

Measure It All

Use circle area, surface area, and volume to solve geometry problems.

GRADE 7 • 7.GSR.5

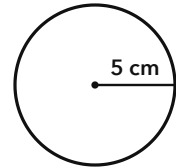
7.GSR.5 "Solve practical problems involving angle measurement, circles, area of circles, surface area of prisms and cylinders, and volume of cylinders and prisms composed of cubes and right prisms."

NAME _____

DATE _____

BUILD THE MEASURE

For a right prism or cylinder, $V = Bh$. For a circle, $A = \pi r^2$. Total surface area includes every exterior surface: a closed cylinder has two circular bases and a curved side, so $SA = 2\pi r^2 + 2\pi rh$. Adjacent angles on a straight line sum to 180° . Keep π exact; area uses square units and volume uses cubic units.

**WORKED EXAMPLE**

The diagram shows the circular base of a cylindrical container. Its radius is 5 cm and the container is 7 cm high. Find the volume.

1. $B = \pi(5)^2 = 25\pi \text{ cm}^2$.

2. $V = Bh = 25\pi \times 7 = 175\pi \text{ cm}^3$.

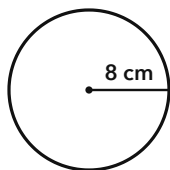
Answer: $175\pi \text{ cm}^3$

PRACTICE 4 problems

- 1** A storage box is 6 cm long, 4 cm wide and 3 cm high. Find its volume. Show the formula and substitution.

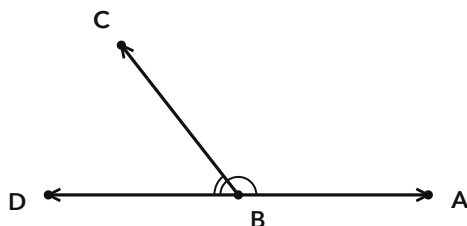
ANSWER _____

- 2 A circular mat has radius 8 cm, as shown. Find its area and show the calculation.



ANSWER _____

- 3 A straight path runs from D through B to A. Path BC makes angle $ABC = 128^\circ$. Find angle CBD and explain.



ANSWER _____

- 4 A closed rectangular gift box is 10 in. long, 2 in. wide and 3 in. high. Find the area of paper needed to cover all six faces, with no overlap.

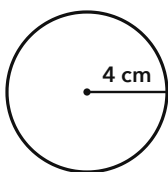
ANSWER _____

APPLY IT Show your work

- 1** A circular tabletop has diameter 12 ft. Find its area. Explain how you obtained the radius.

ANSWER _____

- 2** The diagram shows the circular base of a closed cylindrical can. Its radius is 4 cm and its height is 12 cm. Find the paper needed to cover its curved side, top and bottom, with no overlap.



ANSWER _____

CHALLENGE One step up

A game tournament trophy stand is made by placing a 4-unit by 4-unit by 6-unit rectangular prism on top of a 12-unit by 4-unit by 3-unit rectangular prism. The prisms touch along a face but do not overlap. Find the total volume and explain why adding the two volumes works.

PRACTICE 1

$$V = 6 \times 4 \times 3 = 72 \text{ cm}^3.$$

PRACTICE 2

$$A = \pi(8)^2 = 64\pi \text{ cm}^2.$$

PRACTICE 3

Angle CBD = $180^\circ - 128^\circ = 52^\circ$ because the adjacent angles form a straight angle.

PRACTICE 4

$$SA = 2(10 \times 2 + 10 \times 3 + 2 \times 3) = 2(20 + 30 + 6) = 112 \text{ in}^2.$$

APPLY IT 1

$$36\pi \text{ ft}^2.$$

Radius is half the diameter: $12 \div 2 = 6 \text{ ft}$. $A = \pi(6)^2 = 36\pi \text{ ft}^2$.

APPLY IT 2

$$128\pi \text{ cm}^2$$

The two circular bases have area $2\pi(4)^2 = 32\pi \text{ cm}^2$. The curved surface area is $2\pi(4)(12) = 96\pi \text{ cm}^2$, so the total is $128\pi \text{ cm}^2$.

CHALLENGE

$4 \times 4 \times 6 + 12 \times 4 \times 3 = 96 + 144 = 240$ cubic units. The solids have no overlapping volume, so add their volumes.

Accept equivalent forms that keep π exact. For the challenge, accept a correct total with a statement that the two non-overlapping prism volumes are added.