

The Perimeter Of An Equilateral Triangle Is 126mm. State The Length Of One Of Its Sides.

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Understanding Equilateral Triangles and Their Properties

An equilateral triangle is a special type of triangle where all three sides are of equal length. This symmetry bestows unique properties that make calculations straightforward, especially when dealing with measurements like perimeter and side length.

Key Features of Equilateral Triangles

- All three sides are equal in length.
- All three interior angles are equal, each measuring 60 degrees.
- The height, median, and angle bisector from any vertex are all the same line, coinciding in the triangle.

Understanding these properties is crucial when solving problems related to equilateral triangles, such as determining the length of one side given the perimeter.

Calculating the Length of One Side from the Perimeter

Given the perimeter of an equilateral triangle, we can easily find the length of one side with a simple formula:

Side length = Perimeter / Number of sides

Since an equilateral triangle has three equal sides, the calculation involves dividing the total perimeter by 3.

Step-by-Step Calculation

1. Identify the total perimeter:

In this case, the perimeter is 126mm.

2. Divide the perimeter by 3:

$$\left(\frac{126\text{mm}}{3} = 42\text{mm} \right)$$

3. Interpret the result:

Each side of the equilateral triangle measures 42mm.

Conclusion: Length of One Side

Based on the calculation, the length of one side of the equilateral triangle with a perimeter of 126mm is 42mm.

Additional Insights into Equilateral Triangle Measurements

Understanding the relationship between perimeter and side length is fundamental, but many other properties are useful, especially in geometric constructions or real-world applications.

Properties of an Equilateral Triangle Related to Side Length

- Area calculation:

The area (A) of an equilateral triangle with side length (s) is given by:

$$A = \frac{\sqrt{3}}{4} s^2$$

- Height (altitude):

The height (h) can be determined by:

$$h = \frac{\sqrt{3}}{2} s$$

- Circumradius (radius of circumscribed circle):

$$R = \frac{s}{\sqrt{3}}$$

- Inradius (radius of inscribed circle):

$$r = \frac{s}{2\sqrt{3}}$$

\]

Using these formulas, you can derive various measurements related to the triangle once the side length is known.

Applications of Equilateral Triangle Measurements

Equilateral triangles are common in various fields, including architecture, engineering, and design. Precise measurements, such as knowing the side length from the perimeter, are essential for:

- Constructing geometric shapes and models.
- Designing structural components that require symmetry.
- Calculating materials needed for manufacturing or construction projects.

Summary

- The perimeter of an equilateral triangle is the total length of its three sides.
- Given a perimeter of 126mm, dividing this by 3 yields the length of each side.
- Each side of the triangle measures 42mm.
- Additional properties like area and heights can be calculated once the side length is known.

Final Thoughts

Understanding the relationship between perimeter and side length in equilateral triangles simplifies many geometric problems. Whether you're a student, engineer, or designer, mastering these basic calculations enhances your ability to work with geometric figures accurately and efficiently.

FAQs

Q1: Can the perimeter of an equilateral triangle be any value?

A1: Yes, the perimeter can be any positive length value; the side length simply scales accordingly.

Q2: How does changing the perimeter affect the side length?

A2: The side length is directly proportional to the perimeter; increasing the perimeter increases the side length proportionally.

Q3: Are all equilateral triangles similar?

A3: Yes, all equilateral triangles are similar because they have the same angles and proportional sides.

Q4: How do I verify if a triangle is equilateral based on measurements?

A4: Measure all three sides; if they are equal within the measurement's tolerance, the triangle is equilateral.

References and Further Reading

- Geometry textbooks on triangle properties
- Online resources on equilateral triangles
- Mathematical formulas for triangle measurements

This comprehensive understanding of the relationship between perimeter and side length in equilateral triangles can significantly aid in various practical and academic applications.

Frequently Asked Questions

What is the length of one side of an equilateral triangle with a perimeter of 126mm?

The length of one side is 42mm.

How do you find the length of one side in an equilateral triangle when the perimeter is known?

Divide the perimeter by 3, since all sides are equal.

If the perimeter of an equilateral triangle is

126mm, what is the formula to find the side length?

Side length = Perimeter $\div$ 3. So, $126\text{mm} \div 3 = 42\text{mm}$.

Why are all sides of an equilateral triangle equal, and how does that relate to perimeter calculation?

By definition, all sides are equal, so the perimeter is three times the length of one side.

Can the side length of an equilateral triangle be fractional if the perimeter is 126mm?

Yes, if the perimeter were not divisible evenly by 3, the side length could be fractional. But here, it's an exact division, so the side length is 42mm.

What is the importance of understanding the perimeter when calculating side lengths of triangles?

The perimeter provides the total length around the triangle, which allows us to determine individual side lengths when the triangle's properties are known.

How does the concept of symmetry in an equilateral triangle simplify perimeter and side length calculations?

Since all sides are equal due to symmetry, dividing the perimeter by 3 directly gives the length of one side.

Is a perimeter of 126mm typical for small or large equilateral triangles?

It is a moderate size; the actual size depends on the context, but 42mm per side is a common measurement for small to medium-sized triangles.

What are some practical applications of calculating side lengths of equilateral triangles?

Applications include design and architecture, manufacturing, and geometry problems where precise measurements are needed.

If the perimeter of an equilateral triangle is increased to 150mm, what would be the new side length?

The new side length would be $150\text{mm} \div 3 = 50\text{mm}$.

Additional Resources

The Perimeter Of An Equilateral Triangle Is 126mm. State The Length Of One Of Its Sides.

Understanding the relationship between the perimeter and the side length of an equilateral triangle is fundamental in geometry. When the perimeter of an equilateral triangle is given, determining the length of one of its sides becomes a straightforward task, provided the properties of equilateral triangles are well understood. This article will guide you through the concepts, formulas, and step-by-step calculations involved in solving such problems, ensuring you grasp both the theoretical and practical aspects involved.

Introduction to Equilateral Triangles

An equilateral triangle is a special type of triangle where all three sides are of equal length, and consequently, all three interior angles are equal, each measuring 60 degrees. These features make equilateral triangles highly symmetrical and easier to analyze mathematically.

Key Properties:

- All sides are equal: $a = b = c$
- All angles are equal: 60° each
- The perimeter is the sum of all three sides: $P = 3 \times \text{side length}$

Understanding the Problem

In this particular problem, we're told:

- The perimeter of the equilateral triangle is 126 mm.
- The goal is to find the length of one side.

This problem exemplifies the direct relationship between perimeter and side length in an equilateral triangle, which can be expressed as:

Side length = Perimeter / 3

Step-by-Step Solution Approach

Step 1: Recall the relationship between perimeter and side length

Since all three sides are equal, the perimeter (P) is:

$$P = 3 \times \text{side length}$$

Step 2: Isolate the side length

To find the side length:

$$\text{side length} = \frac{P}{3}$$

Step 3: Substitute the known perimeter value

Given:

$$P = 126 \text{ mm}$$

Calculating:

$$\text{side length} = \frac{126 \text{ mm}}{3}$$

$$\text{side length} = 42 \text{ mm}$$

Final Answer:

The length of one side of the equilateral triangle is 42 mm.

Broader Context and Applications

Knowing the side length of an equilateral triangle from its perimeter is a fundamental skill with diverse applications across mathematics, engineering, architecture, and design.

Practical Applications:

- Construction & Architecture: Ensuring precise measurements when designing equilateral components or decorative features.
- Manufacturing: Cutting materials into equilateral shapes with specific side lengths.
- Geometry & Trigonometry: Using the side length to compute area, height, medians, and angles.

Extending the Concepts: Calculations Beyond Side Length

Once the side length is known, many other properties of the equilateral triangle can be calculated:

1. Area of the triangle

The area (A) of an equilateral triangle with side length (a) is:

$$A = \frac{\sqrt{3}}{4} a^2$$

Using $(a = 42\text{ mm})$:

$$A = \frac{\sqrt{3}}{4} \times (42)^2$$

$$A = \frac{\sqrt{3}}{4} \times 1764$$

$$A \approx 0.433 \times 1764$$

$$A \approx 763.4\text{ mm}^2$$

2. Height of the triangle

The height (h) of an equilateral triangle is:

$$h = \frac{\sqrt{3}}{2} a$$

Using $(a = 42\text{ mm})$:

$$h = \frac{\sqrt{3}}{2} \times 42$$

$$h \approx 0.866 \times 42$$

$$h \approx 36.4\text{ mm}$$

3. Angles

All interior angles are 60° , a defining characteristic of equilateral triangles.

Visualizing the Triangle

Creating a visual representation helps in understanding the relationships:

- Draw an equilateral triangle with each side measuring 42 mm.
- Mark all three vertices.
- Draw the height from one vertex perpendicular to the opposite side, which will bisect that side into two 21 mm segments.
- Connect the centroid, incenter, and circumcenter, which all coincide in an equilateral triangle, to understand symmetry.

Summary and Key Takeaways

- The perimeter of an equilateral triangle relates directly to its side length: $\text{Side length} = \text{Perimeter} / 3$.
- Given a perimeter of 126 mm, the side length is 42 mm.
- Additional properties such as area and height can be easily derived once the side length is known.
- Equilateral triangles are highly symmetrical, making calculations straightforward.

Final Thoughts

Understanding how to determine the side length from the perimeter is a fundamental skill that extends to numerous geometric problems. Recognizing the unique properties of equilateral triangles simplifies many calculations, making them an excellent starting point for exploring more complex geometric concepts. Whether you're a student, educator, or professional, mastering these basics builds a strong foundation for advanced mathematical reasoning and practical problem-solving.

If you encounter similar problems, remember to:

- Identify the type of triangle.
- Recall the key properties.
- Use the appropriate formulas.
- Substitute the known values carefully.
- Check your calculations for accuracy.

By doing so, you'll develop confidence in solving geometric problems efficiently and accurately.

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