Unit 10 · Area, Surface Area and Volume Cheat Sheet

Unit 10 focus: area formulas, composite figures and units

1 AREA & UNITS

Area: space inside a 2-D figure	**square units (cm², ft²)**
Perimeter: distance around	**linear units (cm, ft)**
Surface area: total area of the outside faces	**square units**
Volume: space inside a 3-D figure	**cubic units (cm³, ft³)**

2 POLYGON AREA FORMULAS

Figure	Area
rectangle	$A = lw$
square	$A = s^2$
triangle	$A = \frac{1}{2}bh$
parallelogram	$A = bh$
trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$
circle	$A = \pi r^2$

Height h is always perpendicular to the base (not a slanted side).

3 TRAPEZOID EXAMPLE

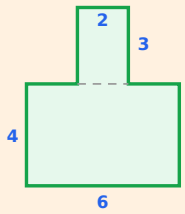
Average the two parallel bases, then multiply by the height.

Example: Bases 6 cm and 10 cm, height 4 cm
Formula: $\frac{1}{2}(6 + 10)(4) = \frac{1}{2}(16)(4)$
Answer: $32\ \text{cm}^2$

4 COMPOSITE FIGURES

Split into simple shapes; add (or subtract) their areas.

Example: A 6 × 4 rectangle with a 2 × 3 rectangle on top
Areas: $6 \times 4 = 24$ and $2 \times 3 = 6$
Add: $24 + 6$
Answer: 30 square units



5 CIRCLES

Find	Formula	r = 3
circumference	$C = 2\pi r$	$6\pi \approx 18.8$
area	$A = \pi r^2$	$9\pi \approx 28.3$

6 QUICK REMINDERS & COMMON MISTAKES

✓ Do remember

- Square units for area, cubic units for volume.
- Use the perpendicular height.
- Keep π unless asked to round.

✗ Common mistakes

- Slant side as height: use the perpendicular height
- Diameter for r: halve it
- Forgetting a face: list every face for surface area

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More practice: surface area and volume of prisms, cylinders, pyramids, cones and spheres

1 PRISMS

$V = Bh$ (B = base area). $SA = Ph + 2B$ (P = base perimeter).

Example: Rectangular prism 5 × 3 × 4
Volume: $5 \cdot 3 \cdot 4 = 60$
SA: $2(15 + 20 + 12) = 94$
Answer: $V = 60$ **units³,** $SA = 94$ **units²**

2 CYLINDERS

$V = \pi r^2 h$. $SA = 2\pi r^2 + 2\pi rh$ (two circles + the curved side).

Example: $r = 3$, $h = 8$
Volume: $\pi(9)(8) = 72\pi$
SA: $18\pi + 48\pi = 66\pi$
Answer: 72π **units³,** 66π **units²**

3 PYRAMIDS & CONES

Solid	Volume	Surface area
pyramid	$\frac{1}{3}Bh$	$B + \frac{1}{2}P\ell$
cone	$\frac{1}{3}\pi r^2 h$	$\pi r^2 + \pi r\ell$

h = vertical height; ℓ = slant height (on the face). A pyramid holds $\frac{1}{3}$ of the matching prism.

4 SPHERES

$V = \frac{4}{3}\pi r^3$. $SA = 4\pi r^2$.

Example: $r = 3$
Volume: $\frac{4}{3}\pi(27) = 36\pi$
SA: $4\pi(9) = 36\pi$
Answer: 36π **units³ and** 36π **units²**

5 VOLUME EXAMPLE

Find the base area first, then multiply by the height.

Example: Cylinder $r = 4$, $h = 10$
Base: $\pi(4)^2 = 16\pi$
Volume: $16\pi(10)$
Answer: $160\pi \approx 502.7$ **units³**

6 CHECK YOURSELF

- Did I use the radius (not the diameter)?
- Vertical height for volume; slant height for surface area of pyramids and cones.
- Did I include every face?
- Are my units squared (area) or cubed (volume)?