LESSON MAKER PRO

Wrap or Fill?

Find the surface area and volume of prisms and cylinders.

GRADE 8 · PA.GM.2

PA.GM.2 "Justify and use formulas to calculate surface area and volume of three-dimensional figures. Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate units (e.g., cm²)..."

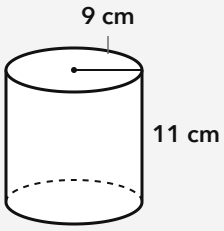
NAME _____ DATE _____

FACES AND LAYERS

A cylinder's surface is made of two circles and a curved side that unwraps into a rectangle, so its surface area is $2\pi r^2 + 2\pi rh$. Its volume is $\pi r^2 h$ because each unit-high layer has area πr^2. For a rectangular prism, add the areas of its six faces to find surface area, or multiply base area B by height h to find volume.

WORKED EXAMPLE

Find the total surface area of the closed cylinder shown. Give your answer in terms of π.

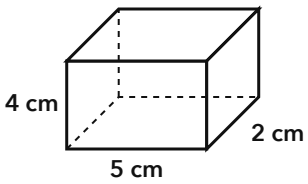


1. Area of two circular ends: $2\pi(9^2) = 162\pi$ cm^2.
2. Area of curved side: $2\pi(9)(11) = 198\pi$ cm^2.
3. Total surface area: $162\pi + 198\pi = 360\pi$ cm^2.

Answer: 360π cm^2

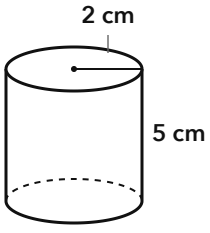
PRACTICE 6 problems

1 Find the total surface area of the rectangular prism shown.



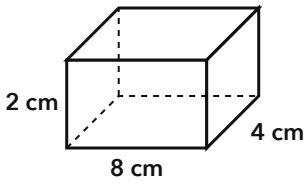
ANSWER _____

2 Find the total surface area of the closed cylinder shown. Give your answer in terms of π.



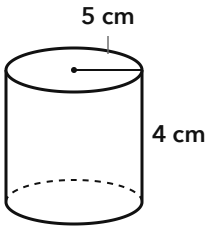
ANSWER _____

3 Find the volume of the rectangular prism shown. In one sentence, explain why you multiply its base area by its height.



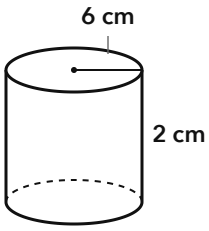
ANSWER _____

4 Find the base area B and the volume V of the cylinder shown. Give both in terms of π.



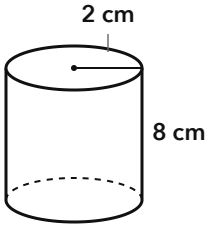
ANSWER _____

5 Find the curved side area and the total surface area of the closed cylinder shown. Give both in terms of π.



ANSWER _____

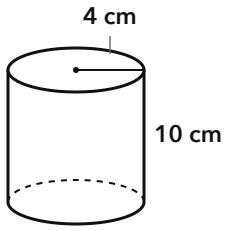
6 Find the volume of the cylinder shown. Use 3.14 for π.



ANSWER _____

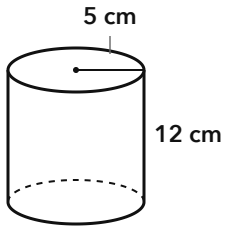
APPLY IT Show your work

1 A reusable cup has a cylindrical interior with the dimensions shown. How much water does it hold when full? Give the volume in terms of π, then use 3.14 to approximate it.



ANSWER _____

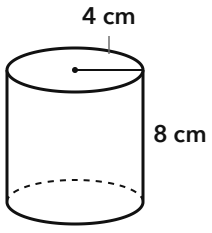
2 A sticker will cover only the curved side of a cylindrical gaming speaker, with no overlap. Find the sticker area in terms of π, then use 3.14 to approximate it.



ANSWER _____

CHALLENGE One step up

A second cylinder has twice the radius and half the height of the cylinder shown. Find both volumes in terms of π. Explain why the second cylinder has twice the volume.



WORK SPACE AND ANSWER

ANSWER KEY

Wrap or Fill?

GRADE 8 · PA.GM.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the total surface area of the rectangular prism shown.	**76 cm²**
2	Find the total surface area of the closed cylinder shown. Give your answer in terms of π.	**28π cm²**
3	Find the volume of the rectangular prism shown. In one sentence, explain why you multiply its base area by its height.	**64 cm³. The base area is 32 cm², and multiplying by the 2 cm height counts two unit-high layers.**
4	Find the base area B and the volume V of the cylinder shown. Give both in terms of π.	**B = 25π cm²; V = 100π cm³**
5	Find the curved side area and the total surface area of the closed cylinder shown. Give both in terms of π.	**Curved side area = 24π cm²; total surface area = 96π cm²**
6	Find the volume of the cylinder shown. Use 3.14 for π.	**100.48 cm³**

PART 2 · APPLY IT

1. **160π cm³; approximately 502.4 cm³** Multiply the base area, 16π cm², by the 10 cm height. Then calculate 160 × 3.14.
2. **120π cm²; approximately 376.8 cm²** Use the curved side area, 2πrh, without adding the circular ends. Then calculate 120 × 3.14.

CHALLENGE

Shown cylinder: 128π cm³. Second cylinder: 256π cm³. Doubling the radius makes the base area four times as large, while halving the height makes the volume half as large, for a net change of 4 × 1/2 = 2.

Accept equivalent exact expressions in terms of π where requested. For explanations, accept any clear description of equal-area layers multiplied by height.