

# Geometry · Cross Sections, Solids of Rotation and Geometric Modeling · Test

Common Core G-GMD.B.4, G-MG.A.1, G-MG.A.2, G-MG.A.3 · mathovore.fr

Name: \_\_\_\_\_ Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ Score: \_\_\_\_\_

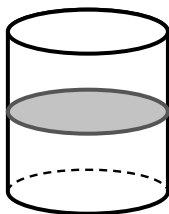
This 45-minute test has 8 questions worth 20 points. Show every step and give exact answers in terms of  $\pi$  unless a question asks for a rounded value. Include units in every answer.

## Test information

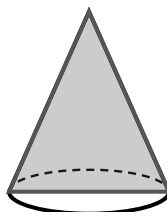
- **Grade:** Geometry
- **Chapter:** Cross Sections, Solids of Rotation and Geometric Modeling
- **Common Core:** G-GMD.B.4, G-MG.A.1, G-MG.A.2, G-MG.A.3
- **Time:** 45 minutes
- **Total:** 20 points (Question 1: 3 pts; Question 2: 2 pts; Question 3: 2 pts; Question 4: 3 pts; Question 5: 2 pts; Question 6: 2 pts; Question 7: 3 pts; Question 8: 3 pts)

## Question 1: Name the cross sections (3 points)

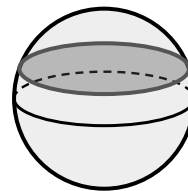
Name the shape of each cross section.



**Cylinder**



**Cone**



**Sphere**

cut parallel to the bases through apex, perpendicular to base cut by a plane

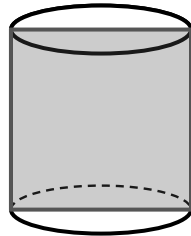
Three solids and their cutting planes.

- (1 point) The cut through the cylinder.
- (1 point) The cut through the cone.
- (1 point) The cut through the sphere.

## Question 2: Cut through a cylinder (2 points)

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A cylinder has a diameter of 12 cm and a height of 15 cm. A plane passes through its axis perpendicular to the bases.



$$d = 12 \text{ cm}, h = 15 \text{ cm}$$

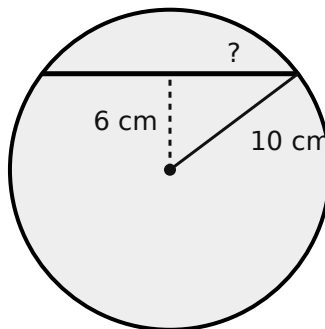
A cut through the axis.

- (1 point) Name the shape of the cross section and give its dimensions.
- (1 point) Find the area of the cross section.

## Question 3: Slicing a sphere (2 points)

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A sphere has a radius of 10 cm. A plane cuts it 6 cm from the center.



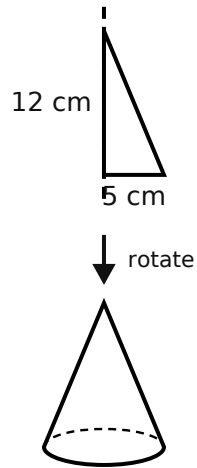
A cut sphere, side view.

- (1 point) Find the radius of the circular cross section.
- (1 point) Find the area of the cross section in terms of  $\pi$ .

## Question 4: Rotating a triangle (3 points)

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A right triangle has legs of 5 cm and 12 cm. It is rotated about the 12 cm leg.



Rotate the shape about the dashed axis.

- (1 point) Name the solid.
- (1 point) Give its radius and height.
- (1 point) Find its volume in terms of  $\pi$ .

### Question 5: Comparing counties (2 points)

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County A has 31,200 residents on  $40 \text{ mi}^2$ . County B has 24,640 residents on  $28 \text{ mi}^2$ .

- (1 point) Find the population density of each county.
- (1 point) Which county is more densely populated, and by how many people per square mile?

### Question 6: Heating a gym (2 points)

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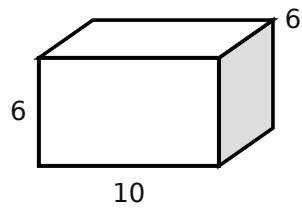
A gym is 50 ft long, 30 ft wide and 12 ft tall. It needs 4 BTUs per cubic foot to be heated.

- (1 point) How many BTUs are needed?
- (1 point) A heater supplies 18,000 BTUs per hour. How many hours does it take?

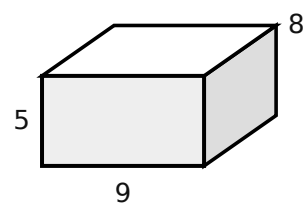
### Question 7: Cheaper box (3 points)

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Noah needs a box that holds  $360 \text{ in}^3$ . Box 1 is 10 in by 6 in by 6 in. Box 2 is 9 in by 8 in by 5 in. Cardboard costs \$0.03 per square inch.



**Box 1:  $10 \times 6 \times 6$  in**



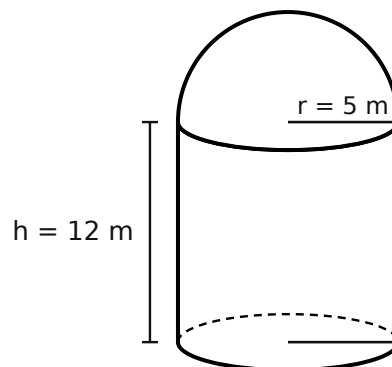
**Box 2:  $9 \times 8 \times 5$  in**

Two shipping boxes.

- (1 point) Show that both boxes hold  $360 \text{ in}^3$ .
- (1 point) Find the surface area of each box.
- (1 point) Find which box costs less to make and its cost.

### Question 8: Grain silo (3 points)

A silo is a cylinder with a radius of  $5 \text{ m}$  and a height of  $12 \text{ m}$ , topped by a hemisphere with a radius of  $5 \text{ m}$ .



A silo: cylinder plus hemisphere.

- (1 point) Find the volume of the cylinder in terms of  $\pi$ .
- (1 point) Find the volume of the hemisphere in terms of  $\pi$ .
- (1 point) Find the total volume to the nearest tenth.