

Geometry - Area, Volume and Dissection Arguments - Answer Key

Common Core G-GMD.A.1, G-GMD.A.3 · maths-pdf.fr/en/

Use this answer key to check the 20 problems on volume formulas. Every solution shows the formula or theorem used, each step of the work, and the final answer in bold. If an answer differs from yours, compare the steps line by line to find where the work changed.

Geometry · Common Core State Standards: **G-GMD.A.1, G-GMD.A.3**

Exercise 1 - Circumference and area

$$C = 2\pi \cdot 7 = 14\pi.$$

$$A = \pi \cdot 7^2 = 49\pi.$$

14π and 49π

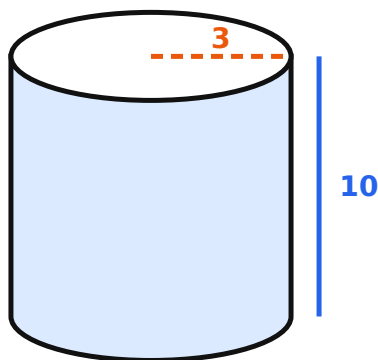
Exercise 2 - Area from the diameter

Radius 5.

$$A = 25\pi = 78.5$$

78.5 square units

Exercise 3 - Cylinder volume



$$V = 90\pi.$$

$$V = \pi \cdot 3^2 \cdot 10 = 90\pi = 282.7.$$

90π , about 282.7 cubic units

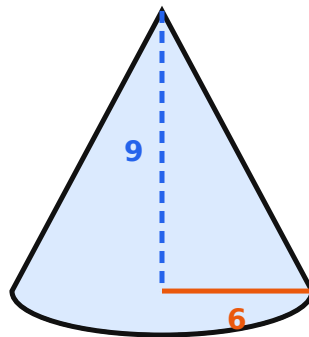
Exercise 4 - Cylinder from the diameter

Radius 4.

$$V = \pi \cdot 4^2 \cdot 12 = 192\pi = 603.2$$

603.2 cubic inches

Exercise 5 - Cone volume



$$V = 108\pi.$$

$$V = \frac{1}{3}\pi \cdot 6^2 \cdot 9 = 108\pi = 339.3$$

108π , about 339.3

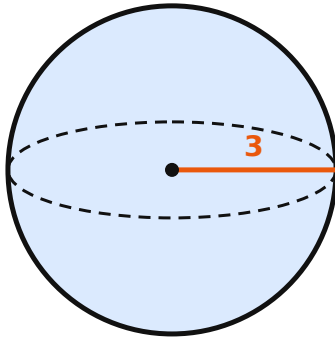
Exercise 6 - Cone with slant height

$$\text{Height: } \sqrt{13^2 - 5^2} = 12.$$

$$V = \frac{1}{3}\pi \cdot 25 \cdot 12 = 100\pi = 314.2$$

Height 12; $V = 100\pi$, about 314.2

Exercise 7 - Sphere volume



$$V = 36\pi.$$

$$V = \frac{4}{3}\pi \cdot 3^3 = 36\pi = 113.1$$

36π , about 113.1

Exercise 8 - Larger sphere

$$V = \frac{4}{3}\pi \cdot 6^3 = 288\pi = 904.8$$

904.8 cubic units

Exercise 9 - Square pyramid

$$\text{Base area } 8^2 = 64.$$

$$V = \frac{1}{3} \cdot 64 \cdot 9 = 192$$

192 cubic units

Exercise 10 - Rectangular pyramid

$$V = \frac{1}{3} \cdot (6 \cdot 10) \cdot 7 = 140$$

140 cubic units

Exercise 11 - Hemisphere

Half of a sphere: $\frac{1}{2} \cdot \frac{4}{3} \pi \cdot 6^3 = 144\pi = 452.4$

452.4 cubic units

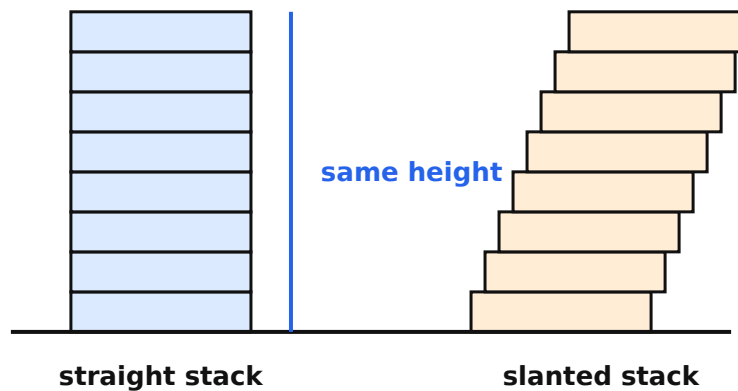
Exercise 12 - Find the radius

$$\pi r^2 \cdot 8 = 200\pi$$

$$r^2 = 25, \text{ so } r = 5.$$

$$r = 5$$

Exercise 13 - Cavalieri



Cavalieri's principle: equal heights and equal cross-sections give equal volumes.

Right prism: $40 \cdot 9 = 360$.

By Cavalieri's principle, the slanted prism has the same volume, 360.

360 for both

Exercise 14 - Cone and cylinder

The cone has one third of the volume.

$$\frac{1}{3} \cdot 150\pi = 50\pi$$

$$50\pi$$

Exercise 15 - Pyramid in a cube

Cube: $6^3 = 216$. Pyramid: $\frac{1}{3} \cdot 36 \cdot 6 = 72$.

$216 \div 72 = 3$ pyramids fill the cube.

216; 72; 3 pyramids

Exercise 16 - Doubling the radius

$\frac{4}{3}\pi(2r)^3 = 8 \cdot \frac{4}{3}\pi r^3$, so the volume is 8 times as large.

Check: $\frac{32}{3}\pi$ and $\frac{256}{3}\pi$, a ratio of 8.

Factor of 8

Exercise 17 - Water tank

$V = \pi \cdot 4^2 \cdot 10 = 160\pi = 502.7$ cubic feet.

$502.7 \cdot 7.48 = 3,760$ gallons.

502.7 cu ft; about 3,760 gallons

Exercise 18 - Ice cream cone

Cone: $\frac{1}{3}\pi \cdot 3^2 \cdot 10 = 30\pi$.

Hemisphere: $\frac{2}{3}\pi \cdot 3^3 = 18\pi$.

$30\pi + 18\pi = 48\pi = 150.8$

150.8 cubic centimeters

Exercise 19 - Grain silo

Cylinder: $\pi \cdot 10^2 \cdot 30 = 3000\pi$.

Hemisphere: $\frac{2}{3}\pi \cdot 10^3 = \frac{2000}{3}\pi$.

$3000\pi + \frac{2000}{3}\pi = \frac{11000}{3}\pi = 11,519$

About 11,519 cubic feet

Exercise 20 - Sand pile

Radius 6.

$$V = \frac{1}{3}\pi \cdot 6^2 \cdot 5 = 60\pi = 188.5$$

188.5 cubic feet