

Find The Total Surface Area Of This Cylinder. Give Your Answer To 1 Decimal Place. 18 Cm 24 Cm

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Understanding how to calculate the total surface area of a cylinder is essential in various fields such as engineering, architecture, and manufacturing. Whether you're a student preparing for exams or a professional involved in design projects, knowing how to determine the surface area accurately can help you estimate material requirements, costs, and more. This comprehensive guide will walk you through the process step-by-step, specifically focusing on a cylinder with dimensions of 18 cm and 24 cm, and will provide the final answer rounded to one decimal place.

What Is the Total Surface Area of a Cylinder?

The total surface area (TSA) of a cylinder is the sum of the areas of all its outer surfaces. This includes:

- The lateral surface area (the side area wrapping around the cylinder)
- The areas of the two circular bases (top and bottom)

Mathematically, the total surface area of a cylinder can be expressed as:

$$TSA = 2\pi r^2 + 2\pi r h$$

Where:

- r is the radius of the circular base
- h is the height of the cylinder
- π (pi) is approximately 3.1416

Understanding this formula is fundamental to solving problems related to surface area.

Given Dimensions and Their Significance

In the problem, the dimensions provided are:

- Height (h) = 24 cm
- Diameter of the base = 18 cm

From these, we can derive the radius:

$$r = \frac{\text{Diameter}}{2} = \frac{18\text{ cm}}{2} = 9\text{ cm}$$

Knowing the radius and height allows us to apply the surface area formula accurately.

Step-by-Step Calculation of the Total Surface Area

Let's proceed with the calculation in an organized manner.

1. Calculate the Area of the Two Circular Bases

Since both bases are identical, their combined area is:

$$2 \times \pi r^2$$

Plugging in the values:

$$2 \times 3.1416 \times (9)^2 = 2 \times 3.1416 \times 81$$

$$= 2 \times 254.4696 = 508.9392\text{ cm}^2$$

2. Calculate the Lateral Surface Area

The lateral surface area of a cylinder is given by:

$$2 \pi r h$$

Plugging in the known values:

$$2 \times 3.1416 \times 9 \times 24 = 2 \times 3.1416 \times 216$$

$$= 2 \times 678.584 = 1357.168\text{ cm}^2$$

3. Sum the Areas for Total Surface Area

Now, add the area of the two bases and the lateral surface area:

$$\text{TSA} = 508.9392 + 1357.168 = 1866.1072 \text{ cm}^2$$

4. Round the Final Answer to 1 Decimal Place

The total surface area, rounded to one decimal place, is:

$$\boxed{1866.1 \text{ cm}^2}$$

Additional Tips for Calculating Surface Area of Cylinders

- Always ensure unit consistency; here, all measurements are in centimeters.
- Remember to derive the radius from the diameter if only the diameter is provided.
- Use a calculator for multiplying large numbers and for π to avoid errors.
- Round off your final answer to the required decimal place for precision and clarity.

Applications of Total Surface Area Calculation

Understanding how to compute the surface area of a cylinder has practical applications such as:

- Estimating the amount of paint needed to coat a cylindrical object
- Calculating material costs for manufacturing containers or pipes
- Designing cylindrical structures in architecture
- Determining heat transfer rates in engineering applications
- Planning for packaging and storage solutions involving cylindrical shapes

Conclusion

Calculating the total surface area of a cylinder involves understanding its geometric properties and applying the correct formulas. For a cylinder with a diameter of 18 cm and a height of 24 cm, the surface area is approximately 1866.1 cm^2 when rounded to one decimal place. Mastery of this calculation enhances problem-solving skills and broadens your understanding of geometric principles applicable in real-world scenarios.

Summary of Key Points

- The formula for total surface area of a cylinder: $(2\pi r^2 + 2\pi r h)$
- Radius derived from diameter: $(r = \frac{d}{2})$
- Use precise values for π or 3.1416 for calculations
- Always perform calculations step-by-step for accuracy
- Round final answers to the specified decimal place

By following these steps and tips, you can confidently determine the surface area of any cylinder and apply this knowledge effectively in various practical contexts.

Frequently Asked Questions

What is the total surface area of a cylinder with a height of 24 cm and a radius of 18 cm?

The total surface area is approximately 4,072.3 square centimeters.

How do you calculate the total surface area of a cylinder given its radius and height?

Total surface area = $2\pi r(h + r)$. Plug in the radius and height to find the area.

What is the value of π used in the calculation for the surface area?

Typically, π is approximated as 3.14 for such calculations.

Can you show the step-by-step calculation for this cylinder's surface area?

Yes. Radius $r = 18$ cm, height $h = 24$ cm. Surface area = $2 \times 3.14 \times 18 \times (24 + 18) = 2 \times 3.14 \times 18 \times 42 \approx 4,721.52 \text{ cm}^2$.

Why do we add the radius to the height in the surface area formula?

Because the total surface area includes the lateral surface area plus the areas of the two circular bases.

What is the approximate lateral surface area of the cylinder?

Lateral surface area $\approx 2 \times 3.14 \times 18 \times 24 \approx 2,711.04 \text{ cm}^2$.

What is the combined area of both circular bases of the cylinder?

Area of both bases $\approx 2 \times 3.14 \times 18^2 \approx 2,041.44 \text{ cm}^2$.

How do rounding and approximations affect the final surface area calculation?

Using π as 3.14 introduces minor rounding differences, so the answer is rounded to one decimal place for accuracy.

What is the final total surface area of the cylinder to one decimal place?

Approximately $4,072.3 \text{ cm}^2$.

Additional Resources

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Understanding the precise measurement of a cylinder's surface area is fundamental in various scientific, engineering, and everyday applications. Whether you're designing a container, calculating material requirements, or exploring geometric concepts, knowing how to accurately determine the total surface area is essential. In this article, we will explore the process of calculating the total surface area of a cylinder with given dimensions—specifically, a height of 18 centimeters and a radius of 24 centimeters. Our goal is to provide a comprehensive, technical, yet accessible explanation, guiding you through each step with clarity.

Understanding the Geometry of a Cylinder

Before diving into calculations, it's important to understand the basic structure of a cylinder.

What Is a Cylinder?

A cylinder is a three-dimensional geometric shape characterized by:

- Two parallel circular bases
- A curved lateral surface connecting the bases

The two main dimensions defining a cylinder are:

- Radius (r): The distance from the center to the edge of the circular base

- Height (h): The perpendicular distance between the two bases

In our case:

- Radius (r): 24 cm

- Height (h): 18 cm

Components of the Total Surface Area

The total surface area (TSA) of a cylinder encompasses:

1. Lateral Surface Area (LSA): The area of the curved side
2. Area of the Two Circular Bases: The combined area of both ends

Mathematically:

Total Surface Area (TSA) = Lateral Surface Area + Area of 2 Bases

Expressed as:

$$\text{TSA} = 2\pi rh + 2\pi r^2$$

Where:

- π (pi) ≈ 3.1416

- r = radius

- h = height

Step-by-Step Calculation

Given the dimensions:

- r = 24 cm

- h = 18 cm

Let's proceed with the calculations.

1. Calculate the Lateral Surface Area

The lateral surface area of a cylinder is given by:

$$LSA = 2\pi rh$$

Substituting the known values:

$$LSA = 2 \times 3.1416 \times 24 \text{ cm} \times 18 \text{ cm}$$

Performing the multiplication:

$$- 2 \times 3.1416 = 6.2832$$

$$- 6.2832 \times 24 = 150.7968$$

$$- 150.7968 \times 18 = 2,714.3424 \text{ cm}^2$$

Lateral Surface Area $\approx 2714.3 \text{ cm}^2$ (rounded to one decimal place)

2. Calculate the Area of the Two Bases

The area of one circular base:

$$A = \pi r^2$$

Substituting:

$$A = 3.1416 \times (24 \text{ cm})^2$$

Calculating:

$$- 24^2 = 576$$

$$- 3.1416 \times 576 \approx 1,810.9648 \text{ cm}^2$$

Since there are two bases:

$$\text{Total area of bases} = 2 \times 1,810.9648 \approx 3,621.9296 \text{ cm}^2$$

Total area of both bases $\approx 3621.9 \text{ cm}^2$ (rounded to one decimal place)

3. Sum to Find Total Surface Area

Adding the lateral surface area and the area of the two bases:

$$TSA \approx 2714.3 + 3621.9 \approx 6,336.2 \text{ cm}^2$$

Final Answer: The total surface area of the cylinder is approximately 6,336.2 square centimeters.

Practical Implications and Applications

Understanding the surface area of a cylinder is vital across diverse fields:

- Manufacturing: Estimating the amount of material needed for cylindrical containers or pipes.
- Packaging: Calculating wrapping material for cylindrical objects.
- Engineering: Designing cylindrical components with specific surface area requirements.
- Science: Analyzing surface-related properties such as heat transfer or chemical reactions.

Accurate measurements to one decimal place ensure precision, especially when dealing with large-scale manufacturing or scientific experiments.

Additional Considerations

While the calculation above assumes a perfect cylinder with smooth surfaces, real-world objects may have imperfections or additional features that slightly alter surface area measurements. For highly precise applications, additional factors such as surface roughness or material thickness may need to be considered.

Furthermore, when dealing with cylinders that are not perfectly symmetrical or have irregularities, advanced measurement techniques like 3D scanning or computational modeling can provide more accurate surface area assessments.

Summary

To succinctly recap:

- The total surface area of a cylinder involves adding the lateral surface area and the areas of two circular bases.
- Using the formula $TSA = 2\pi rh + 2\pi r^2$, substituting $r = 24$ cm and $h = 18$ cm, yields approximately 6,336.2 cm^2 .
- Rounding to one decimal place ensures clarity and precision for practical and academic purposes.

Understanding these calculations equips you with the foundational knowledge necessary for tackling similar geometric problems, fostering both confidence and competence in spatial measurements.

Final Words

Calculating the total surface area of a cylinder is a fundamental skill blending geometric principles with practical application. Whether for academic pursuits, engineering projects, or everyday tasks, mastering this calculation enhances your spatial reasoning and precision. Remember, always double-check your formulas and measurements, and ensure your calculations are accurate to the desired number of decimal places. With this guide, you are now well-equipped to determine the surface area of cylinders with confidence and accuracy.

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