

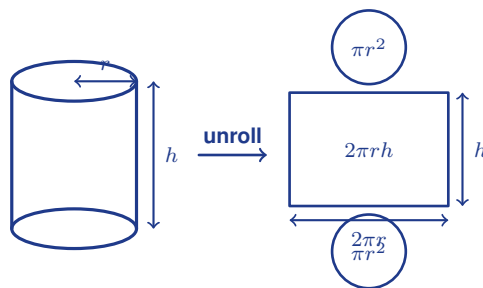
Surface Area of Cylinders

Name: _____

Date: _____

Score: _____ / 17

The **surface area** of a cylinder is the total area of everything on the outside: two circular bases plus the curved surface that wraps around them. Here is a great trick: imagine “unrolling” the curved part into a rectangle—its width equals the circumference of the base ($2\pi r$) and its height equals the height of the cylinder. That gives the formula $SA = 2\pi r^2 + 2\pi rh$, where the first term covers both bases and the second covers the lateral surface. If you only need the lateral area—like finding how much paper wraps a label—use just $LA = 2\pi rh$. As always, double-check that you are using the radius, not the diameter!



Key Concepts & Quick Review

Surface Area of a Cylinder:

$$SA = 2\pi r^2 + 2\pi rh$$

$2\pi r^2$ area of the two circular bases

$2\pi rh$ lateral (curved) surface area

Lateral area only (open-top or label-area problems): $LA = 2\pi rh$.

Use $\pi \approx 3.14$ unless told otherwise. Surface area is measured in *square units* (cm^2 , in^2 , etc.).

Examples

① Find the total surface area of a cylinder with $r = 3\text{ cm}$ and $h = 10\text{ cm}$. Use $\pi \approx 3.14$.

Think It Through: A cylinder's surface area has two parts: the two circular bases and the curved side (lateral area). First, the bases: $2 \times 3.14 \times 3^2 = 2 \times 3.14 \times 9 = 56.52\text{ cm}^2$. Next, picture unrolling the curved side into a rectangle whose width is the circumference: $2 \times 3.14 \times 3 \times 10 = 188.4\text{ cm}^2$. Add them up: $56.52 + 188.4 = 244.92\text{ cm}^2$.

Answer: 244.92 cm^2

② A can has a diameter of 8 cm and a height of 12 cm . Find the lateral surface area only.

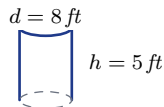
Think It Through: The question asks for the lateral area only—that is the curved part, not the top or bottom circles. First find the radius: $r = \frac{8}{2} = 4\text{ cm}$. Then apply the lateral-area formula: $LA = 2\pi rh = 2 \times 3.14 \times 4 \times 12 = 301.44\text{ cm}^2$. Imagine peeling the label off the can—that is the lateral surface!

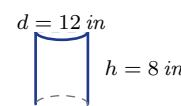


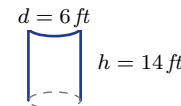
 **Answer:** 301.44 cm^2

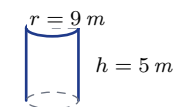
 **Practice Problems**

Find the total surface area of each cylinder. Use $\pi \approx 3.14$. Round to the nearest hundredth.




1. Find the total surface area of a cylinder _____ with radius 4 cm and height 6 cm .
2. Find the total surface area of a cylinder _____ with radius 5 in and height 10 in .
3. Find the total surface area of a cylinder _____ with diameter 10 m and height 7 m .
4. Find the total surface area of a cylinder _____ with radius 2 ft and height 9 ft .
5. Find the total surface area of a cylinder _____ with diameter 14 cm and height 3 cm .
6. Find the total surface area of a cylinder _____ with radius 7 in and height 4 in .
7. Find the total surface area of a cylinder _____ with radius 1 m and height 15 m .
8. Find the total surface area of a cylinder _____ with diameter 8 ft and height 5 ft .

9. Find the total surface area of a cylinder _____ with radius 6 cm and height 6 cm .

10. Find the total surface area of a cylinder _____ with diameter 12 in and height 8 in .


11. Find the total surface area of a cylinder _____ with radius 3 m and height 11 m .
12. Find the total surface area of a cylinder _____ with radius 10 cm and height 2 cm .
13. Find the total surface area of a cylinder _____ with diameter 6 ft and height 14 ft .


14. Find the total surface area of a cylinder _____ with radius 8 in and height 1 in .
15. Find the total surface area of a cylinder _____ with radius 9 m and height 5 m .


Study Tips

-  Surface area has **two parts**: the circles on top and bottom ($2\pi r^2$) plus the curved side ($2\pi r h$). Don't forget either one!
-  If a problem asks for a "label" or "wrapper" area, that is the **lateral area** only — no bases.
-  Surface area uses **square** units; volume uses **cubic** units. Mixing them up is a common mistake.

 **Word Problems**

16. A coffee mug (open on top) has a radius of 4 cm and a height of 10 cm . What is the total outer surface area (one base + lateral)? Use $\pi \approx 3.14$. _____



17. A company is making labels that wrap around a tin can. The can has a diameter of 6 cm and a height of 9 cm . How much paper is needed for one label? _____



Answer Keys

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1) 251.2</p> <p>2) 471</p> <p>3) 376.8</p> <p>4) 138.16</p> <p>5) 439.6</p> <p>6) 483.56</p> <p>7) 100.48</p> <p>8) 226.08</p> <p>9) 452.16</p> | <p>10) 527.52</p> <p>11) 263.76</p> <p>12) 753.6</p> <p>13) 320.28</p> <p>14) 452.16</p> <p>15) 791.28</p> <p>16) 301.44 cm^2</p> <p>17) 169.56 cm^2</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Step-by-Step Explanations

Strategy: For Parts of a Circle, name the circle part first: radius, diameter, chord, arc, sector, segment, tangent, or secant, because vocabulary guides the calculation. Circle vocabulary answers should match the exact part shown in the diagram.

Practice 1: Find arc length. **Answer:** 9.42

At the beginning of the practice, name the part shown first, then use arc or sector formulas only when a measure is requested.

Practice 15: Is the diameter also a chord? **Answer:** yes

For the second model problem, name the part shown first, then use arc or sector formulas only when a measure is requested.

Word-problem notes:

16. Answer: Arc: $\frac{150}{360} \times 2\pi(12) = \frac{5}{12} \times 24\pi = 10\pi \approx 31.4 \text{ m}$; area: $\frac{150}{360} \times \pi(144) = 60\pi \approx 188.5 \text{ m}^2$; cost: $\approx \$9.42$.

The sprinkler covers a sector, so use the fraction $\frac{150}{360} = \frac{5}{12}$ of a full circle. The full circumference for radius 12 m is $2\pi(12) = 24\pi$, so the arc length is $\frac{5}{12} \cdot 24\pi = 10\pi \approx 31.4 \text{ m}$. The full circle area is $\pi(12)^2 = 144\pi$, so the watered area is $\frac{5}{12} \cdot 144\pi = 60\pi \approx 188.5 \text{ m}^2$. Multiply by the water cost, 188.5×0.05 , to get about $\$9.42$.

17. Answer: $20 \text{ min} = \frac{1}{3}$ of circle; arc = $\frac{1}{3} \times 2\pi(14) \approx 29.3 \text{ cm}$; area = $\frac{1}{3} \times \pi(196) \approx 205.3 \text{ cm}^2$; $1 \text{ hr} = 2\pi(14) \approx 87.96 \text{ cm}$.

In 20 min , the minute hand travels $\frac{20}{60} = \frac{1}{3}$ of a full turn. Since the hand length is 14 cm , that is the radius of the circle traced by the tip. So the distance traveled is one third of the full circumference: $\frac{1}{3} \cdot 2\pi(14) \approx 29.3 \text{ cm}$. The swept area is one third of the full circle area: $\frac{1}{3} \cdot \pi(14)^2 \approx 205.3 \text{ cm}^2$. In one full hour, the tip travels one complete circumference, $2\pi(14) \approx 87.96 \text{ cm}$.



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