Volume Formula Sheet

Volume

Prism or cylinder	$V = Bh$
Pyramid or cone	$V = Bh / 3$
Sphere	$V = (4/3)\pi r^3$

B is the area of one base. h is perpendicular height. Use cubic units.

Rectangular prism volume

Length by width by height	$V = Lwh$
Base area by height	$V = Bh$
Example: 5 by 3 by 2	$V = 30 \text{ units}^3$

B is the area of one base. Volume counts cubic units.

Choose base and height

Cylinder: r = 3 cm, h = 5 cm	$V = \pi(3)^2(5) = 45\pi \text{ cm}^3$
Cone with the same base and height	$V = 15\pi \text{ cm}^3$
Hemisphere	$V = 2\pi r^3/3$

Measure the perpendicular height. If a diameter is given, halve it before squaring the radius.



Frustum, ellipsoid & torus

Cone frustum	$V = \pi h(R^2 + Rr + r^2)/3$
Ellipsoid, positive semiaxes	$V = 4\pi abc/3$
Ring torus, R > r	$V = 2\pi^2 Rr^2$

In the frustum, h is perpendicular height. A torus uses centerline radius R and tube radius r.

Cross-sections, washers & shells

Known cross-section	$V = \int_a^b A(x)\,dx$
Washers	$A(x) = \pi(R^2 - r^2)$
Cylindrical shells	$V = 2\pi \int_a^b \text{radius} \times \text{height}\,dx$

Choose slices perpendicular to the rotation axis for washers and parallel for shells. Use consistent variables.