

Geometry · Area and Volume Formulas · Test Answer Key

Common Core G-GMD.A.1, G-GMD.A.3 · mathovore.fr

Each solution shows the formula, the substitution and the result, followed by a scoring guide. Award partial credit only as the guide describes, and check that cubic units are used for every volume.

GeometryCommon Core: G-GMD.A.1 · G-GMD.A.3

Question 1: Circle measures (2 points)

(a) $C = \pi d = 16\pi \approx 50.27 \text{ in.}$

(b) $r = 8$, so $A = \pi(8)^2 = 64\pi \approx 201.06 \text{ in}^2$.

Answers: $16\pi \text{ in}$; $64\pi \text{ in}^2$.

Scoring: 1 point for the circumference, 1 point for the area (the radius must be 8, not 16).

Question 2: Rearranged sectors (2 points)

(a) The base is half the circumference: $\frac{2\pi(12)}{2} = 12\pi \text{ cm.}$

(b) The height is the radius, 12 cm . Area $= 12\pi \times 12 = 144\pi \text{ cm}^2$, which confirms $A = \pi r^2$.

Answers: $12\pi \text{ cm}$; $144\pi \text{ cm}^2$.

Scoring: 1 point for the base; 1 point for the area and the formula.

Question 3: Slanted cylinder (2 points)

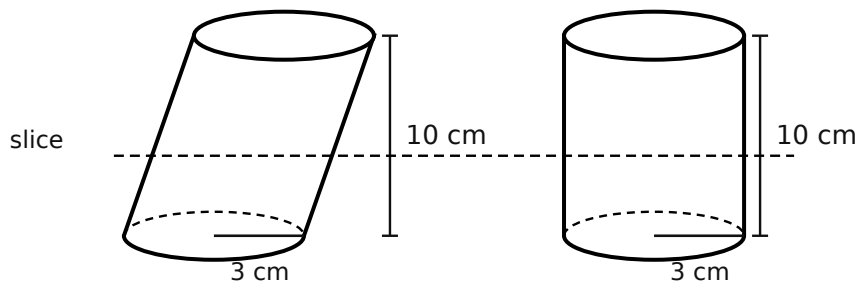
(a) The right cylinder has volume $\pi(3)^2(10) = 90\pi \text{ cm}^3$, and the slanted cylinder has the same volume.

(b) Cavalieri's principle: both solids are 10 cm tall and every horizontal cross section is a circle of radius 3 cm (area $9\pi \text{ cm}^2$), so the volumes are equal.

Answer: $90\pi \text{ cm}^3$.

Scoring: 1 point for 90π ; 1 point for naming Cavalieri's principle with equal heights and equal

cross-sectional areas.



Each slice has area $9\pi \text{ cm}^2$.

Question 4: Oil drum (2 points)

(a) $r=12$, so $V=\pi(12)^2(36)=5184\pi \text{ in}^3$ (about $16,286.02 \text{ in}^3$).

(b) $16,286.02 \div 231 \approx 70.50$, so about 70.5 gallons.

Answers: $5184\pi \text{ in}^3$; **about 70.5 gallons**.

Scoring: 1 point for using the radius 12 and getting 5184π ; 1 point for the correct conversion to gallons.

Question 5: Pyramid height (2 points)

(a) $150=\frac{1}{3}(36)h=12h$, so $h=12.5 \text{ m}$.

(b) The prism has $V=Bh=36 \times 12.5=450 \text{ m}^3$, which is 3 times the pyramid.

Answers: 12.5 m; 450 m^3 .

Scoring: 1 point for the height; 1 point for the prism volume.

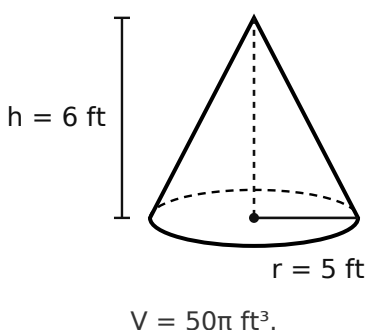
Question 6: Pile of sand (2 points)

(a) $r=5$, so $V=\frac{1}{3}\pi(25)(6)=50\pi \approx 157.08 \text{ ft}^3$.

(b) $157.08 \times 100 = 15,708$ pounds.

Answers: $50\pi \approx 157.08 \text{ ft}^3$; **about 15,708 pounds**.

Scoring: 1 point for the volume (radius 5, factor $\frac{1}{3}$); 1 point for the weight.



Question 7: Volume of a sphere (2 points)

$$V = \frac{4}{3}\pi(9)^3 = \frac{4}{3}\pi(729) = 972\pi \approx 3,053.63.$$

Answer: $972\pi \approx 3,053.63 \text{ cm}^3$.

Scoring: 1 point for the correct formula and substitution; 1 point for 972π and the rounded value.

Question 8: Hemisphere and cylinder (3 points)

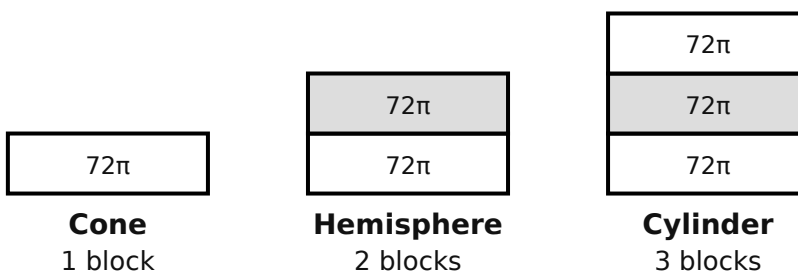
(a) $V = \pi(6)^2(6) = 216\pi \text{ cm}^3.$

(b) $V = \frac{1}{3}\pi(36)(6) = 72\pi \text{ cm}^3.$

(c) $216\pi - 72\pi = 144\pi$. The hemisphere is half a sphere: $\frac{1}{2} \cdot \frac{4}{3}\pi(6)^3 = \frac{2}{3}\pi(216) = 144\pi$. The volumes are equal, as Cavalieri's principle predicts.

Answers: 216π ; 72π ; $144\pi \text{ cm}^3$.

Scoring: 1 point for the cylinder; 1 point for the cone; 1 point for the subtraction and the matching hemisphere volume.



Cone : hemisphere : cylinder = 1 : 2 : 3 when the radius equals the height.

Question 9: Cone candles (3 points)

(a) $\pi(4)^2(9) = 144\pi \text{ cm}^3$.

(b) $\frac{1}{3}\pi(3)^2(6) = 18\pi \text{ cm}^3$.

(c) $144\pi \div 18\pi = 8$ candles.

Answers: $144\pi \text{ cm}^3$; $18\pi \text{ cm}^3$; **8 candles**.

Scoring: 1 point for each correct part.

Total
20 points