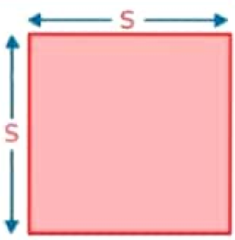
2D – SHAPES

Square

(P = Perimeter)
(A = Area)

$P = 4s$

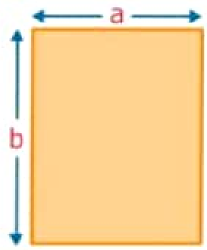
$A = s^2$



Rectangle

$P = 2(a + b)$

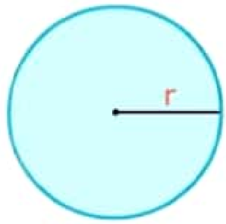
$A = a.b$



Circle

$P = 2\pi r$

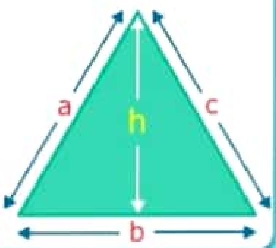
$A = \pi r^2$



Triangle

$P = a + b + c$

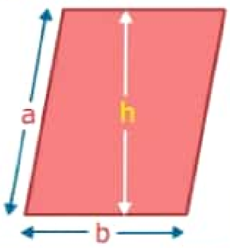
$A = \frac{1}{2}\, b.h$



Paralellogram

$P = 2(a + b)$

$A = b.h$

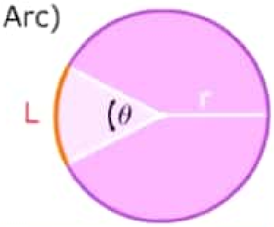


Circular sector

(L = Length of Arc)

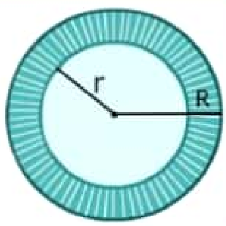
$L = 2\pi r . \frac{\theta}{360^\circ}$

$A = \pi r^2 . \frac{\theta}{360^\circ}$



Circular ring

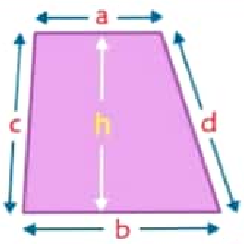
$A = \pi(R^2 - r^2)$



Trapezoid

$P = a + b + c + d$

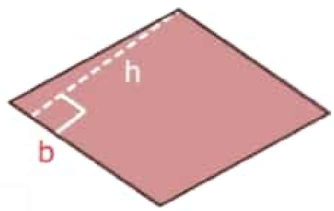
$A = \frac{1}{2}\, h. (a + b)$



Rhombus

$P = 4b$

$A = b.h$



3D – SHAPES

SPHERE

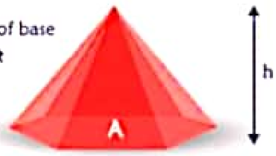
Volume = $\frac{4\pi r^3}{3}$

Surface area = $4\pi r^2$

PYRAMID

Volume of a general pyramid = $\frac{1}{3}$ Ah

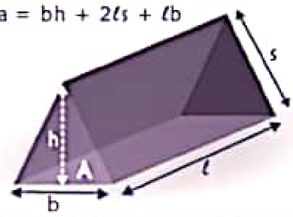
where:
A = area of base
h = height



TRIANGULAR PRISM

Volume = $A\ell$ or $\frac{1}{2}bh\ell$

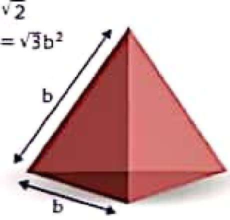
Surface area = $bh + 2\ell s + \ell b$



REGULAR TETRAHEDRON

Volume = $\frac{b^3}{6\sqrt{2}}$

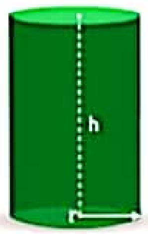
Surface area = $\sqrt{3}b^2$



RIGHT CYLINDER

Volume = $\pi r^2 h$

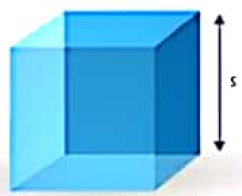
Surface area = $2\pi r(r + h)$



CUBE

Volume = s^3

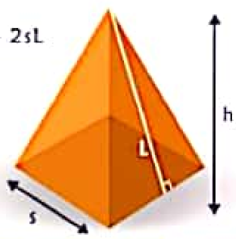
Surface area = $6s^2$



SQUARE-BASED PYRAMID

Volume = $\frac{1}{3}s^2h$

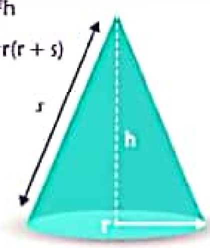
Surface area = $s^2 + 2sL$



RIGHT CIRCULAR CONE

Volume = $\frac{1}{3}\pi r^2 h$

Surface area = $\pi r(r + s)$

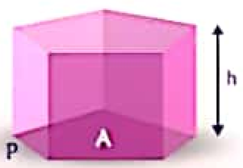


PENTAGONAL PRISM

Volume of any prism = Ah

Surface area of a closed prism = $2A + 5(h \times p)$

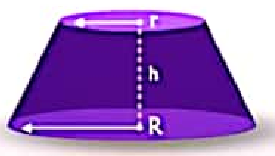
where:
A = area of base
h = height
p = perimeter of base



FRUSTUM OF A CONE

Volume = $\frac{1}{3}\pi h(r^2 + rR + R^2)$

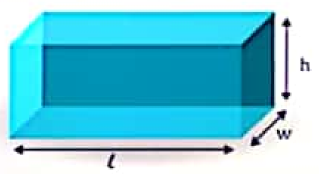
Total Surface Area = $\pi(r+R)\sqrt{(R-r)^2+h^2} + \pi(r^2+R^2)$



CUBOID

Volume = $\ell \times w \times h$

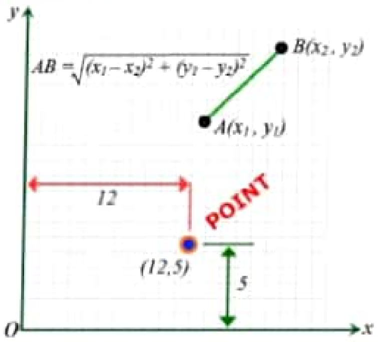
Surface area = $2\ell h + 2\ell w + 2wh$



POINT IN 2D CARTESIAN SYSTEM

Point Definition

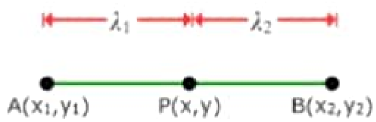
Point is an exact location. It has no size, only position.



Section Formula

Internally

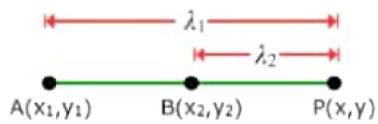
When P divides AB in ratio $\lambda_1 : \lambda_2$



$$P\left(\frac{\lambda_1 x_2 + \lambda_2 x_1}{\lambda_1 + \lambda_2}, \frac{\lambda_1 y_2 + \lambda_2 y_1}{\lambda_1 + \lambda_2}\right)$$

Externally

When P divides AB in ratio $\lambda_1 : \lambda_2$

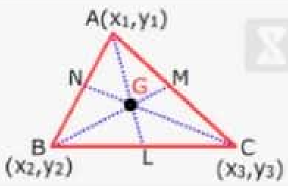


$$P\left(\frac{\lambda_1 x_2 - \lambda_2 x_1}{\lambda_1 - \lambda_2}, \frac{\lambda_1 y_2 - \lambda_2 y_1}{\lambda_1 - \lambda_2}\right)$$

Special points in a triangle with 2D co-ordinates

Centroid (G)

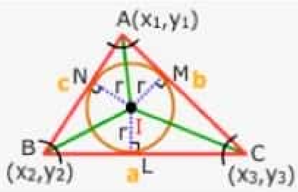
Point of intersection of medians



$$G\left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3}\right)$$

Incentre (I)

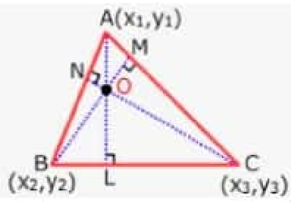
Point of intersection of angle bisectors



$$I\left(\frac{ax_1 + bx_2 + cx_3}{a+b+c}, \frac{ay_1 + by_2 + cy_3}{a+b+c}\right)$$

Orthocentre (O)

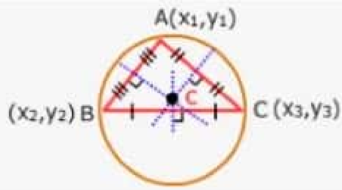
Point of intersection of Altitudes



$$O\left(\frac{x_1 \tan A + x_2 \tan B + x_3 \tan C}{\tan A + \tan B + \tan C}, \frac{y_1 \tan A + y_2 \tan B + y_3 \tan C}{\tan A + \tan B + \tan C}\right)$$

Circumcentre (C)

Point of intersection of perpendicular bisectors

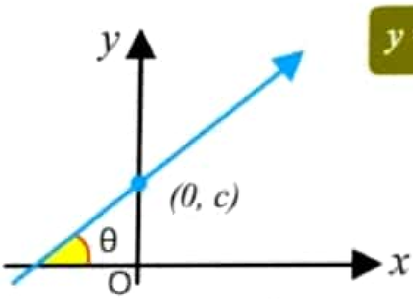


$$C\left(\frac{x_1 \sin 2A + x_2 \sin 2B + x_3 \sin 2C}{\sin 2A + \sin 2B + \sin 2C}, \frac{y_1 \sin 2A + y_2 \sin 2B + y_3 \sin 2C}{\sin 2A + \sin 2B + \sin 2C}\right)$$

Straight line

1 Slope - Intercept Form

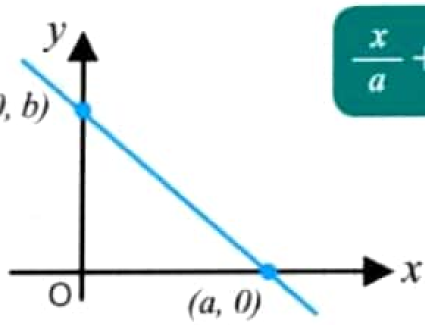
$$y = mx + c$$



where $m = \tan\theta$

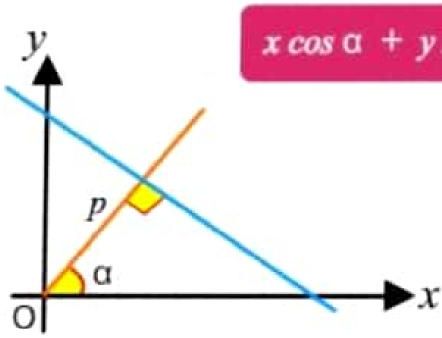
2 Double Intercept Form

$$\frac{x}{a} + \frac{y}{b} = 1$$



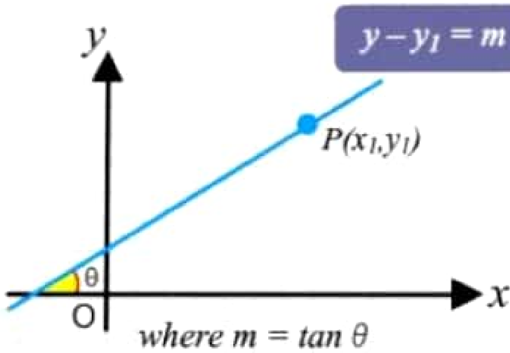
3 Normal Form

$$x\cos\alpha + y\sin\alpha = p$$



4 Slope - Point Form

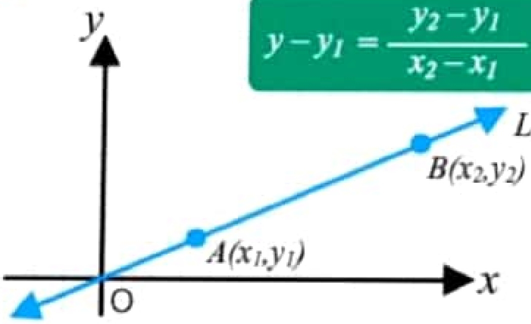
$$y - y_1 = m(x - x_1)$$



where $m = \tan\theta$

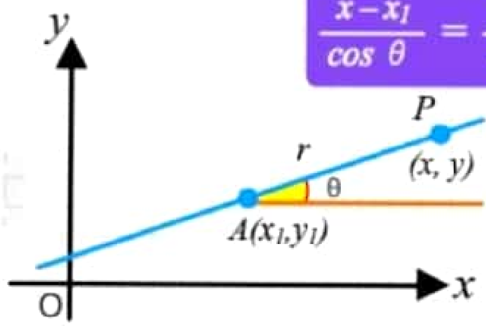
5 Two Point Form

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$



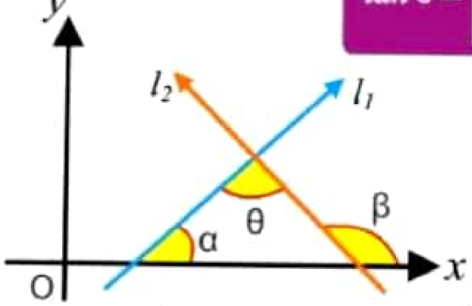
6 Parametric Form

$$\frac{x - x_1}{\cos\theta} = \frac{y - y_1}{\sin\theta} = r$$



7 Angle between two Straight lines

$$\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$$



$m_1 = \tan\alpha$ $m_2 = \tan\beta$

8 Distance between Point & line

$$d = \left|\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right|$$