

Geometry · Area and Volume Formulas · Worksheet Answer Key

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

Every worked solution shows the formula, the substitution and the final answer in bold, with exact answers in terms of π and rounded values. Compare each step with your own work to find where a mistake started.

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

Problem 1: Circumference from the radius

$$C = 2\pi r = 2\pi(7) = 14\pi. \text{ Then } 14\pi \approx 43.98.$$

The circumference is $14\pi \approx 43.98$ cm.

Problem 2: Circumference from the diameter

$$C = \pi d = \pi(18) = 18\pi \approx 56.55.$$

The circumference is $18\pi \approx 56.55$ in.

Problem 3: Radius from the circumference

$$C = 2\pi r, \text{ so } 25.12 = 2(3.14)r = 6.28r. \text{ Divide both sides by } 6.28: r = 4.$$

$$\text{Check: } 2(3.14)(4) = 25.12.$$

The radius is 4 m.

Problem 4: Area of a circle

$$A = \pi r^2 = \pi(9)^2 = 81\pi \approx 254.47.$$

The area is $81\pi \approx 254.47$ ft².

Problem 5: Area from the diameter

$$\text{The radius is } 14 \div 2 = 7 \text{ in. Then } A = \pi(7)^2 = 49\pi \approx 153.94.$$

The area is $49\pi \approx 153.94$ in².

Problem 6: Radius from the area

$\pi r^2 = 144\pi$, so $r^2 = 144$ and $r = 12$ (a length is positive).

Then $C = 2\pi(12) = 24\pi \approx 75.40$.

The radius is 12 cm and the circumference is 24π cm.

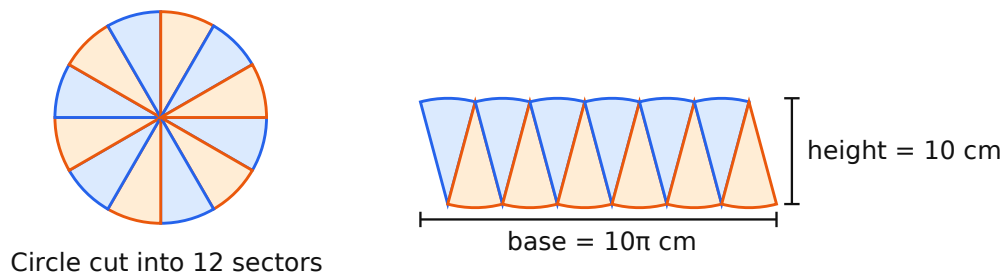
Problem 7: Sectors into a parallelogram

(a) $C = 2\pi(10) = 20\pi$ cm.

(b) The base is half the circumference: $\frac{20\pi}{2} = 10\pi$ cm.

(c) The height is the radius, 10 cm. Area = $10\pi \times 10 = 100\pi \approx 314.16$ cm². This matches $\pi r^2 = \pi(10)^2$.

Answers: 20π cm; 10π cm; 100π cm².



The base is half of 20π .

Problem 8: Volume of a cylinder

$$V = \pi r^2 h = \pi(4)^2(10) = 160\pi \approx 502.65.$$

The volume is $160\pi \approx 502.65$ cm³.

Problem 9: Height of a cylinder

$$225\pi = \pi(5)^2 h = 25\pi h. \text{ Divide both sides by } 25\pi : h = 9.$$

$$\text{Check: } \pi(5)^2(9) = 225\pi.$$

The height is 9 in.

Problem 10: Equal stacks of coins

(a) Height = $6 \times 0.3 = 1.8$ cm for each stack.

(b) Volume = area $\times$ height = $5 \times 1.8 = 9$ cm³ for each stack.

(c) At every level, both stacks have a cross section with area 5 cm², and both are 1.8 cm tall. By Cavalieri's principle the volumes are equal.

Answers: 1.8 cm; 9 cm³; same cross-sectional areas and heights.

Problem 11: Volume of a pyramid

The base area is $B = 6 \times 6 = 36$ m². Then $V = \frac{1}{3}Bh = \frac{1}{3}(36)(9) = 108$.

The volume is 108 m³.

Problem 12: Rectangular pyramid

$B = 8 \times 5 = 40$ ft². Then $V = \frac{1}{3}(40)(12) = 160$.

The volume is 160 ft³.

Problem 13: Volume of a cone

$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(9)(7) = 21\pi \approx 65.97$.

The volume is $21\pi \approx 65.97$ in³.

Problem 14: Height of a cone

$100\pi = \frac{1}{3}\pi(5)^2 h = \frac{25\pi}{3}h$. Multiply by 3: $300\pi = 25\pi h$. Divide by 25π : $h = 12$.

The height is 12 cm.

Problem 15: Volume of a sphere

$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(216) = 288\pi \approx 904.78$.

The volume is $288\pi \approx 904.78$ cm³.

Problem 16: Volume of a hemisphere

A hemisphere is half a sphere: $V = \frac{1}{2} \cdot \frac{4}{3}\pi(5)^3 = \frac{2}{3}\pi(125) = \frac{250\pi}{3} \approx 261.80$.

The bowl holds $\frac{250\pi}{3} \approx 261.80$ in³.

125π/3	125π/3	125π/3
125π/3	125π/3	125π/3
125π/3	125π/3	125π/3
Cone 1 block	Hemisphere 2 blocks	Cylinder 3 blocks

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

Problem 17: Cone compared with cylinder

Cylinder: $\pi(4)^2(9) = 144\pi \approx 452.39 \text{ cm}^3$.

Cone: $\frac{1}{3}\pi(16)(9) = 48\pi \approx 150.80 \text{ cm}^3$.

$$\frac{48\pi}{144\pi} = \frac{1}{3}.$$

Answer: **cylinder** $144\pi \text{ cm}^3$, **cone** $48\pi \text{ cm}^3$, **cone** $= \frac{1}{3}$ of cylinder.

Problem 18: Grain bin

(a) $V = \pi(6)^2(20) = 720\pi \approx 2,261.95 \text{ ft}^3$.

(b) $2,261.95 \div 50 \approx 45.24$, so 45 loads leave some grain behind. The bin needs **46 loads**.

Problem 19: Scoop on a sugar cone

Scoop: $\frac{4}{3}\pi(1.5)^3 = \frac{4}{3}\pi(3.375) = 4.5\pi \approx 14.14 \text{ in}^3$.

Cone: $\frac{1}{3}\pi(1.5)^2(5) = \frac{1}{3}\pi(11.25) = 3.75\pi \approx 11.78 \text{ in}^3$.

Difference: $4.5\pi - 3.75\pi = 0.75\pi \approx 2.36$.

The melted ice cream is larger than the cone, so it **overflows by about** 2.36 in^3 .

Problem 20: Depth of water in a tank

The radius is 5 ft. Then $1000 = \pi(5)^2h = 25\pi h$, so $h = \frac{1000}{25\pi} = \frac{40}{\pi} \approx 12.73$.

The depth is **about** 12.73 ft.

Problem 21: Melting candles

One candle: $\frac{1}{3}(3 \times 3)(5) = 15 \text{ in}^3$. Four candles: 60 in^3 .

Mold: $60 = \pi(2)^2h = 4\pi h$, so $h = \frac{15}{\pi} \approx 4.77$.

The wax is **about** 4.77 in tall.

Problem 22: Cone cup poured into a cylinder

Cone: $\frac{1}{3}\pi(16)(12) = 64\pi \text{ cm}^3$.

Cylinder: $64\pi = \pi(16)h$, so $h = 4$.

The water is 4 cm deep, one third of the cone's height.

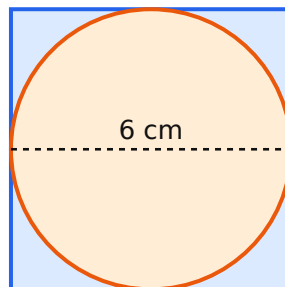
Problem 23: Ball in a box

Ball: $r = 3$, $V = \frac{4}{3}\pi(27) = 36\pi \approx 113.10 \text{ cm}^3$. Box: $6^3 = 216 \text{ cm}^3$.

(a) $\frac{36\pi}{216} = \frac{\pi}{6} \approx 0.5236$, which is about 52.4%.

(b) $216 - 36\pi \approx 102.90 \text{ cm}^3$.

Answers: **about** 52.4%; **about** 102.90 cm^3 .



The ball fills 36π of the 216 cm^3 box.