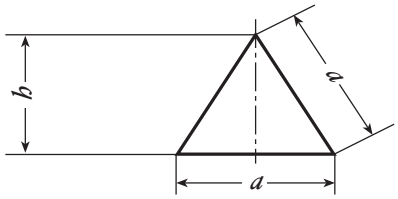
a.b.e.® Construction Chemicals

FORMULAE

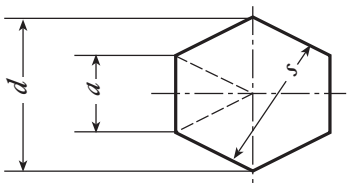
EQUILATERAL TRIANGLE



$$A = \frac{a^2}{4}\sqrt{3}$$

$$h = \frac{a}{2}\sqrt{3}$$

HEXAGON



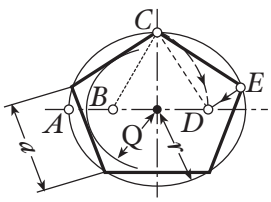
$$A = \frac{3}{2}\, a^2\sqrt{3}$$

$$d = 2\, a$$

$$= \frac{2}{\sqrt{3}}\, s = 1.155\, s$$

$$s = \frac{\sqrt{3}}{2}\, d = 0.866\, d$$

PENTAGON



$$A = \frac{5}{8}\, r^2 \sqrt{10 + 2\sqrt{5}}$$

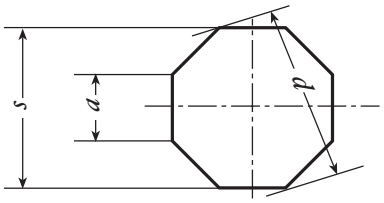
$$a = \frac{1}{2}\, r \sqrt{10 - 2\sqrt{5}}$$

$$Q = \frac{1}{4}\, r \sqrt{6 + 2\sqrt{5}}$$

Construction:

$$\overline{AB} = 0.5\, r, \quad \overline{BC} = \overline{BD}, \quad \overline{CD} = \overline{CE}$$

OCTAGON



$$A = 2\, a\, s = 0.83\, s^2$$

$$= 2\, s \sqrt{d^2 - s^2}$$

$$a = s \times \tan 22.5 \approx 0.415$$

$$s = d \times \cos 22.5 \approx 0.925\, d$$

$$d = \frac{s}{\cos 22.5} \approx 1.083\, s$$

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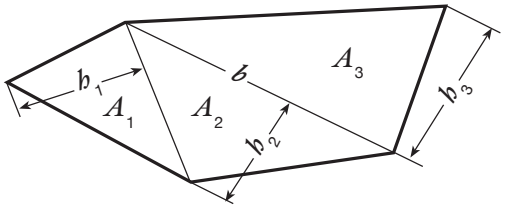
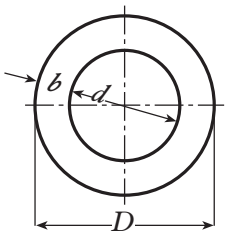
POLYGON



$$A = A_1 + A_2 + A_3$$

$$= \frac{ab_1 + bb_2 + bb_3}{2}$$

ANNULUS

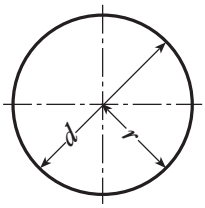


$$A = \frac{\pi}{4}(D^2 - d^2)$$

$$= (d + b)\,b$$

$$b = \frac{D - d}{2}$$

CIRCLE

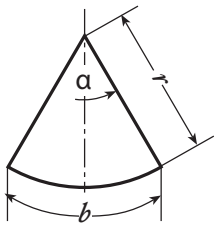


$$A = \frac{\pi}{4} d^2 = \pi r^2$$

$$\approx 0.785\ d^2$$

$$\text{Circum} = 2\pi r = \pi d$$

SECTOR OF A CIRCLE



$$A = \frac{\pi}{360} r^2\alpha = \frac{\widehat{\alpha}}{2} r^2$$

$$= \frac{br}{2}$$

$$b = \frac{\pi}{180} r\alpha$$

$$\widehat{\alpha} = \frac{\pi}{180} \alpha \quad (\widehat{\alpha} = \alpha \text{ in circular measure})$$

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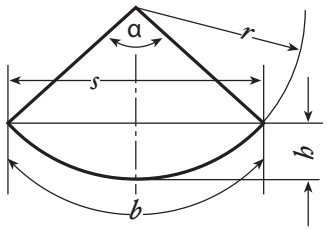
SEGMENT OF A CIRCLE



$$s = 2\,r\,\sin\frac{\alpha}{2}$$

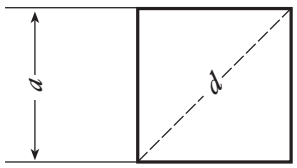
$$A = \frac{h}{6s}\left(3h^2 + 4s^2\right) = \frac{r^2}{2}\left(\widehat{\alpha} - \sin\alpha\right)$$

$$r = \frac{h}{2} + \frac{3^2}{8h}$$

$$h = r\left(1 - \cos\frac{\alpha}{2}\right) = \frac{s}{2}\tan\frac{\alpha}{4}$$

$$\widehat{\alpha} = \frac{\pi}{180}\,\alpha \qquad \left(\widehat{\alpha} = \alpha \text{ in circular measure}\right)$$

SQUARE

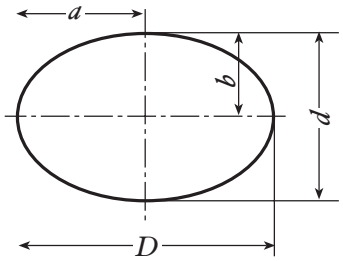


$$A = a^2$$

$$a = \sqrt{A}$$

$$d = a\sqrt{2}$$

ELLIPSE

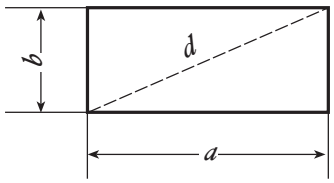


$$A = \frac{\pi}{4}\,D\,d = \pi\,a\,b$$

$$\text{Circum} \approx \frac{D + d}{2}$$

$$= \pi\,(a + b)\left[1 + \frac{1}{4}\lambda^2 + \frac{1}{64}\lambda^4 + \frac{1}{256}\lambda^6 + \frac{25}{16384}\lambda^8 + \ldots\right], \text{ where } \lambda = \frac{a - b}{a + b}$$

RECTANGLE



$$A = a\,b$$

$$d = \sqrt{a^2 + b^2}$$

A = Area
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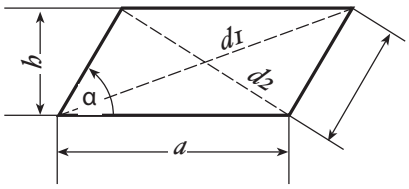
V = Volume

PARALLELOGRAM

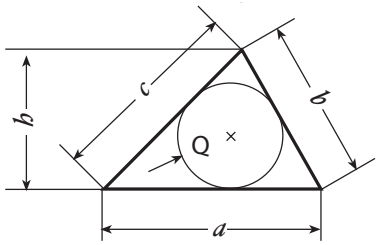


$$A = a\,b = a\,b\,\sin\alpha$$

$$d_1 = \sqrt{(a + h\cot\alpha)^2 + h^2}$$

$$d_2 = \sqrt{(a - h\cot\alpha)^2 + h^2}$$

TRIANGLE

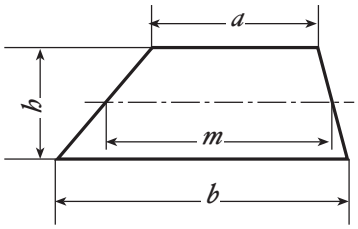


$$A = \frac{a\,h}{2} = Q\,s$$

$$= \sqrt{s\,(s - a)\,(s - b)\,(s - c)}$$

$$s = \frac{a + b + c}{2}$$

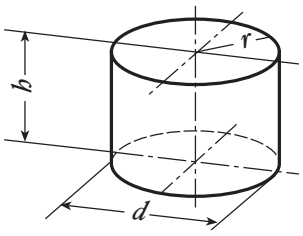
TRAPEZIUM



$$A = \frac{a + b}{2}\,h = m\,h$$

$$m = \frac{a + b}{2}$$

CYLINDER



$$V = \frac{\pi}{4}\,d^2\,h$$

$$A_m = 2\,\pi\,r\,h$$

$$A_0 = 2\,\pi\,r\,(r + h)$$

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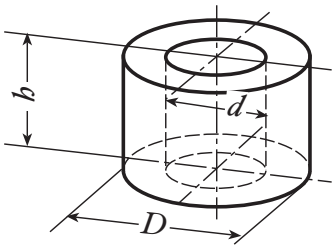
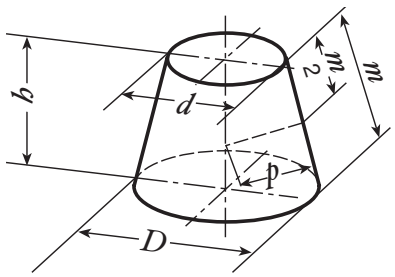
HOLLOW CYLINDER



$$V = \frac{\pi}{4} h (D^2 - d^2)$$

FRUSTUM OF CONE

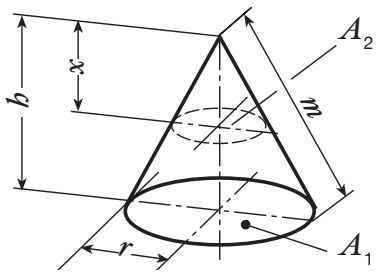


$$V = \frac{\pi}{12} h (D^2 + Dd + d^2)$$

$$A_m = \frac{\pi}{2} m (D + d) = 2\pi p h$$

$$m = \sqrt{\left(\frac{D - d}{2}\right)^2 + h^2}$$

CONE



$$V = \frac{\pi}{3} r^2 h$$

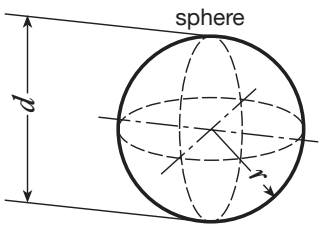
$$A_m = \pi r m$$

$$A_0 = \pi r (r + m)$$

$$m = \sqrt{h^2 + r^2}$$

$$A_2 : A_1 = x^2 : h^2$$

SPHERE



$$V = \frac{4}{3} \pi r^3 = \frac{1}{6} \pi d^3$$

$$\approx 4 \cdot 189\, r^3$$

$$A_0 = 4\pi r^2 = \pi d^2$$

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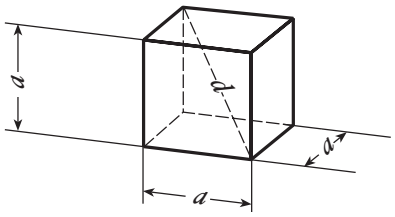
CUBE

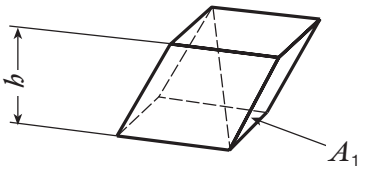


$V = a^3$

$A_0 = 6a^2$

$d = \sqrt{3}\,a$

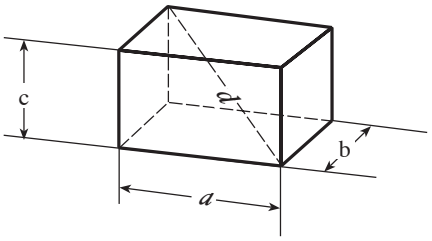
PARALLELEPIPED



$V = A_1 h$

(Cavalieri principle)

CUBOID

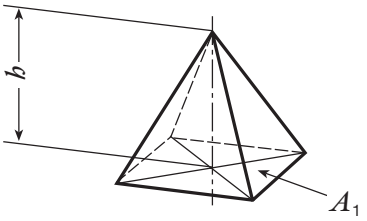


$V = a\,b\,c$

$A_0 = 2(a\,b + a\,c + b\,c)$

$d = \sqrt{a^2 + b^2 + c^2}$

PYRAMID



$V = \frac{A_1 h}{3}$

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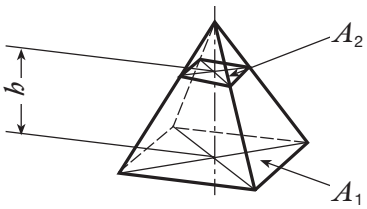
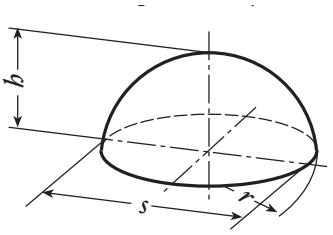
FRUSTUM OF PYRAMID



$$V = \frac{h}{3}\left(A_1 + A_2 + \sqrt{A_1 A_2}\right)$$

$$\approx h\,\frac{A_1 + A_2}{2}$$

SEGMENT OF A SPHERE



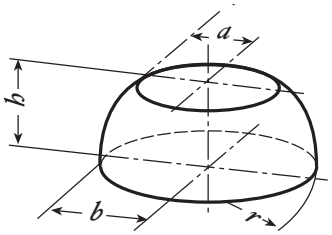
$$V = \frac{\pi}{6}\,h\left(\frac{3}{4}s^2 + h^2\right)$$

$$= \pi\,h^2\left(r - \frac{h}{3}\right)$$

$$A_m = 2\,\pi\,r\,h$$

$$= \frac{\pi}{4}\left(s^2 + 4h^2\right)$$

ZONE OF A SPHERE

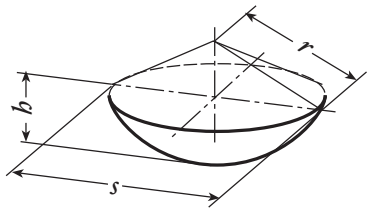


$$V = \frac{\pi}{6}\,h\left(3a^2 + 3b^2 + h^2\right)$$

$$A_m = 2\,\pi\,r\,h$$

$$A_0 = \pi\left(2rh + a^2 + b^2\right)$$

SECTOR OF A SPHERE



$$V = \frac{2}{3}\,\pi\,r^2\,h$$

$$A_0 = \frac{\pi}{2}\,r\left(4h + s\right)$$

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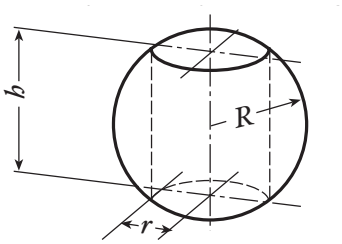
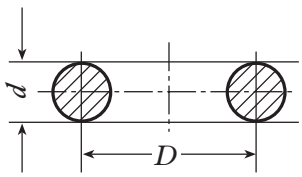
SPHERE WITH CYLINDRICAL BORING



$$V = \frac{\pi}{6} h^3$$

$$A_0 = 2 \pi h (R + r)$$

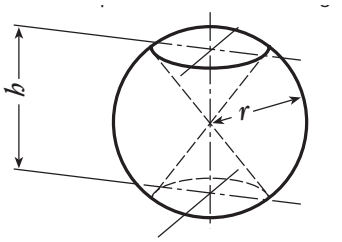
TORUS



$$V = \frac{\pi^2}{4} D d^2$$

$$A_0 = \pi^2 D d$$

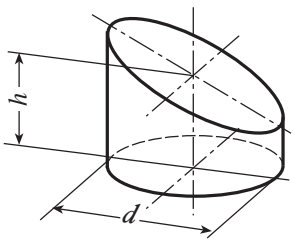
SPHERE WITH CONICAL BORING



$$V = \frac{2}{3} \pi r^2 h$$

$$A_0 = 2 \pi r \left(h + \sqrt{r^2 - \frac{h^2}{4}} \right)$$

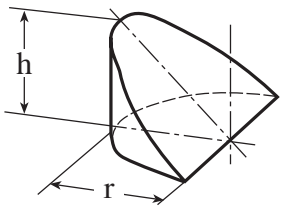
SLICED CYLINDER



$$V = \frac{\pi}{4} d^2 h$$

A = Area
A_o = Total surface area
Am = Generated surface are
V = Volume

UNGULA

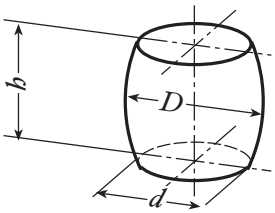


$$V = \frac{2}{3} r^2 h$$

$$A_m = 2 r h$$

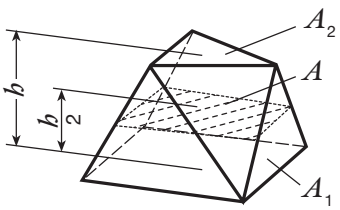
$$A_0 = A_m + \frac{\pi}{2} r^2 + \frac{\pi}{2} r \sqrt{r^2 + h^2}$$

BARREL



$$V = \frac{\pi}{12} h (2 D^2 + d^2)$$

PRISMOID



$$V = \frac{h}{6} (A_1 + A_2 + 4A)$$

This formula may be used for calculations involving solids shown on formulae cube and thus spheres and parts of spheres.

A = Area
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V = Volume