

In Circle T With $M_{STU} = 102$ And $S_t = 13$ Units Find Area Of Sector STU . Round To The Nearest Hundredth

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Understanding how to calculate the area of a sector in a circle is a fundamental aspect of geometry that has practical applications in fields such as engineering, architecture, and design. This article walks you through a comprehensive step-by-step process to find the area of the sector STU in circle T , given specific measurements: $M_{STU} = 102$ and $S_t = 13$ units. By the end of this guide, you'll be equipped with the knowledge to approach similar problems confidently.

Understanding the Problem and Key Concepts

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

- Circle T : The circle in question.
- Sector STU : A portion of the circle bounded by two radii (ST and TU) and the arc STU .
- $M_{STU} = 102$: This likely refers to the measure of the central angle subtended by the sector STU , given in degrees.
- $S_t = 13$ Units: The length of the radius from the center T to point S (and T to U , assuming the sector is symmetric).

Key Concepts to Recall:

- Central Angle: The angle formed at the center of the circle by two radii.
- Arc Length: The length of the curved part of the circle between two points.
- Area of a Sector: A fraction of the entire circle's area, proportional to the central angle.

Step 1: Confirm the Given Data

Let's clearly list what we have:

- Central angle (M_{STU}): 102 degrees
- Radius (S_t): 13 units

Assumption: Since the problem states "Mzstu," which appears to be a measure of angle, and "St" as a length, we interpret:

- The central angle of sector STU is 102° .
- The radius from T to S (and T to U) is 13 units.

Note: If the problem specifies points S and U on the circle with a common center T, then the sector's central angle is 102° , and the radius length is 13 units.

Step 2: Find the Area of the Sector STU

The formula for the area of a sector is:

$$\text{Area of Sector} = \frac{\theta}{360^\circ} \times \pi r^2$$

Where:

- θ = central angle in degrees
- r = radius of the circle
- $\pi \approx 3.1416$

Step 2.1: Plug in Known Values

$$\text{Area} = \frac{102^\circ}{360^\circ} \times \pi \times (13)^2$$

Step 2.2: Calculate the fraction

$$\frac{102}{360} = \frac{17}{60} \approx 0.2833$$

Step 2.3: Calculate r^2

$$13^2 = 169$$

Step 2.4: Compute the area

$$\text{Area} \approx 0.2833 \times 3.1416 \times 169$$

First, multiply $(\pi \times r^2)$:

$$3.1416 \times 169 \approx 3.1416 \times 169 = 531.9384$$

Then multiply by the fraction:

$$0.2833 \times 531.9384 \approx 150.8$$

Step 2.5: Round to the nearest hundredth

$$\boxed{150.80}$$

Final Answer:

The area of sector STU is approximately 150.80 square units.

Additional Tips for Solving Similar Problems

Understanding the Variables

- Always identify whether a given measure is an angle (in degrees or radians) or a length.
- Clarify the points involved and their positions relative to the circle's center.

Using the Sector Area Formula

- Remember the formula involves the fraction of the circle's full area, determined by the ratio of the central angle to 360° .
- Double-check your calculations, especially with fractions and multiplication.

When to Convert Units

- If the angle is given in radians, adjust the formula accordingly.
- For degrees, use the standard formula as shown above.

Summary of Steps for Calculating Sector Area

1. Identify the given data: central angle (θ), radius (r).
2. Convert the angle to a fraction of 360°: $\frac{\theta}{360^\circ}$.
3. Calculate the area of the entire circle: πr^2 .
4. Calculate the sector area: multiply the circle's area by the fraction.
5. Round the result to the desired decimal place, in this case, the nearest hundredth.

Conclusion

Calculating the area of a sector in a circle is straightforward once you understand the relationship between the central angle and the circle's total area. Using the provided measurements—central angle of 102° and radius of 13 units—you can determine the sector's area with confidence. Remember to verify your given data, apply the correct formula, and round your final answer to the required decimal precision.

With practice, solving similar problems involving sectors, angles, and circle measurements will become an intuitive part of your geometry toolkit, enabling you to tackle both academic exercises and real-world applications with ease.

Frequently Asked Questions

How do you find the area of a sector given the central angle and radius?

The area of a sector is calculated using the formula: $(\theta / 360) \times \pi \times r^2$, where θ is the central angle in degrees and r is the radius.

What is the central angle in the circle T with Mzstu = 102 degrees?

The central angle Mzstu is given as 102 degrees, which is used directly in calculating the sector area.

Given radius $r = 13$ units and central angle $\theta = 102^\circ$, what is the area of the sector?

Using the formula: $(102 / 360) \times \pi \times 13^2 \approx (0.2833) \times 3.1416 \times 169 \approx 149.97$ square units.

How do you round the area of the sector to the nearest hundredth?

You round the calculated area, approximately 149.97, to two decimal places, which remains 149.97.

What is the final area of sector Stu in circle T?

The area of sector Stu is approximately 149.97 square units when rounded to the nearest hundredth.

Additional Resources

In Circle T With $m\angle \text{Stu} = 102$ And $\text{St} = 13$ Units Find Area Of Sector Stu. Round To The Nearest Hundredth is a compelling problem that combines fundamental circle geometry concepts with practical problem-solving skills. Whether you're a student preparing for exams, a teacher looking for a clear explanation, or a math enthusiast eager to sharpen your understanding, this guide will walk you through the process step-by-step. By breaking down the problem, explaining key concepts, and illustrating each stage, you'll gain a comprehensive understanding of how to find the area of a sector in a circle, especially when given certain measurements and angles.

Understanding the Problem

Before diving into calculations, it's crucial to thoroughly understand what the problem is asking and identify the given information.

Restating the Problem

In the problem, we're told:

- The circle is centered at T.
- The measure of angle Mzstu is 102 degrees.
- The segment St has a length of 13 units.
- We are asked to find the area of sector Stu, rounding the answer to the nearest hundredth.

Clarifying the Terminology

- Circle T: The circle with center at point T.

- Mzstu: Likely a typo or shorthand for angle MSTU or a similar notation; in typical geometry problems, angles are denoted by three points. Assuming it refers to angle STU or a similar angle involving points S, T, and U.
- St: A chord or segment connecting points S and T, with a length of 13 units.
- Sector Stu: The sector of the circle defined by the points S and U on the circle, with the center T.

Note: Due to the notation, assumptions are necessary. Based on typical circle problems, we interpret:

- Angle Mzstu = 102° as the measure of angle STU (or a similar angle involving points S, T, and U).
- St = 13 units as the length of the chord ST.
- The goal is to find the area of the sector formed between points S and U, subtended at the center T.

Key Concepts in Circle Geometry

To solve this problem, understanding essential concepts about circles and sectors is vital.

1. Radius and Chord Length

The radius (r) of a circle is the distance from the center to any point on the circle.

- The chord is a line segment connecting two points on the circle.
- The length of a chord (c) relates to the radius and the central angle subtending it.

2. Central Angles and Arc Measures

- The central angle is an angle with its vertex at the circle's center.
- The measure of the arc subtended by the central angle is equal to the angle's measure in degrees.

3. Sector Area Formula

The area of a sector of a circle is given by:

$$\text{Area of Sector} = \frac{\theta}{360^\circ} \times \pi r^2$$

where:

- θ is the central angle in degrees.
- r is the radius of the circle.

4. Relationship Between Chord Length, Radius, and Central Angle

The chord length (c) relates to the radius (r) and the central angle (θ) (in degrees) by:

$$c = 2r \sin\left(\frac{\theta}{2}\right)$$

This formula allows us to find the radius if the chord length and the central angle are known.

Step-by-Step Solution Approach

Given the information, here's how to proceed:

Step 1: Identify the Known Values

- Chord $(ST = 13)$ units.
- Central angle $(\angle STU = 102^\circ)$.
- Objective: Find the area of sector (STU) .

Step 2: Find the Radius (r)

Since the chord (ST) subtends the central angle, we can use:

$$c = 2r \sin\left(\frac{\theta}{2}\right)$$

Plugging in:

$$13 = 2r \sin\left(\frac{102^\circ}{2}\right) = 2r \sin 51^\circ$$

Solve for (r) :

$$r = \frac{13}{2 \sin 51^\circ}$$

Calculate $(\sin 51^\circ)$:

$$\begin{aligned} & \left[\right. \\ & \sin 51^\circ \approx 0.7771 \\ & \left. \right] \end{aligned}$$

Thus:

$$\begin{aligned} & \left[\right. \\ & r \approx \frac{13}{2} \times 0.7771 = \frac{13}{1.5542} \approx 8.36 \\ & \left. \right] \end{aligned}$$

Rounded to two decimal places, the radius is approximately 8.36 units.

Step 3: Calculate the Area of Sector $\angle STU$

Using the sector area formula:

$$\begin{aligned} & \left[\right. \\ & \text{Area} = \frac{\theta}{360^\circ} \times \pi r^2 \\ & \left. \right] \end{aligned}$$

Plug in the known values:

$$\begin{aligned} & \left[\right. \\ & \text{Area} = \frac{102^\circ}{360^\circ} \times \pi \times (8.36)^2 \\ & \left. \right] \end{aligned}$$

Calculate:

$$\begin{aligned} & - \left(\frac{102}{360} = 0.2833 \right) \\ & - \left(8.36^2 \approx 69.89 \right) \\ & - \left(\pi \approx 3.1416 \right) \end{aligned}$$

Now, multiply:

$$\begin{aligned} & \left[\right. \\ & \text{Area} \approx 0.2833 \times 3.1416 \times 69.89 \\ & \left. \right] \end{aligned}$$

Calculate step-by-step:

$$\begin{aligned} & - \left(3.1416 \times 69.89 \approx 219.76 \right) \\ & - \left(0.2833 \times 219.76 \approx 62.24 \right) \end{aligned}$$

Final Answer:

$$\boxed{\text{Area of Sector } STU \approx \mathbf{62.24 \text{ square units}}}$$

Additional Insights and Common Pitfalls

Verifying the Solution

- Always double-check calculations, especially trigonometric functions.
- Confirm that the chord length corresponds to the central angle in question; inconsistent data can lead to errors.

Assumptions Made

- The notation and problem phrasing suggest points S, T, and U form a sector with a central angle of 102° , and the segment ST is a chord with length 13.
- The problem's wording may vary; ensure clarity in real-world scenarios or exams.

Practical Applications

Understanding how to find the area of a sector is essential in various fields:

- Engineering (designing circular components)
- Architecture (calculating material in curved structures)
- Navigation (arc lengths on Earth's surface)
- Astronomy (sector areas of celestial circles)

Summary of Key Steps

1. Identify known values: chord length and central angle.
2. Calculate the radius: using the chord length and the sine relation.
3. Compute the sector area: using the sector formula with the derived radius.
4. Round your answer: to the nearest hundredth.

Final Thoughts

Mastering the process of finding the area of a sector in a circle involves understanding the relationships between chords, angles, and radii. By methodically applying formulas and verifying each step, you can confidently solve similar problems. Remember, practice with different values and configurations enhances problem-solving skills and deepens your comprehension of circle geometry.

In circle T with $Mzstu = 102$ and $St = 13$ units, the area of sector Stu is approximately 62.24 square units when rounded to the nearest hundredth.

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