GRADE 11 ESSENTIAL
UNIT C – 3-D GEOMETRY
APPENDIX - GEOMETRIC FORMULAE

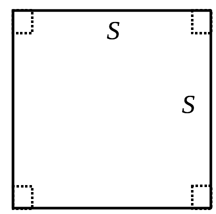
Shape	Diagram	Formulae

FLAT OBJECTS
2 DIMENSIONAL

Square

(all four sides same length, 90°corners)

(a rectangle with all sides same length)

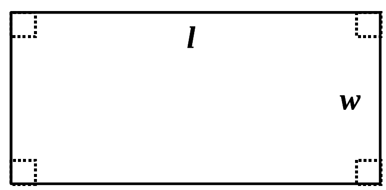


Perimeter, P:
P = s + s + s + s = 4*s

Area, A:
A = s * s = s^2

Rectangle

(Four sides, square corners)



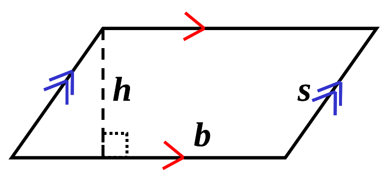
Perimeter, P:
P = *l* + *w* + *l* + *w* = 2*l* + 2*w*

Area, A:
A = *l* * *w*

Parallelogram and Rhombus

(leaning rectangle or leaning square)

Note
b is always ⊥ to h



Perimeter; P:
P = 2b + 2s

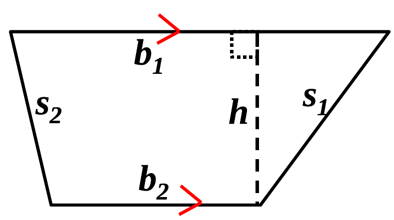
Area; A:
A = b * h

[b and h; perpendicular; at 90°]

Trapezoid

(Four sides, only two sides parallel { '||' })

Note
b is always ⊥ to h
[perpendicular; at 90°]



Perimeter; P:
P = $b_1 + s_1 + b_2 + s_2$

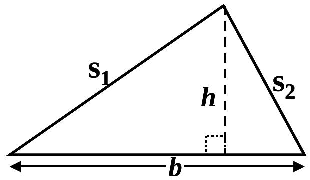
Area; A:
A = $b_{average} * h$

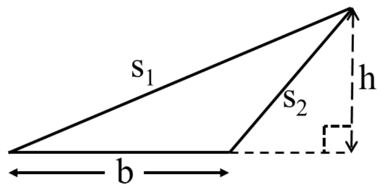
$$= \frac{1}{2}(b_1 + b_2) * h$$

Triangle
(three sides)

(half a parallelogram or rectangle)
(acute, obtuse, or right)
(scalene, isosceles, equilateral)

Note
b is always ⊥ to h





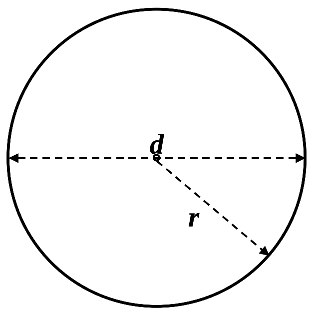
Perimeter; P:

$P = s_1 + s_2 + b$

Area; A:

$A = \frac{1}{2} * b * h$

Circle



Circumference; C:

$C = \pi d = 2\pi r$

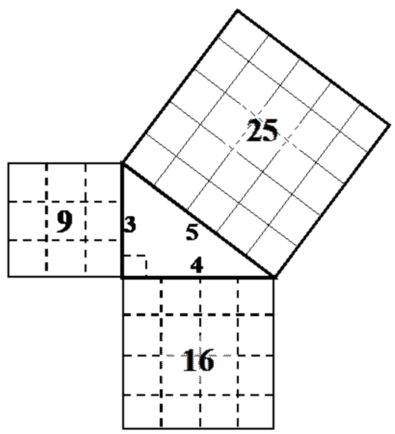
Area; A

$A = \pi r^2$

Pythagoras

$$c^2 = a^2 + b^2$$

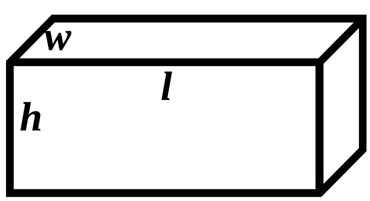
*where **c** is the length of the **hypotenuse** and **a** and **b** are the lengths of the shorter two sides*



SOLID OBJECTS
3 DIMENSIONAL

Rectangular Prism

(Two congruent rectangles connected at edges by rectangles)



Surface Area; SA

SA = Add area of all faces; *or*
SA= 2*lw* + 2*hl* + 2*hw*

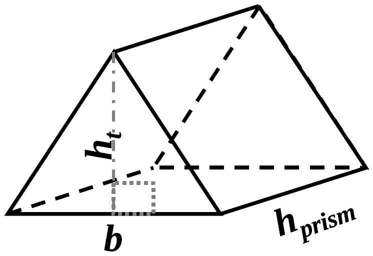
Volume; V:

$V = Base_{area} * h$
$V = (l*w)*h$

Triangular Prism

(Two congruent triangles connected at edges by rectangles)

Gets confusing using height for the triangle, ***h_t****, and height for the prism,* ***h_{prism}****.*



Surface Area; SA

SA = Add area of all faces; the net is two triangles and three rectangles.

$SA = P_{base}h_{prism} + bh_t$ *(fancy)*

Volume; V:

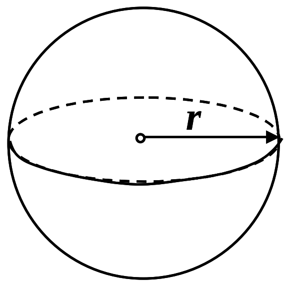
V = Base$_{area}$ * h

$V = \frac{1}{2} b h_{triangle} * h_{prism}$

Sphere

All the points in space that are equidistant from a single centre point

(Ball)



Surface Area; SA

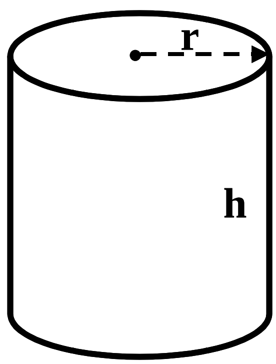
SA = $4\pi r^2$

Volume; V:

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

Cylinder

(Two congruent circles connected with a rectangle wrapped around circumference)



Surface Area; SA

top & bottom — lateral side

SA = $2\pi r^2 + 2\pi rh$

tube

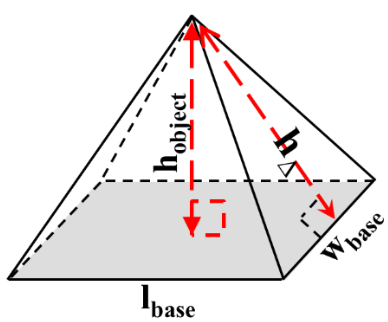
Volume; V:

V = Base$_{area}$ * h
= A * h
= $\pi r^2 h$

Rectangular Pyramid or Square Pyramid

(A rectangle connected to an apex point by triangles on its edges)

*****caution the pyramid has a height,** and **the triangular faces each have a height*****



Surface Area; SA

SA = add up area of all the faces (Base area plus four triangles)

Volume; V:

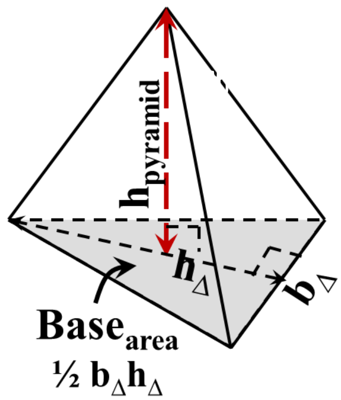
$V = \frac{1}{3} * Base_{area} * h_{pyramid}$

$= \frac{1}{3} * (l * w) * h_{pyramid}$

Triangular Pyramid

(A triangle base connected to an apex point by triangles on its edges)

caution the pyramid has a height h_{object}, and the triangular faces have a height, h_{Δ}



Surface Area; SA

SA = add up area of each of the four triangular faces.

Volume; V:

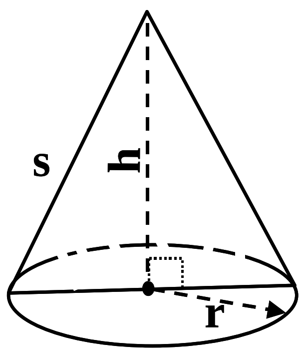
$$V = \frac{1}{3} * Base_{area} * h_{pyramid}$$

$$\frac{1}{3} * \left(\frac{1}{2} * b_{\Delta} * h_{\Delta}\right) * h_{object}$$

$$= \frac{1}{6} * b_{\Delta} * h_{\Delta} * h_{object}$$

Cone

(The arc of a circular sector of a circle connected to a smaller circle base and coming to an apex point)



Surface Area; SA

SA = $\pi r^2 + \pi rs$

('s' here is 'slant range' along the side of the cone)

Volume; V:

$$V = \frac{1}{3} * Base_{area} * h_{cone}$$

$$V = \frac{1}{3} * (\pi r^2) * h_{cone}$$

Letter Abbreviations:

r ≡ radius, d ≡ diameter; h ≡ height; A ≡ area; l ≡ length; w ≡ width; B = $Base_{area}$

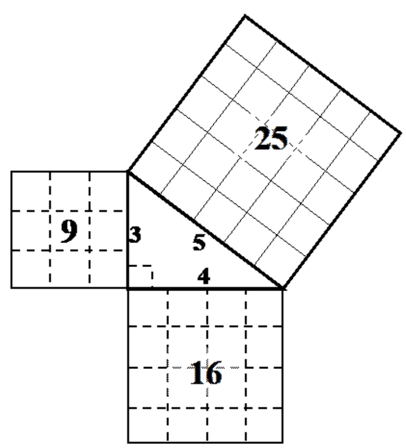
s ≡ *side* or *sometimes* slant range; ⊥ ≡ perpendicular

And do not forget Pythagoras!

Pythagoras

$$c^2 = a^2 + b^2$$

*where **c** is the length of the **hypotenuse** and **a** and **b** are the lengths of the **shorter** two sides*



Add your own favourite formulae below: