In EFG, G = 5. 2 Cm, E = 5. 1 Cm And F=42. Find The Area Of EFG, To The Nearest 10th Of A Square Centimeter

In EFG, G = 5. 2 Cm, E = 5. 1 Cm And F=42. Find The Area Of EFG, To The Nearest 10th Of A Square Centimeter

Understanding how to calculate the area of a triangle when given specific measurements is a fundamental skill in geometry. This article explores a practical example involving the triangle EFG, where the lengths of sides and an included angle are provided. By analyzing this problem step-by-step, readers will learn effective methods to find the area of a triangle, especially when only certain measurements are available, such as side lengths and angles.

Introduction to Triangle Area Calculation

Before diving into the specifics of the EFG triangle, it is essential to review common methods used to determine the area of a triangle:

- Base and Height Method: Using the formula $\frac{1}{2} \times \text{base} \times \text{height}$, suitable when the height (altitude) is known.
- Heron’s Formula: When all three sides are known, the area can be calculated using Heron’s formula.
- Using Two Sides and the Included Angle: When two sides and the included angle are known, the area can be calculated with the formula:

$$
\text{Area} = \frac{1}{2} \times a \times b \times \sin C
$$

where a and b are two sides, and C is the included angle between them.

In the case of triangle EFG, given the side lengths and an angle, the most straightforward method is to use the last approach.

Understanding the Data Provided for Triangle EFG

Let’s analyze the given measurements:

- G = 5.2 cm: This indicates that side G (probably side GE or GF, depending on labeling) has a length of 5.2 cm.
- E = 5.1 cm: This suggests side E (possibly side EF or EG) measures 5.1 cm.
- F = 42: This likely refers to an angle measurement, possibly angle at vertex F, which measures 42 degrees.

It’s important to clarify the triangle’s labeling and the sides associated with the vertices:

- Vertices are labeled E, F, and G.
- Sides are named opposite the respective vertices:
- Side EF is opposite vertex G.
- Side FG is opposite vertex E.
- Side GE is opposite vertex F.

Assuming the notation aligns with standard triangle labeling conventions, the known data points are:

- Side GE = 5.2 cm (G to E)
- Side EF = 5.1 cm (E to F)
- Angle F = 42° (angle at vertex F)

Given this, the goal is to find the area of triangle EFG.

Step-by-Step Solution to Find the Area of Triangle EFG

Step 1: Identify Known Values

- $a = \text{side } GE = 5.2 \text{ cm}$
- $b = \text{side } EF = 5.1 \text{ cm}$
- $\angle F = 42^\circ$

Step 2: Determine the Relevant Formula

Since two sides and the included angle are known, the most efficient way to find the area is:

$$
\text{Area} = \frac{1}{2} \times a \times b \times \sin C
$$

where:

- a and b are sides GE and EF,
- C is the included angle between these sides.

In this case, the angle provided is at vertex F, which is between sides EF

and GF. To use the formula, we need to identify the included angle between sides GE and EF.

Step 3: Clarify the Included Angle

Given that angle $F = 42^\circ$, and the sides are:

- GE (adjacent to F),
- EF (adjacent to F),

then the angle between sides GE and EF at vertex F is indeed 42°. Therefore, the area calculation becomes straightforward.

Step 4: Apply the Formula

Plugging the known values into the formula:

$$
\text{Area} = \frac{1}{2} \times 5.2 \times 5.1 \times \sin 42^\circ
$$

Calculate:

- $5.2 \times 5.1 = 26.52$
- $\sin 42^\circ \approx 0.6691$

Therefore:

$$
\text{Area} \approx \frac{1}{2} \times 26.52 \times 0.6691
$$

$$
\text{Area} \approx 13.26 \times 0.6691
$$

$$
\text{Area} \approx 8.878 \text{ cm}^2
$$

Step 5: Round to the Nearest 10th

Rounding 8.878 to the nearest tenth:

$$
\boxed{8.9 \text{ cm}^2}
$$

Thus, the area of triangle EFG is approximately 8.9 square centimeters.

Additional Considerations and Assumptions

- Coordinate Geometry Approach: If the exact positions of points E, F, and G were known, coordinate geometry could be used for verification.
- Law of Cosines and Heron’s Formula: These methods are less direct here since the problem provides two sides and an angle, making the side-angle-side formula preferable.
- Accuracy: Using a calculator for sine values is essential to ensure precision in the final answer.

Practical Applications of Calculating Triangle Area

Understanding how to compute the area of a triangle with limited data has numerous real-world applications:

- Architecture and Construction: Calculating surface areas for materials estimation.
- Navigation and Surveying: Determining land areas based on measurements.
- Engineering: Structural analysis involving triangular components.
- Education: Building foundational skills in geometry and trigonometry.

Summary and Key Takeaways

- When given two sides and the included angle, the area of a triangle can be efficiently calculated using the formula:

$$
\text{Area} = \frac{1}{2} \times a \times b \times \sin C
$$

- Precise calculation of sine values is crucial for accuracy.
- Rounding to the nearest tenth provides a clear and concise answer suitable for most practical purposes.

Final Answer:

The area of triangle EFG is approximately 8.9 square centimeters.

Meta Description: Discover how to calculate the area of triangle EFG with sides measuring 5.2 cm and 5.1 cm and an included angle of 42°, rounded to the nearest tenth of a square centimeter. Step-by-step explanation and tips included.

Frequently Asked Questions

In triangle EFG, G = 5.2 cm, E = 5.1 cm, and F = 42°, how do you find the area of triangle EFG?

Use the formula for the area of a triangle: (1/2) side1 side2 sin(included angle). Here, with sides G and E and included angle F, the area = (1/2) 5.2 5.1 sin(42°). Calculate sin(42°), then multiply accordingly.

What is the value of sin(42°) used in calculating the area of triangle EFG?

sin(42°) is approximately 0.6691.

How do you convert the given side lengths and angle into the area of triangle EFG?

Plug the side lengths and sine of the included angle into the formula: Area = 0.5 5.2 5.1 0.6691, then compute the result.

What is the approximate area of triangle EFG to the nearest 10th of a square centimeter?

The area is approximately 8.9 square centimeters.

Why is the sine of the angle F necessary in calculating the area of triangle EFG?

Because the formula for the area of a triangle with two sides and included angle is (1/2) side1 side2 sin(angle), which accounts for the height component in the triangle.

Can the Law of Cosines be used to find the area of triangle EFG in this problem?

Yes, if you have all three sides, Law of Cosines can find the third side, then Heron's formula can be used to find the area. But since the included angle is given, using the sine formula is more straightforward.

If the side lengths G and E of triangle EFG are 5.2 cm and 5.1 cm respectively, and the included angle is 42°, what is the step-by-step calculation for the

area?

Step 1: Calculate sin(42°) ≈ 0.6691.
Step 2: Use the formula: Area = 0.5 5.2 5.1 0.6691.
Step 3: Multiply: 0.5 5.2 = 2.6.
Step 4: 2.6 5.1 = 13.26.
Step 5: 13.26 0.6691 ≈ 8.88.
Step 6: Round to the nearest tenth: 8.9 sq cm.

Is it necessary to know side F to calculate the area of triangle EFG?

No, given two sides and the included angle, the area can be calculated without knowing side F. Side F is typically the side opposite angle F, but if the side lengths G and E and the included angle are known, the area can be found directly.

What formula is used to find the area of triangle EFG in this problem?

The formula used is: Area = (1/2) side1 side2 sin(included angle).

Additional Resources

Calculating the Area of Triangle EFG in EFG with G = 5.2 cm, E = 5.1 cm, and F = 42°

Introduction: Understanding the Problem Statement

In this detailed exploration, we are tasked with finding the area of triangle EFG, given specific measurements:

- Side G (which is likely side EG) = 5.2 cm
- Side E (which may be FE) = 5.1 cm
- Angle F (the angle at vertex F) = 42°

The problem further instructs us to determine the area of triangle EFG, rounding our final answer to the nearest tenth of a square centimeter.

Before diving into calculations, it is crucial to interpret the problem carefully, understand the given data, and clarify the geometric configuration involved.

Clarifying the Geometric Configuration

Identifying the Triangle and Its Vertices

In triangle EFG:

- Vertices are labeled E, F, and G.
- The side lengths are given as G = 5.2 cm and E = 5.1 cm.

However, in triangle notation, sides are usually named opposite their corresponding vertices. For example:

- Side EF is opposite vertex G
- Side FG is opposite vertex E
- Side EG is opposite vertex F

Given that the problem states G = 5.2 cm and E = 5.1 cm, it suggests that perhaps the side lengths are associated with specific sides:

- Side EG (opposite vertex F) = 5.2 cm
- Side FE (opposite vertex G) = 5.1 cm

Alternatively, the notation might be different, but based on typical triangle notation, the sides are:

- EF (between vertices E and F)
- FG (between vertices F and G)
- GE (between vertices G and E)

Since the problem provides G = 5.2 cm and E = 5.1 cm, it seems plausible that:

- G corresponds to side EG, length = 5.2 cm
- E corresponds to side FE, length = 5.1 cm

And the given angle at F is 42°, which is angle F in the triangle.

Assumptions for Clarity

Given the data, the most consistent interpretation is:

- Triangle vertices: E, F, G
- Sides: EG = 5.2 cm, FE = 5.1 cm

- Included angle at vertex F: 42°

This setup implies that:

- The sides adjacent to F are FE and FG (unknown length, but perhaps the side FG can be determined)
- The angle at F is between sides FE and FG

But because G is given as 5.2 cm and E as 5.1 cm, and the angle at F is given, the most straightforward approach is to treat EF and GF as the sides adjacent to F, with the included angle at F being 42°.

Approach to Finding the Area

Given the data, the most effective method to compute the area involves using the formula for the area of a triangle when two sides and the included angle are known:

$$
\text{Area} = \frac{1}{2} \times a \times b \times \sin(C)
$$

Where:

- a and b are two sides of the triangle
- C is the included angle between these sides

In our case:

- $a = \text{length of side } EF = 5.1\, \text{cm}$
- $b = \text{length of side } FG$ (unknown, but perhaps can be derived)
- $C = \text{angle at } F = 42^\circ$

Alternatively, if the side lengths G = 5.2 cm and E = 5.1 cm correspond to sides EG and EF, then the problem simplifies to using the known sides and the included angle at F.

Step-by-Step Calculation Process

Step 1: Clarify Known Data

Based on the problem statement, the most logical interpretation is:

- Sides:
- $EF = 5.1\, \text{cm}$
- $EG = 5.2\, \text{cm}$
- Included angle at F:
- $\angle F = 42^\circ$

This suggests that:

- Sides EF and EG are adjacent to F.
- The side FG is between F and G.

Since FG is unknown, but the two sides EF and EG and the angle at F are known, the most efficient approach is to use the Law of Cosines to find FG.

Step 2: Find the Side FG Using Law of Cosines

The Law of Cosines states:

$$
FG^2 = EF^2 + EG^2 - 2 \times EF \times EG \times \cos(\angle F)
$$

Plugging in the known values:

$$
FG^2 = (5.1)^2 + (5.2)^2 - 2 \times 5.1 \times 5.2 \times \cos(42^\circ)
$$

Calculations:

- $5.1^2 = 26.01$
- $5.2^2 = 27.04$
- $\cos(42^\circ) \approx 0.7431$

Now,

$$
FG^2 = 26.01 + 27.04 - 2 \times 5.1 \times 5.2 \times 0.7431
$$

Calculate the product:

- $2 \times 5.1 \times 5.2 = 2 \times 26.52 = 53.04$

Then,

$$
FG^2 = 26.01 + 27.04 - 53.04 \times 0.7431
$$

Calculate:

- $53.04 \times 0.7431 \approx 39.44$

Finally,

$$
FG^2 = 53.05 - 39.44 = 13.61
$$

Thus,

$$
FG = \sqrt{13.61} \approx 3.69\, \text{cm}
$$

Step 3: Find the Area Using Two Sides and the Included Angle

Now that we have:

- $EF = 5.1\, \text{cm}$
- $FG \approx 3.69\, \text{cm}$
- $\angle F = 42^\circ$

We can use the formula:

$$
\text{Area} = \frac{1}{2} \times EF \times FG \times \sin(42^\circ)
$$

Calculate:

- $\sin(42^\circ) \approx 0.6691$

So,

$$
\text{Area} \approx 0.5 \times 5.1 \times 3.69 \times 0.6691
$$

\]

First, multiply \(5.1 \times 3.69 \):

- \(5.1 \times 3.69 \approx 18.84\)

Then,

\[
\text{Area} \approx 0.5 \times 18.84 \times 0.6691
\]

Multiply:

- \(0.5 \times 18.84 = 9.42\)

Finally,

\[
\text{Area} \approx 9.42 \times 0.6691 \approx 6.31\, \text{cm}^2
\]

Final Answer: Rounded to the Nearest Tenth

The area of triangle EFG, rounded to the nearest tenth, is approximately 6.3 square centimeters.

Additional Insights and Considerations

Validity of the Approach

The method used hinges on the assumption that:

- The given sides \(G = 5.2\, \text{cm}\) and \(E = 5.1\, \text{cm}\) correspond to sides adjacent to the angle at F.
- The angle at F is between these sides, enabling the use of the formula involving two sides and the included angle.

This approach aligns well with standard triangle area calculations, especially when the third side is unknown or complex to compute directly.

Potential Ambiguities and Clarifications

- If the side lengths or angles were differently interpreted, the calculations might vary.
- The problem could also involve other configurations, such as different labeling or additional data, but based on the provided information, this is the most logical and straightforward interpretation.

Alternative Methods

- If more data

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