Cylinder Surface Area and Volume

Apply the skill to decisions and designs

Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Cylinder volume is $V = \pi r^2 h$; the wall area is $2\pi rh$. A closed cylinder adds two disk areas, an open-top cylinder only one. For $r = 2$ cm and $h = 5$ cm, the wall is 20π cm^2 and the closed area is 28π cm^2.

Worked example

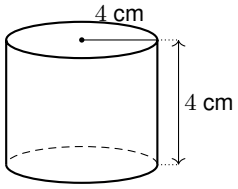
Find the exact volume for $r = 2$ cm and $h = 5$ cm.

1. Base area: $\pi(2)^2 = 4\pi$ cm^2.
2. Multiply by height: $(4\pi)(5) = 20\pi$ cm^3.
3. Check: $20\pi/(4\pi) = 5$ cm.
Answer: 20π cm^3.

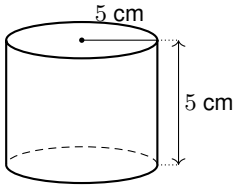
Practice Problems

Show your thinking.

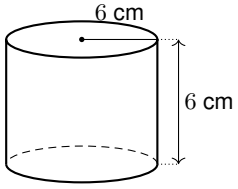
1. A can has inside radius 4 cm and height 4 cm. Find its exact capacity in cubic centimeters.



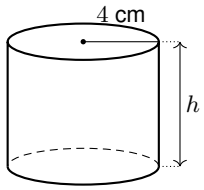
2. A closed cylindrical package has radius 5 cm and height 5 cm. Find its exact material area, ignoring seams.



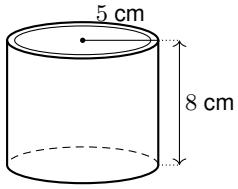
3. A label covers the wall of a radius-6 cm, height-6 cm cylinder and overlaps by 1 cm around the seam. Find the cut dimensions and area.



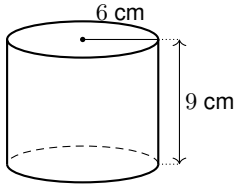
4. A radius-4 cm cylinder must hold 112π cm^3. Find the required height. Does it fit under 6 cm of clearance?



5. An open-top bin has radius 5 cm and height 8 cm. Find exact material area and how much area is saved by omitting the lid.



6. A designer increases the cylinder radius from 6 cm to 7 cm and keeps height 9 cm. Find the old and new capacities and the increase.



Answer Key

1. 64π cm^3.
2. 100π cm^2.
3. $(12\pi + 1)$ cm by 6 cm; $(72\pi + 6)$ cm^2.
4. 7 cm. No; it is 1 cm too tall.
5. 105π cm^2. Saves 25π cm^2.
6. 324π to 441π cm^3; increase 117π cm^3.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Base area: $\pi(4)^2 = 16\pi$ cm^2.
2. Multiply by height: $(16\pi)(4) = 64\pi$ cm^3.
3. Check: dividing 64π cm^3 by 16π cm^2 gives 4 cm.

Problem 2

1. Two circular ends: $2\pi(5)^2 = 50\pi$ cm^2.
2. Curved wall: $2\pi(5)(5) = 50\pi$ cm^2.
3. Total: $(50 + 50)\pi = 100\pi$ cm^2.

Problem 3

1. Unrolled width is the circumference: $2\pi(6) = 12\pi$ cm.
2. Add the seam allowance to the width: $12\pi + 1$ cm; height stays 6 cm.
3. Area is width times height: $(12\pi + 1)(6) = (72\pi + 6)$ cm^2.

Problem 4

1. The given radius gives base area $\pi(4)^2 = 16\pi$ cm^2.
2. Divide volume by base area: $h = 112\pi/(16\pi) = 7$ cm.
3. Check: $(16\pi)(7) = 112\pi$ cm^3.
4. The required height exceeds clearance by $7 - (6) = 1$ cm.

Problem 5

1. One bottom disk: $\pi(5)^2 = 25\pi$ cm^2.
2. Wall area: $2\pi(5)(8) = 80\pi$ cm^2.
3. Add only the bottom: $(25 + 80)\pi = 105\pi$ cm^2.
4. A lid would be one more disk, so leaving it off saves 25π cm^2.

Problem 6

1. Original volume: $\pi(6)^2(9) = 324\pi$ cm^3.
2. New volume: $\pi(7)^2(9) = 441\pi$ cm^3.
3. Increase: $(441 - 324)\pi = 117\pi$ cm^3.

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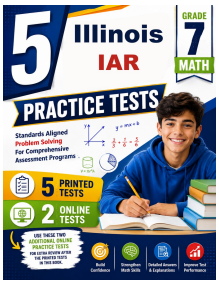

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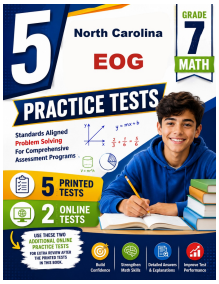

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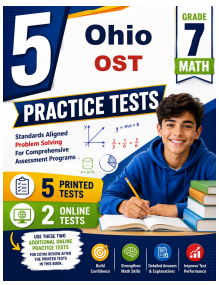

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