

Geometry · Cross Sections, Solids of Rotation and Geometric Modeling · Quiz

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

Name: _____ Date: ____/____/____ Score: _____

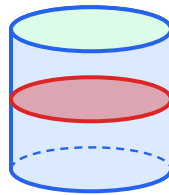
Answer these 10 multiple-choice questions on cross sections, solids of rotation, density and design. Pick one answer for each question and read the explanation to see the common mistake.

GeometryCommon Core: **G-GMD.B.4 · G-MG.A.1 · G-MG.A.2 · G-MG.A.3**

Questions

Question 1

A plane cuts a cylinder parallel to its bases. What is the shape of the cross section?

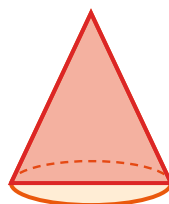


A horizontal cut.

- A. A circle
- B. A rectangle
- C. A triangle
- D. An ellipse that is not a circle

Question 2

A plane passes through the apex of a cone and the center of its base. What is the cross section?



A vertical cut.

- A. A circle
- B. A rectangle
- C. A triangle
- D. A trapezoid

Question 3

A sphere has a radius of 5 cm. A plane cuts it 3 cm from the center. What is the area of the circular cross section?

- A. $34\pi \text{ cm}^2$
- B. $25\pi \text{ cm}^2$
- C. $4\pi \text{ cm}^2$
- D. $16\pi \text{ cm}^2$

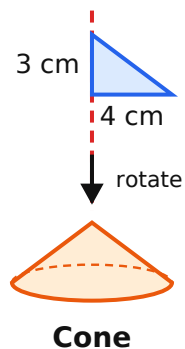
Question 4

Which solid is made by rotating a rectangle about one of its sides?

- A. A cylinder
- B. A cone
- C. A sphere
- D. A cube

Question 5

A right triangle with legs 3 cm and 4 cm is rotated about the 3 cm leg. What is the volume of the solid?



Rotate the shape about the dashed axis.

- A. $12\pi \text{ cm}^3$
- B. $16\pi \text{ cm}^3$
- C. $9\pi \text{ cm}^3$
- D. $48\pi \text{ cm}^3$

Question 6

A district has 6,300 people in 9 mi^2 . What is its population density?

- A. 70 people per square mile
- B. 7,000 people per square mile
- C. 700 people per square mile
- D. 56,700 people per square mile

Question 7

A room is 10 ft by 12 ft with an 8 ft ceiling and needs 5 BTUs per cubic foot. How many BTUs are needed?

- A. 960 BTUs
- B. 600 BTUs
- C. 4,800 BTUs
- D. 2,400 BTUs

Question 8

Which whole-number dimensions give a rectangular garden the greatest area using exactly 36 feet of fence?

- A. 6 ft by 12 ft
- B. 8 ft by 10 ft
- C. 4 ft by 14 ft
- D. 9 ft by 9 ft

Question 9

A round hay bale is modeled as a cylinder with a diameter of 5 ft and a width of 4 ft. What is its volume?

- A. $100\pi \approx 314.16 \text{ ft}^3$
- B. $25\pi \approx 78.54 \text{ ft}^3$
- C. $10\pi \approx 31.42 \text{ ft}^3$
- D. $50\pi \approx 157.08 \text{ ft}^3$

Question 10

A cube with an edge of 3 cm has a mass of 24.3 g. What is its density?

- A. 8.1 g/cm^3
- B. 0.9 g/cm^3
- C. 2.7 g/cm^3
- D. 72.9 g/cm^3

Answer key

1. **A** – A cut parallel to the bases has the same shape as a base, a circle. A rectangle comes from a cut through the axis.
2. **C** – The plane meets the cone along two slant lines and the base diameter, which makes a triangle.
3. **D** – The slice radius is $\sqrt{(25 - 9)} = 4$ cm, so the area is 16π cm². Adding 25 and 9 is a common mistake.
4. **A** – Every point of the rectangle sweeps a circle about the side, so the solid is a cylinder.
5. **B** – The cone has radius 4 and height 3: $V = (1/3)\pi(16)(3) = 16\pi$. Swapping the two legs gives 12π .
6. **C** – Density = $6,300 \div 9 = 700$. Multiplying instead of dividing gives 56,700.
7. **C** – Volume = $10 \times 12 \times 8 = 960$ ft³, and $960 \times 5 = 4,800$. Using the floor area, 120, gives 600.
8. **D** – The length and width add to 18. The areas are 81, 72, 80 and 56, so the square gives the most.
9. **B** – The radius is 2.5 ft, so $V = \pi(6.25)(4) = 25\pi$. Using the diameter as the radius gives 100π .
10. **B** – Volume = 27 cm³ and density = $24.3 \div 27 = 0.9$. Dividing by the edge, 3, gives 8.1.

Remember:

- Standards G-GMD.B.4, G-MG.A.1, G-MG.A.2 and G-MG.A.3 cover cross sections, rotations, modeling, density and design problems.
- A plane parallel to the base of a cylinder, cone or sphere makes a circle; through the axis it makes a rectangle or triangle.
- A rectangle spins into a cylinder, a right triangle into a cone, and a semicircle into a sphere.
- Density = amount $\div$ area or volume, such as people per square mile or BTUs per cubic foot.
- Design problems pick the best option that satisfies constraints on size, material or cost.