

What Is The Measure Of Angle D F E? Triangle D E F. The Exterior Angle To Angle F Is 142 Degrees. 38

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Understanding the measures of angles within triangles is a fundamental aspect of geometry that often appears in academic exams, standardized tests, and real-world applications. In particular, solving for unknown angles in given triangles involves applying core principles such as the sum of interior angles, the exterior angle theorem, and supplementary angles. This article offers a comprehensive guide to determine the measure of angle DFE in triangle DEF, where the exterior angle to angle F measures 142 degrees, along with an additional detail of 38 degrees that may relate to an interior or exterior angle measurement. Whether you're a student, educator, or enthusiast, this guide will clarify the steps involved in solving this problem and equip you with the necessary knowledge to approach similar geometry challenges confidently.

Understanding Triangle DEF and Its Angles

Before delving into calculations, it is essential to familiarize ourselves with the basic properties of triangle DEF and the relevant angle relationships.

Basic Properties of Triangles

- Sum of Interior Angles: The interior angles of any triangle always sum up to 180 degrees.
- Exterior Angle Theorem: An exterior angle of a triangle is equal to the sum of the two non-adjacent interior angles.
- Supplementary Angles: Adjacent angles formed by a straight line sum up to 180 degrees.

Given Data Explanation

- The exterior angle to angle F measures 142 degrees.
- An additional measure of 38 degrees is provided, which could relate to another angle in the triangle or an exterior angle.

Understanding how these pieces fit together allows us to accurately determine the measure of angle DFE.

Visualizing the Problem: Diagram of Triangle DEF

While a diagram cannot be visually displayed here, imagine the following:

- Triangle DEF with vertices D, E, and F.
- At vertex F, there is an exterior angle (formed by extending side EF beyond F) measuring 142 degrees.
- The interior angles at vertices D, E, and F are labeled accordingly.

This visualization helps in applying the relevant theorems and relationships.

Step-by-Step Solution to Find Angle DFE

Let's proceed systematically to find the measure of angle DFE.

Step 1: Identify Known Angles

- Exterior angle at F: 142° .
- Additional measure: 38° (assumed to be an interior angle or related measure).

Note: Clarification on where the 38° applies is necessary. For the purpose of this problem, we will consider two scenarios:

1. The 38° is the measure of angle E.
2. The 38° is an exterior angle at a different vertex.

The most logical assumption, based on typical problems, is that 38° is the measure of angle E.

Step 2: Applying the Exterior Angle Theorem at Vertex F

The exterior angle theorem states:

> The measure of an exterior angle of a triangle is equal to the sum of the two non-adjacent interior angles.

In triangle DEF, if the exterior angle at F (which extends beyond side EF) is 142° , then:

Exterior Angle at F = Angle D + Angle E

Expressed as:

$$142^\circ = \text{Angle D} + \text{Angle E}$$

Given:

- Angle E = 38°

Calculate:

$$\text{Angle D} = 142^\circ - 38^\circ = 104^\circ$$

Step 3: Find the Remaining Interior Angle DFE

Now that we have:

- Angle D = 104°
- Angle E = 38°

Recall that the sum of interior angles in a triangle is 180° :

$$\text{Angle D} + \text{Angle E} + \text{Angle F} = 180^\circ$$

But wait, the angle at vertex F (interior angle) can be found once we know the exterior angle.

Since the exterior angle at F is 142° , the interior angle at F is:

$$\text{Interior angle at F} = 180^\circ - \text{Exterior angle at F}$$

Calculate:

$$\text{Interior angle at F} = 180^\circ - 142^\circ = 38^\circ$$

Step 4: Confirming the Measures

Now, verify the sum:

- Angle D = 104°
- Angle E = 38°
- Angle F = 38°

Sum:

$$104^\circ + 38^\circ + 38^\circ = 180^\circ$$

This confirms our calculations are consistent.

Step 5: Determining Angle DFE

In triangle DEF, angle DFE is the same as angle F, as they are the same vertex.

Therefore:

$$\text{Measure of angle DFE} = 38^\circ$$

Additional Considerations and Clarifications

While the above solution hinges on certain assumptions, it's essential to interpret the problem precisely.

Possible Scenarios for the "38" Degree Measure

- Scenario 1: The 38° refers to angle E in triangle DEF.
- Scenario 2: The 38° is an exterior angle at a different vertex, or perhaps a different measure related to the triangle.

In most standard problems, when an exterior angle is given along with another angle measure, the typical setup involves:

- Using the exterior angle theorem to find an interior angle.
- Confirming the sum of interior angles equals 180° .

Summary of Key Formulas Used

- Sum of interior angles:

$$\angle D + \angle E + \angle F = 180^\circ$$

- Exterior angle theorem:

$$\text{Exterior angle} = \text{Sum of two non-adjacent interior angles}$$

- Exterior angle and interior angle relationship:
$$\angle \text{Interior angle} = 180^\circ - \angle \text{Exterior angle}$$

Conclusion: Final Answer

Based on the reasoning above, the measure of angle DFE in triangle DEF is 38 degrees.

This conclusion is consistent with the following:

- The exterior angle at F is 142° , which equals the sum of angles D and E.
- Given angle E is 38° , then angle D is 104° , and the interior angle at F (which is angle DFE) is 38° .

Therefore, the measure of angle DFE is 38° .

Additional Tips for Solving Similar Geometry Problems

- Always identify which angles are interior and which are exterior.
- Use the exterior angle theorem to relate exterior angles to interior angles.
- Confirm that the sum of interior angles in a triangle is 180° .
- When multiple angles are given, look for relationships and complementary or supplementary angles.
- Draw clear diagrams to visualize relationships.

FAQs about Triangle Angle Measures

Q1: How do I find an unknown interior angle in a triangle when an exterior angle is given?

A: Use the exterior angle theorem to find the sum of the two non-adjacent interior angles, then subtract known angles as needed.

Q2: Can an exterior angle be greater than 180° ?

A: No, exterior angles of triangles are always less than 180° , but their measures can be close to 180° depending on the triangle's shape.

Q3: What if the problem provides different angles or additional measures?

A: Use the same principles—sum of interior angles, exterior angle theorem, and supplementary angles—to set up equations and solve step-by-step.

By mastering these principles and steps, you'll be well-equipped to analyze and solve a wide range of triangle angle problems with confidence and precision.

Frequently Asked Questions

What is the measure of angle DFE in triangle DEF if the exterior angle at F is 142 degrees?

The measure of angle DFE is 38 degrees.

How do you find the interior angle DFE in triangle DEF when given an exterior angle at F?

You subtract the exterior angle (142°) from 180° to find the adjacent interior angle, then use triangle angle sum properties to find DFE.

Why is the exterior angle at F in triangle DEF equal to 142 degrees significant?

Because an exterior angle equals the sum of the two remote interior angles, helping us determine the measures of unknown angles.

What are the steps to find angle DFE in triangle DEF with the given exterior angle at F?

First, find the adjacent interior angle at F by subtracting 142° from 180° , then use the triangle angle sum to find angle DFE.

If the exterior angle at F of triangle DEF is 142° , what is the measure of the interior angle at F?

The interior angle at F is 38 degrees.

Can the measure of angle DFE be determined solely from the exterior angle at F being 142° ?

Yes, by applying the exterior angle theorem and triangle angle sum properties, you can determine angle DFE as 38° .

Does the exterior angle at F relate to angles D and E in

triangle DEF?

Yes, the exterior angle at F equals the sum of the remote interior angles D and E.

What is the importance of understanding exterior angles in triangle problems like DEF?

Understanding exterior angles helps in calculating unknown interior angles and solving for missing measures in triangles.

Additional Resources

What Is The Measure Of Angle D F E? Triangle D E F. The Exterior Angle To Angle F Is 142 Degrees. 38 is a common geometric problem that involves understanding the relationships between interior and exterior angles within a triangle. This type of problem not only tests your knowledge of basic geometric principles but also highlights the importance of the exterior angle theorem and how angles relate to each other within a triangle. In this comprehensive guide, we will break down the problem step-by-step, explore relevant geometric principles, and provide a clear method to find the measure of angle D F E in triangle D E F.

Understanding the Problem

Before diving into calculations, it's essential to understand the problem's components:

- Triangle D E F: A triangle with vertices labeled D, E, and F.
- The exterior angle to angle F is given as 142 degrees.
- The phrase "The exterior angle to angle F" suggests that an exterior angle at vertex F is supplementary to the interior angle F, meaning they form a linear pair.

The goal is to determine the measure of angle D F E, which is presumably an angle within the triangle, possibly at vertex E or D, depending on the notation.

Clarifying the Notation and Diagram

Interpreting Triangle Notation

In geometric problems, the notation often follows:

- Triangle D E F: vertices D, E, and F.
- Angles: Usually denoted by the vertex letter, e.g., angle D, angle E, and angle F.
- Angles within the triangle: For example, angle D E F is the angle at vertex E, formed by sides E D and E F.

Assumptions for This Problem

Given the phrase "The exterior angle to angle F," the most typical interpretation is:

- At vertex F, an exterior angle is formed by extending one side of the triangle beyond F.
- This exterior angle is 142 degrees.

Additionally, the number 38 appears at the end of the problem statement, which could relate to:

- An additional angle measure.
- A reference to a specific segment or measure within the triangle.

For clarity, we will assume the following:

- Triangle D E F with vertices labeled D, E, and F.
- The exterior angle at vertex F (formed by extending side D F beyond F) measures 142 degrees.
- The interior angle at vertex F (angle D F E) is what we are asked to find.

Geometric Principles Involved

1. Exterior Angle Theorem

The exterior angle theorem states:

> The measure of an exterior angle of a triangle equals the sum of the two non-adjacent interior angles.

In symbols:

Exterior Angle at vertex F = Angle D E F + Angle E D F (angles at vertices E and D).

2. Linear Pair and Supplementary Angles

- An exterior angle and its adjacent interior angle at the same vertex are supplementary:

Exterior angle at vertex F + Interior angle at F = 180 degrees.

Step-by-Step Solution Approach

Step 1: Identify the knowns and unknowns

- Known: Exterior angle at vertex F = 142° .
- Unknown: Angle D F E (presumably the interior angle at vertex F or another angle in the triangle).

Step 2: Use the exterior angle theorem

If the exterior angle at F is 142° , then:

Exterior angle at F = Sum of the two non-adjacent interior angles

Assuming the interior angles are:

- Angle D E F (at vertex E),
- Angle D F E (at vertex D),

then:

$$142^\circ = \text{Angle D E F} + \text{Angle D F E}.$$

Our goal is to find Angle D F E.

Step 3: Express relationships involving interior and exterior angles

Since the exterior angle at F (say, angle F outside the triangle) is 142° , then:

$$\text{Interior angle at F} = 180^\circ - 142^\circ = 38^\circ.$$

This is because interior and exterior angles at a vertex are supplementary (they form a linear pair).

Therefore:

$$\text{Angle D F E (interior angle at F)} = 38^\circ.$$

Additional Clarification: The Role of the Number 38

The number 38 appears at the end of the problem statement, which aligns with the calculation above: the interior angle at F is 38 degrees.

In summary:

- The exterior angle to angle F is 142° .
- The interior angle at F is 38° (since exterior and interior angles at a vertex are supplementary).
- The measure of angle D F E (the interior angle at vertex F) is 38 degrees.

Final Answer

The measure of angle D F E in triangle D E F is 38 degrees.

Additional Insights and Geometric Practice

To deepen your understanding, here are some related concepts and tips:

Tips for Solving Similar Problems

- Always identify if the problem involves interior or exterior angles.
- Remember the exterior angle theorem: exterior angle = sum of the two non-adjacent interior angles.
- Exterior and interior angles at a vertex are supplementary.
- When given an exterior angle, subtract it from 180° to find the corresponding interior angle.

Practice Problems

1. In triangle ABC, an exterior angle at vertex C measures 110° . Find the interior angle at C.
2. Given two interior angles of a triangle are 50° and 60° , find the third interior angle.
3. If an exterior angle at vertex D of triangle D E F measures 150° , what is the measure of the interior angle at D?

Conclusion

Understanding the relationship between interior and exterior angles in triangles is fundamental in solving many geometric problems. In this particular case, recognizing that the exterior angle at vertex F is 142° directly leads to the interior angle at F being 38° , thanks to the supplementary angle relationship. By mastering these core principles, you can confidently approach similar questions involving triangles, exterior angles, and their measures.

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