of its sides: $P + Q + R$.

If the sides of triangle PQR are known as $P = 5$ cm, $Q = 7$ cm, and $R = 9$ cm, what is its perimeter?

Perimeter = $5 + 7 + 9 = 21$ cm. So, the answer is 21 cm.

How do you calculate the perimeter of a triangle when only two side lengths are given?

You need the length of the third side to find the perimeter. Add all three side lengths together.

Can the perimeter of triangle PQR be calculated without knowing all side lengths?

No, the perimeter requires knowing the lengths of all three sides. Without all sides, it cannot be accurately calculated.

Why is it important to show your work when calculating the perimeter of PQR?

Showing work demonstrates the steps taken, helps verify accuracy, and clarifies the calculation process.

If one side of triangle PQR is increased, how does that affect the perimeter?

Increasing one side length will increase the perimeter by the same amount, assuming other sides remain unchanged.

What is the answer format for the perimeter of PQR in this problem?

The answer should be expressed as a numerical value with units, e.g., 'Answer=___'.

Additional Resources

What Is The Perimeter Of P Q R? Show Your Work. Answer=___ is a common question in geometry that tests your understanding of how to calculate the perimeter of a triangle when given the coordinates or lengths of its sides. Determining the perimeter is a fundamental skill in geometry, and understanding how to approach this problem step-by-step helps build a solid foundation for more advanced mathematical concepts. In this article, we'll explore the process of calculating the perimeter of triangle P Q R in detail, including the use of the distance formula, step-by-step calculations, and tips for ensuring accuracy.

Understanding the Perimeter of a Triangle

Before diving into the specific problem involving triangle P Q R, it is essential to understand what the perimeter of a triangle entails.

What Is the Perimeter?

The perimeter of a triangle is the total length around the figure. It is obtained by summing the lengths of all three sides:

$$\text{Perimeter} = \text{side P Q} + \text{side Q R} + \text{side R P}$$

In coordinate geometry, when the vertices of the triangle are given as points in a coordinate plane, we need to calculate the lengths of each side using the distance formula before summing them.

Step-by-Step Guide to Finding the Perimeter of Triangle P Q R

Step 1: Gather the Coordinates of the Vertices

Suppose the vertices of the triangle P Q R are given as points in the coordinate plane:

- Point P: $((x_1, y_1))$
- Point Q: $((x_2, y_2))$
- Point R: $((x_3, y_3))$

Note: If the problem provides lengths directly, you can skip to adding those lengths. But often, the coordinates are given, and you need to compute side lengths.

Step 2: Use the Distance Formula to Find Each Side Length

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

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

Apply this formula to each pair of vertices:

- Side P Q: between points $((P(x_1, y_1))$ and $((Q(x_2, y_2))$
- Side Q R: between points $((Q(x_2, y_2))$ and $((R(x_3, y_3))$
- Side R P: between points $((R(x_3, y_3))$ and $((P(x_1, y_1))$

Step 3: Calculate Each Side Length

Let's illustrate with an example:

Suppose:

- $((P(2, 3))$
- $((Q(5, 7))$
- $((R(9, 2))$

Calculate each side:

- PQ:

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

- QR:

$$d_{QR} = \sqrt{(9 - 5)^2 + (2 - 7)^2} = \sqrt{4^2 + (-5)^2} = \sqrt{16 + 25} = \sqrt{41} \approx 6.40$$

- RP:

$$d_{RP} = \sqrt{(2 - 9)^2 + (3 - 2)^2} = \sqrt{(-7)^2 + 1^2} = \sqrt{49 + 1} = \sqrt{50} \approx 7.07$$

\]

Step 4: Sum the Lengths to Find the Perimeter

Now, add the side lengths:

\[

$$\text{Perimeter} = d_{PQ} + d_{QR} + d_{RP} = 5 + 6.40 + 7.07 \approx 18.47$$

\]

Answer: The perimeter of triangle P Q R is approximately 18.47 units.

Additional Tips for Accurate Calculations

- Double-check your coordinate substitutions: Ensure you are plugging in the correct points.
- Use a calculator for square roots: To avoid errors, especially with square roots of non-perfect squares.
- Round appropriately: Decide on a decimal place consistent with the problem's context.
- Label all steps: This helps avoid confusion and makes your work clear.

Common Scenarios and Variations

When Coordinates Are Not Given

If only side lengths are provided, simply add them. For example, if:

- $(PQ = 5)$ units
- $(QR = 6.4)$ units
- $(RP = 7.07)$ units

then:

\[

$$\text{Perimeter} = 5 + 6.4 + 7.07 = 18.47 \text{ units}$$

\]

When the Triangle Is Right-Angled or Equilateral

- For an equilateral triangle, all sides are equal, simplifying calculations.
- For a right-angled triangle, you can use Pythagoras' theorem to find missing side lengths if only two are known.

Final Thoughts: Solving for the Perimeter of P Q R

Understanding how to find the perimeter of triangle P Q R requires familiarity with the distance formula and systematic calculation. Whether the vertices are given as coordinates or the side lengths are provided directly, the key is to carefully compute each side's length and then sum them.

Summary

- Identify the vertices' coordinates or given lengths.
- Apply the distance formula to find each side length.
- Add the three side lengths to get the perimeter.
- Use precise calculations and double-check your work for accuracy.

Practice Exercise

Given the points:

- $P(1, 2)$
- $Q(4, 6)$
- $R(7, 2)$

Calculate the perimeter of triangle P Q R.

Solution Approach:

1. Calculate PQ :

$$\sqrt{(4-1)^2 + (6-2)^2} = \sqrt{3^2 + 4^2} = 5$$

2. Calculate QR :

$$\sqrt{(7-4)^2 + (2-6)^2} = \sqrt{3^2 + (-4)^2} = 5$$

3. Calculate RP :

$$\sqrt{(1-7)^2 + (2-2)^2} = \sqrt{(-6)^2 + 0} = 6$$

4. Sum:

$$5 + 5 + 6 = 16$$

Perimeter = 16 units.

Conclusion

Calculating the perimeter of triangle P Q R involves understanding the relationship between the vertices, applying the distance formula thoughtfully, and summing the side lengths. This step-by-step process not only helps find the answer but also strengthens your overall understanding of coordinate geometry principles. Keep practicing with different coordinate sets and problem types to master this essential skill in geometry!

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