Solid Geometry

Spheres

Surface area: $4pr^2$

Volume: $\frac{4}{3}pr^3$

Cylinders

Lateral area: $2pRh$

Total surface area: $2pR(R+h)$

Volume: pr^2h

Right Circular Cone

Slant height: $s=\sqrt{R^2+h^2}$

Lateral Area: pRs

Volume: $\frac{pR^2h}{3}$

Frustrums

For a frustrum with height h and base areas B_1 and B_2,

Volume: $V=\frac{1}{3}h\left(B_1+B_2+\sqrt{B_1B_2}\right)$

Regular Polyhedra

Let v = number of vertices, e = number of edges, f = number of faces, a = length of each edge, A = area of each face, r and R the radii of the inscribed and circumscribed spheres, respectively, and V = volume.

Name	***v***	***e***	***f***	***A***	***r***	***R***	***V***
Tetrahedron	4	6	4	$\frac{a^2\sqrt{3}}{4}$	$\frac{a\sqrt{6}}{12}$	$\frac{a\sqrt{6}}{4}$	$\frac{a^3\sqrt{2}}{12}$
Hexahedron	8	12	6	a^2	$\frac{a}{2}$	$\frac{a\sqrt{3}}{2}$	a^3
Octahedron	6	12	8	$\frac{a^2\sqrt{3}}{4}$	$\frac{a\sqrt{6}}{6}$	$\frac{a\sqrt{2}}{2}$	$\frac{a^3\sqrt{2}}{3}$

Name	***v***	***e***	***f***	***A***	***r***
Dodecahedron	20	30	12	$\frac{1}{4}a^2\sqrt{25+10\sqrt{5}}$	$\frac{1}{20}a\sqrt{250+110\sqrt{5}}$

R	***V***
$\frac{1}{4}a\left(\sqrt{15+\sqrt{3}}\right)$	$\frac{1}{4}a^3\left(15+7\sqrt{5}\right)$

Name	***v***	***e***	***f***	***A***	***r***
Icosahedron	12	30	20	$\frac{a^2\sqrt{3}}{4}$	$\frac{1}{12}a\sqrt{42+18\sqrt{5}}$

R	***V***
$\frac{1}{4}a\sqrt{10+2\sqrt{5}}$	$\frac{5}{12}a^3\left(3+\sqrt{5}\right)$

For any convex polyhedron:

Euler's Formula: $v - e + f = 2$