In FGH, G = 67 Cm, H = 57 Cm And F=120. Find The Area Of FGH, To The Nearest Square Centimeter.

In FGH, G = 67 Cm, H = 57 Cm And F=120. Find The Area Of FGH, To The Nearest Square Centimeter.
Understanding how to calculate the area of various geometric figures is a fundamental skill in mathematics, especially in geometry. Whether you're a student preparing for exams or someone interested in practical applications, mastering the process of finding areas of different shapes enhances your problem-solving abilities. In this comprehensive guide, we will delve into the details of calculating the area of triangle FGH, given specific measurements for points G, H, and F. We will explore the relevant formulas, step-by-step calculations, and tips to ensure accuracy. By the end of this article, you'll be equipped to confidently determine the area of triangle FGH to the nearest square centimeter.

Understanding the Problem Statement

Before diving into calculations, it’s essential to understand the problem's components clearly. The given data states:

- G = 67 cm
- H = 57 cm
- F = 120 (unit assumed to be centimeters)

The problem asks us to find the area of triangle FGH, which is formed by points F, G, and H, with the given distances.

Key Concepts in Calculating the Area of a Triangle

To solve for the area of triangle FGH, we need to familiarize ourselves with several fundamental geometric formulas and concepts:

1. Basic Triangle Area Formulas

- Base and Height Method:

$$
\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}
$$

Suitable when the height of the triangle is known.

- Heron's Formula:

When the lengths of all three sides are known, Heron's formula allows calculation of the area without knowing the height explicitly.

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2. Heron's Formula

Heron's formula states that for a triangle with sides of lengths a, b, c:

$$
\text{Area} = \sqrt{s(s - a)(s - b)(s - c)}
$$

where s is the semi-perimeter:

$$
s = \frac{a + b + c}{2}
$$

This method is particularly useful if the side lengths of triangle FGH are known or can be determined.

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3. Coordinate Geometry Approach

If the coordinates of points F, G, and H are known or can be deduced, the area can be calculated using the coordinate formula:

$$
\text{Area} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|
$$

This approach requires knowledge of the points' coordinates but can be very precise.

Analyzing the Given Data

The problem provides certain measurements, but as it stands, it isn't explicitly clear how these measurements relate:

- G = 67 cm
- H = 57 cm
- F = 120 cm

Typically, in geometry problems involving triangles:

- The points F, G, H are vertices of the triangle.
- The given numbers could represent side lengths or distances between points.

Assumption:
Given the data, it is reasonable to interpret G, H, and F as side lengths of triangle FGH.

Determining the Side Lengths of Triangle FGH

To proceed, we need to clarify what G, H, and F represent:

- If G, H, and F are points, their corresponding side lengths are:

- Side FG: length between points F and G
- Side GH: length between points G and H
- Side HF: length between points H and F

- If G, H, and F are the side lengths themselves, then:

$$
FG = G = 67\, \text{cm}
$$
$$
GH = H = 57\, \text{cm}
$$
$$
HF = F = 120\, \text{cm}
$$

Given the context, the most logical assumption is that the side lengths of triangle FGH are:

- $FG = 67\, \text{cm}$
- $GH = 57\, \text{cm}$
- $HF = 120\, \text{cm}$

Calculating the Semi-perimeter s

Using Heron's formula, first compute the semi-perimeter:

$$
s = \frac{FG + GH + HF}{2}
$$

Plugging in the values:

$$
s = \frac{67 + 57 + 120}{2} = \frac{244}{2} = 122\, \text{cm}
$$

Applying Heron's Formula to Find the Area

Now, calculate the area:

$$
\text{Area} = \sqrt{s(s - FG)(s - GH)(s - HF)}
$$

Substituting the known values:

$$
\text{Area} = \sqrt{122 (122 - 67) (122 - 57) (122 - 120)}
$$

Simplify each term:

$$
122 - 67 = 55
$$
$$
122 - 57 = 65
$$
$$
122 - 120 = 2

\]

Thus, the area becomes:

$$
\text{Area} = \sqrt{122 \times 55 \times 65 \times 2}
$$

Performing the Calculations Step-by-Step

1. Multiply 122 and 55:

$$
122 \times 55 = 6,710
$$

2. Multiply 65 and 2:

$$
65 \times 2 = 130
$$

3. Multiply the results:

$$
6,710 \times 130 = 872,300
$$

4. Take the square root:

$$
\text{Area} = \sqrt{872,300}
$$

Using a calculator:

$$
\sqrt{872,300} \approx 933.28
$$

Final Answer: Area of Triangle FGH

Rounding to the nearest square centimeter:

$$
\boxed{933\, \text{cm}^2}
$$

Therefore, the area of triangle FGH is approximately 933 square centimeters.

Additional Tips for Accurate Calculation

To ensure precision in similar problems, consider the following:

- Always verify the units of measurement.
- Double-check the side lengths and their relationships.
- Use a calculator for square roots and large multiplications.
- When in doubt, sketch the triangle to visualize the problem.
- Confirm whether the given data represents sides, angles, or coordinates for the best approach.

Conclusion

Calculating the area of a triangle with given side lengths is straightforward once you understand and apply Heron's formula correctly. In this case, assuming the provided measurements are side lengths, the area of triangle FGH is approximately 933 square centimeters. Mastery of such calculations is essential for solving complex geometric problems efficiently and accurately. Whether for academic purposes or practical applications, understanding the process enhances your mathematical skills and confidence.

FAQs about Triangle Area Calculation

1. **Can Heron's formula be used if the height of the triangle is unknown?**
   Yes, Heron's formula relies solely on side lengths, making it ideal when the height is not known.

2. **What if the side lengths do not form a valid triangle?**

The sum of any two sides must be greater than the third. If this condition isn't met, the measurements do not form a valid triangle.

3. **How precise should the calculations be?**
   For most practical purposes, rounding to the nearest square centimeter is sufficient, but more precise calculations can be done with more decimal places.

By understanding the fundamental concepts and applying Heron's formula correctly, you can confidently calculate the area of any triangle given its side lengths. Practice with different sets of measurements to improve your skills and become proficient in geometric area calculations.

Frequently Asked Questions

Given in triangle FGH, where G = 67 cm, H = 57 cm, and F = 120°, how do you find the area of the triangle?

Use the formula for the area of a triangle with two sides and an included angle: Area = $0.5 \times G \times H \times \sin(F)$. Substitute the values: $0.5 \times 67 \times 57 \times \sin(120°)$.

What is the value of sin(120°) used in calculating the area of triangle FGH?

$\sin(120°) = \sqrt{3}/2 \approx 0.8660$.

Calculate the approximate area of triangle FGH with G=67 cm, H=57 cm, and angle F=120°, rounded to the nearest square centimeter.

Area $\approx 0.5 \times 67 \times 57 \times 0.8660 \approx 1658.4$ cm^2. Rounded to the nearest square centimeter, the area is 1658 cm^2.

Which formula is used to find the area of a triangle when two sides and the included angle are known?

The formula is: Area = $0.5 \times \text{side1} \times \text{side2} \times \sin(\text{included angle})$.

If the sides G and H are given as 67 cm and 57 cm respectively, and the included angle is 120°, what is the importance of the sine function in the calculation?

The sine function accounts for the angle between the two sides, allowing calculation of the triangle's area without knowing the height explicitly.

Can the area of triangle FGH be found using Heron's formula with the given data?

No, Heron's formula requires the lengths of all three sides. Since only two sides and an included angle are given, the area is best found using the formula involving sine.

What are the key steps to solve for the area of triangle FGH given G, H, and angle F?

Step 1: Convert the angle to radians if necessary. Step 2: Calculate sin(F). Step 3: Use the formula $0.5 \times G \times H \times \sin(F)$. Step 4: Compute and round the result.

Is it necessary to convert the angle from degrees to radians when calculating the sine for the area formula?

It depends on the calculator; many calculators accept degrees directly. If using a calculator that requires radians, convert 120° to radians: $120° \times (\pi/180) = 2\pi/3$ radians.

What is the significance of rounding the area to the nearest square centimeter in this problem?

Rounding provides a simplified, practical measurement suitable for real-world applications where exact precision beyond whole centimeters is unnecessary.

What is the final answer for the area of triangle FGH, given G=67 cm, H=57 cm, and angle F=120°, rounded to the nearest square centimeter?

The area is approximately 1658 square centimeters.

Additional Resources

Geometry Problem Analysis

When exploring the problem of finding the area of triangle FGH given specific measurements, we delve into a fundamental aspect of geometry that combines understanding of side lengths, angles, and various formulas. This problem is an excellent example of applying the Law of Cosines and the formula for the area of a triangle to arrive at an accurate solution.

In this article, we will thoroughly examine the problem, interpret the given data, and systematically work through the calculation process, ensuring clarity at each step. Whether you're a student preparing for exams or a mathematics enthusiast interested in geometric problem-solving, this detailed breakdown aims to enhance your understanding of how to approach such problems effectively.

Understanding the Given Data and Geometric Context

The problem statement provides three key pieces of information:

- G = 67 cm
- H = 57 cm
- F = 120 (assumed to be degrees)

Our goal is to find the area of triangle FGH, rounded to the nearest square centimeter.

Clarifying the Data

First, it's crucial to interpret what these measurements represent:

- G and H are likely side lengths of the triangle, given in centimeters.
- F is most probably an angle, given as 120 degrees, at vertex F.

Assuming the standard notation where points F, G, and H are vertices of the triangle, and the given measurements correspond as follows:

- Side g (opposite vertex G) = 67 cm
- Side h (opposite vertex H) = 57 cm
- Angle at vertex F = 120 degrees

In typical triangle notation:

- Side FG is opposite vertex H.

- Side FH is opposite vertex G.
- Side GH is opposite vertex F.

However, the data as provided suggests that the angle F is 120 degrees, which is the measure of the angle at vertex F, and the sides G and H are the lengths of sides adjacent or opposite to certain vertices.

Interpreting the Triangle Configuration

To proceed with the calculations, we need to establish the most logical configuration based on the data:

- F = 120°: The angle at vertex F
- G = 67 cm: One side length
- H = 57 cm: Another side length

Given the typical notation, it's reasonable to interpret:

- The side GH is the side between points G and H.
- The angle F is at vertex F, with sides FG and FH meeting at F.

In such a case, the side GH is opposite vertex F, and the given sides G and H are lengths of sides meeting at F.

Alternatively, if the problem was to find the area of triangle FGH, and F is an angle at vertex F, with sides G and H known, we can proceed with the formula for the area of a triangle when two sides and the included angle are known:

\[
\text{Area} = \frac{1}{2} \times G \times H \times \sin(F)
\]

This approach is typical when given two sides and the included angle.

Therefore, the most straightforward interpretation is:

- Sides FG and FH are of lengths 67 cm and 57 cm, respectively.
- The angle F (at vertex F) between these sides is 120°.

Calculating the Area Using the Sine Formula

Given the above interpretation, the problem simplifies to:

$$
\text{Area} = \frac{1}{2} \times \text{side}_1 \times \text{side}_2 \times \sin(\text{included angle})
$$

where:

- $side_1$ = 67 cm (say, FG)
- $side_2$ = 57 cm (say, FH)
- included angle = 120°

Step 1: Convert the angle to radians

Most calculators and sine functions operate in radians, but some can work directly with degrees. To be safe, convert:

$$
\text{F (degrees)} = 120^\circ
$$

and

$$
\sin(120^\circ) = \sin(180^\circ - 60^\circ) = \sin(60^\circ) = \frac{\sqrt{3}}{2} \approx 0.8660
$$

Step 2: Calculate the sine of 120°

$$
\sin(120^\circ) \approx 0.8660
$$

Step 3: Apply the area formula

$$
\text{Area} = \frac{1}{2} \times 67 \times 57 \times 0.8660
$$

Calculating step-by-step:

- Multiply sides:

$$
67 \times 57 = 3819
$$

- Multiply by sine:

$$
3819 \times 0.8660 \approx 3304.5
$$

- Halve the result:

$$
\frac{3304.5}{2} \approx 1652.25
$$

Final step: Round to the nearest square centimeter

$$
\boxed{\text{Area} \approx 1652\, \text{cm}^2}
$$

Summary and Final Remarks

By interpreting the provided data as sides FG and FH measuring 67 cm and 57 cm respectively, with an included angle F of 120°, we employed the standard formula for the area of a triangle derived from two sides and the included angle:

$$
\boxed{\text{Area} = \frac{1}{2} \times G \times H \times \sin(F)}
$$

This formula is particularly useful in cases where the triangle's dimensions are specified via two sides and an included angle, as in this problem.

The calculated area of approximately 1652 cm^2 reflects the maximum precision attainable given the data, rounded to the nearest square centimeter.

Key Takeaways:

- Always clarify the geometric configuration based on the data provided.
- Use the appropriate formula: for two sides and an included angle, the area is $\frac{1}{2}ab \sin C$.
- Convert angles to radians if your calculator requires it; otherwise, use degree mode.
- Double-check assumptions if data ambiguity exists; in this case, the interpretation led to a straightforward solution.

In conclusion, the area of triangle FGH, given the specified dimensions and angle, is approximately 1652 cm^2. This solution demonstrates the power of fundamental trigonometric formulas in geometric problem-solving, providing a clear pathway from given data to a precise, rounded answer.

In Fgh G 67 Cm H 57 Cm And F 120 Find The Area Of Fgh To The Nearest Square Centimeter

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