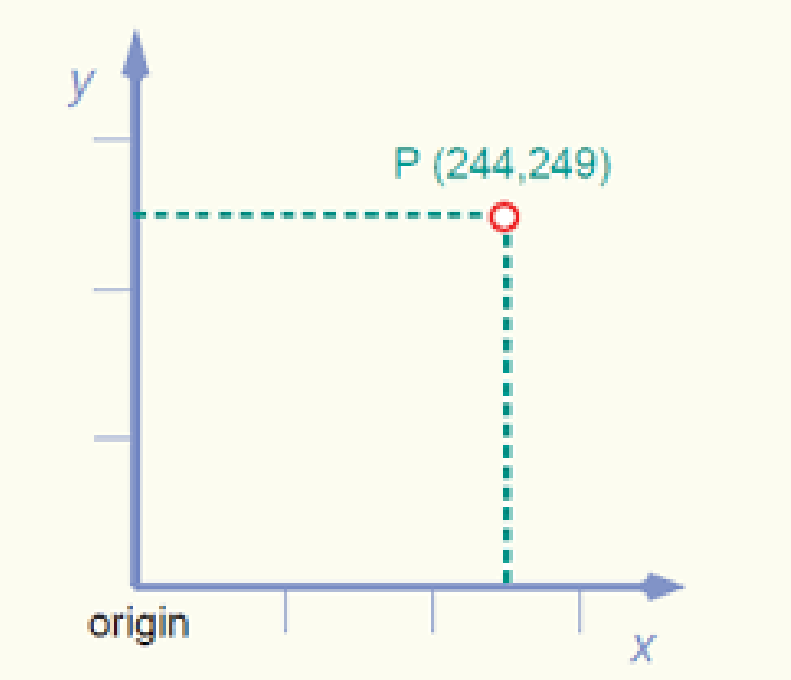
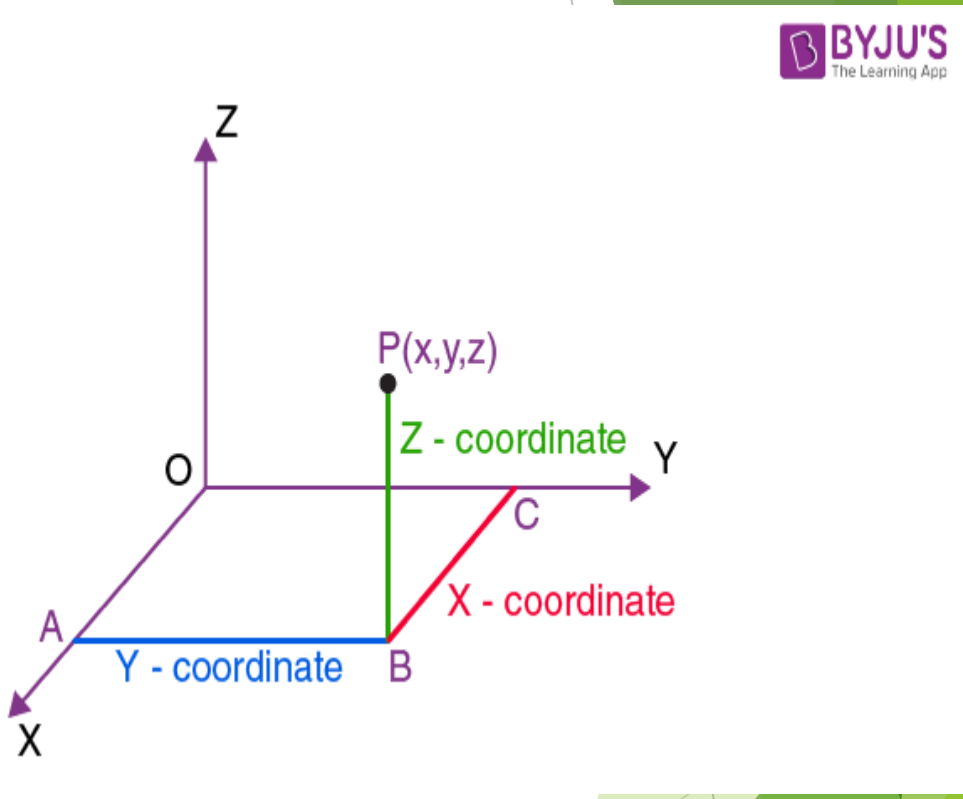
Data Science

Co-ordinates

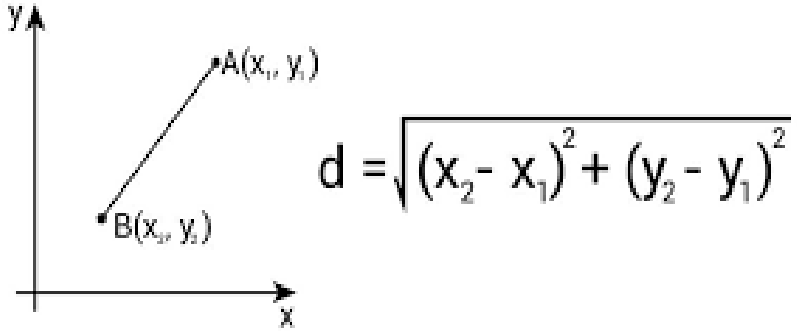




Coordinates 2d: p(x,y) = p(12,25)
Coordinates 3d: p(x,y,z) = p(12,25,64)
Coordinates 4d: p(x1,x2,x3,x4) = p(12,25,64,-23)
Coordinates nd: p(x1,x2,x3,x4,…) = p(12,25,64,-23,…)

Distance formula

Distance Formula



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

The distance d between two points $P(x_1, y_1)$ and $Q(x_2, y_2)$ in a 2D Cartesian coordinate system is given by the **distance formula**:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

The distance d between two points $P(x_1, x_2, x_3)$ and $Q(y_1, y_2, y_3)$ in a **3D Cartesian coordinate system** is given by:

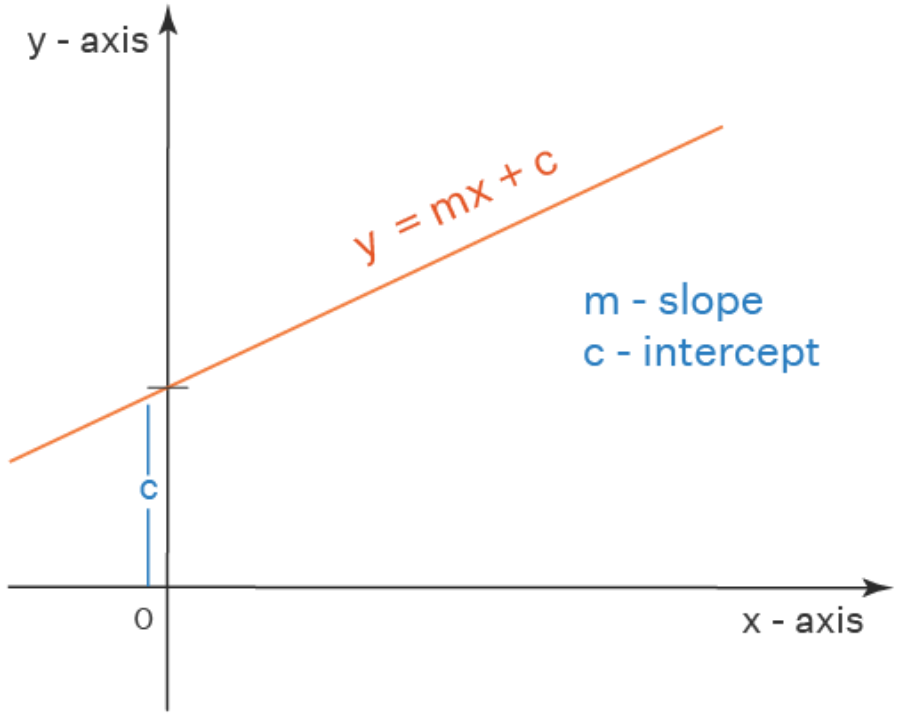
$$d = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + (x_3 - y_3)^2}$$

The distance d between two points $P(x_1, x_2, x_3, \ldots, x_n)$ and $Q(y_1, y_2, y_3, \ldots, y_n)$ in an **n-dimensional Euclidean space** is given by:

$$d = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2}$$

Line

Slope Intercept Form: y = mx + c

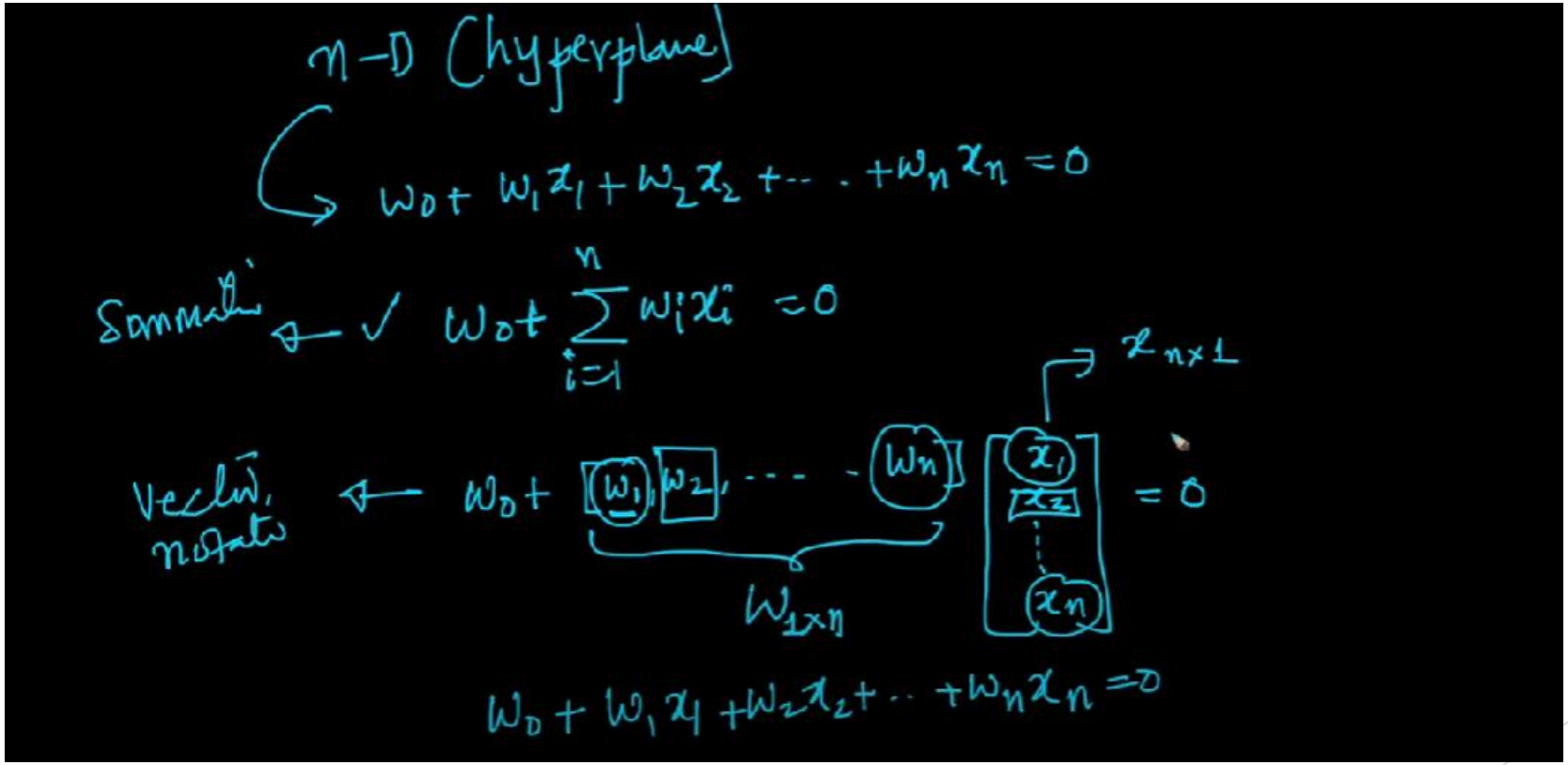


In 2d: y = mx + c
General form: mx-y+c = 0 = ax+by+c = 0 (here a = m and b = -1)

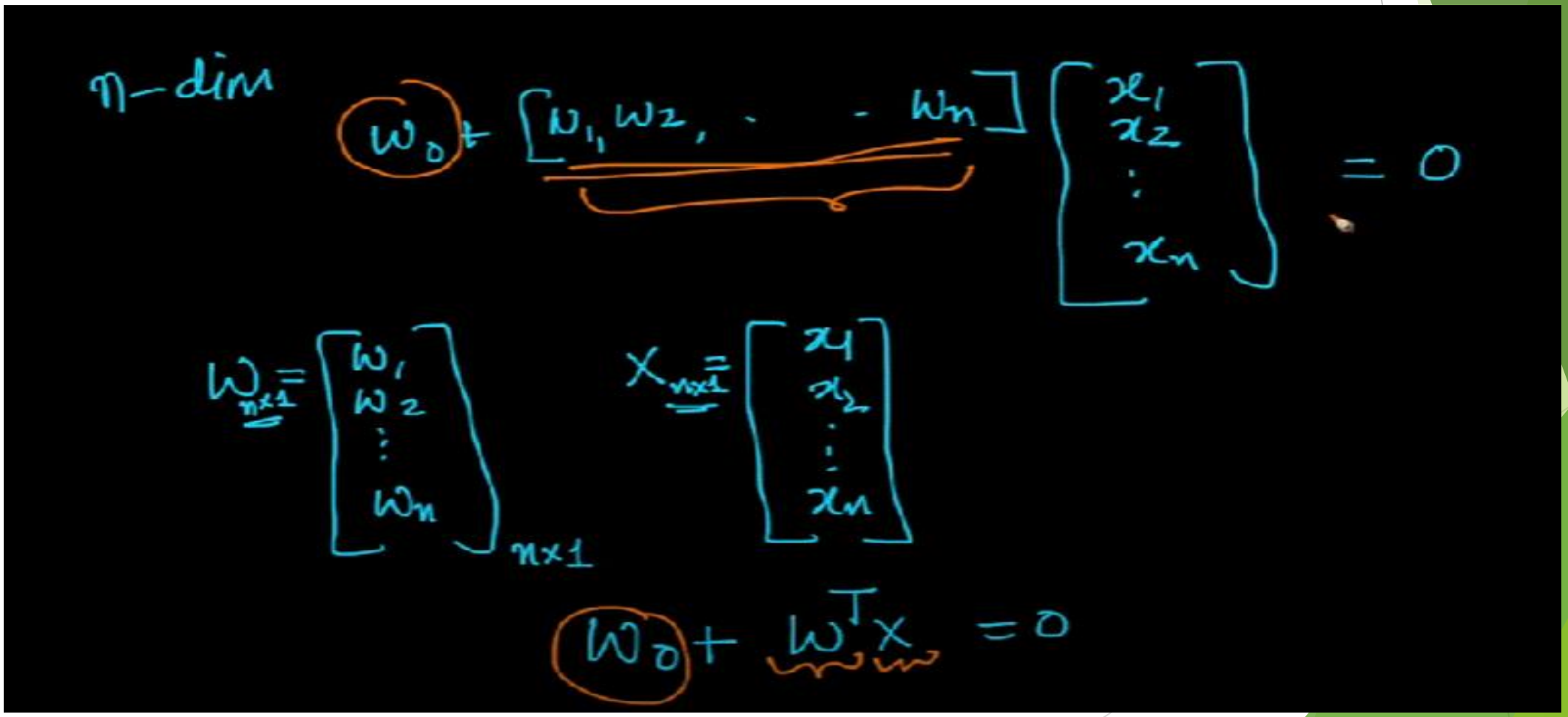
In 3d (Plane): ax+by+cz+d = 0
w1x1+w2x2+w3x3+w0 = 0

In nd (Hyper Plane):w1x1+w2x2+w3x3+w0 = 0

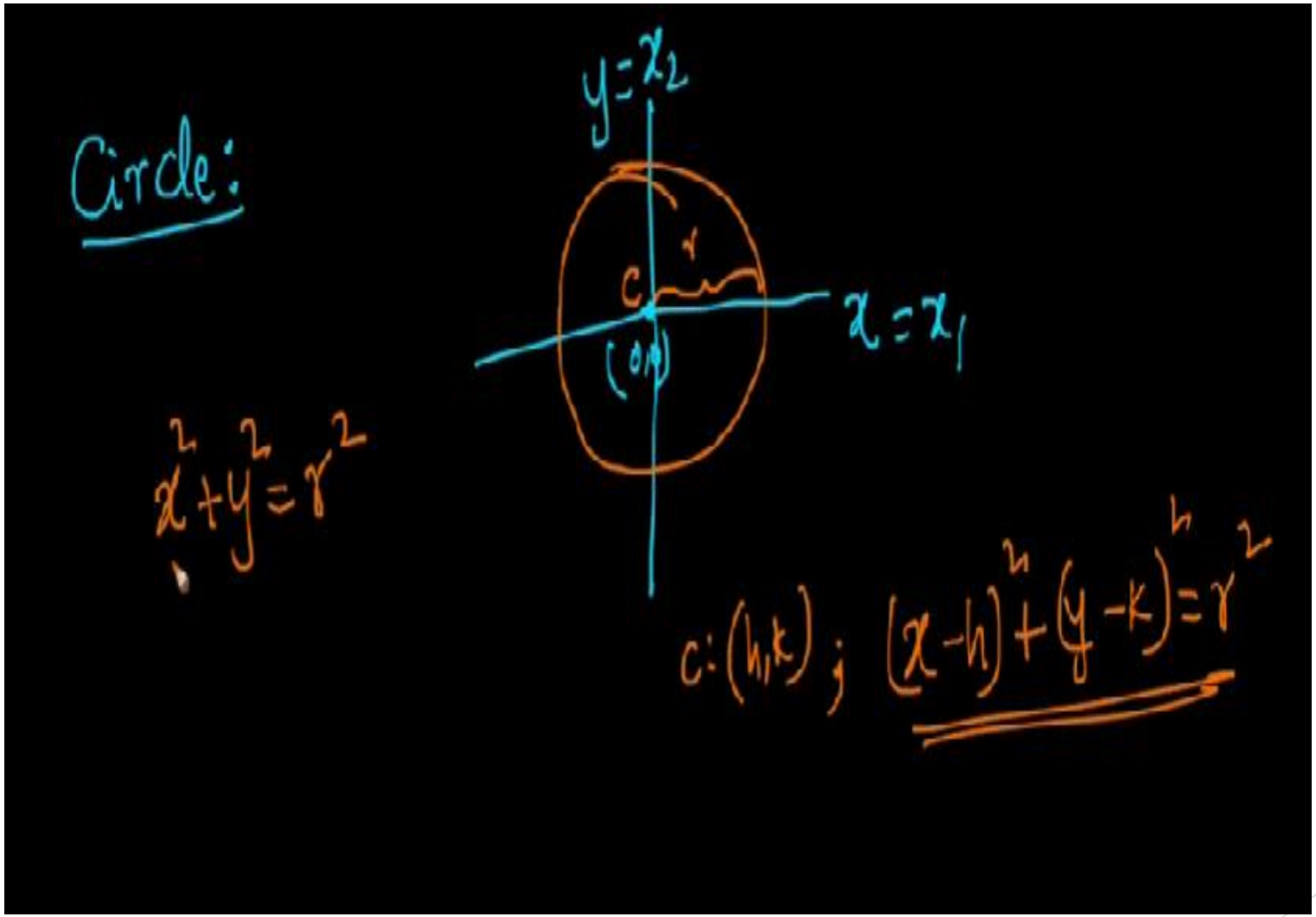
Line continued

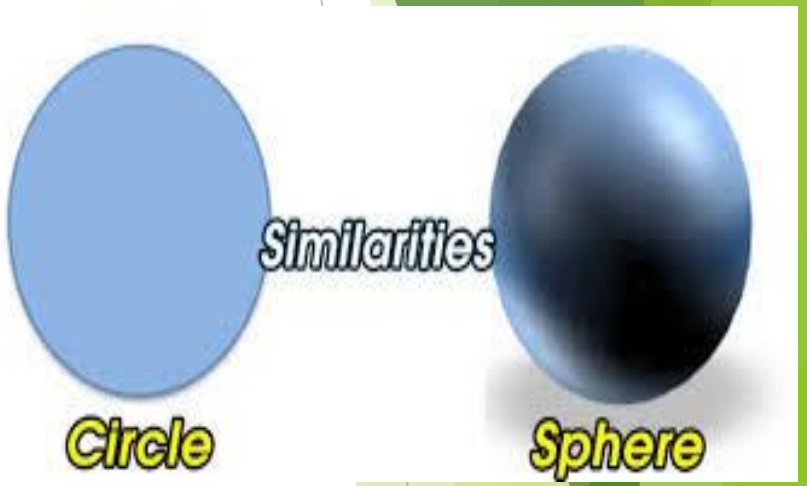


Line continued

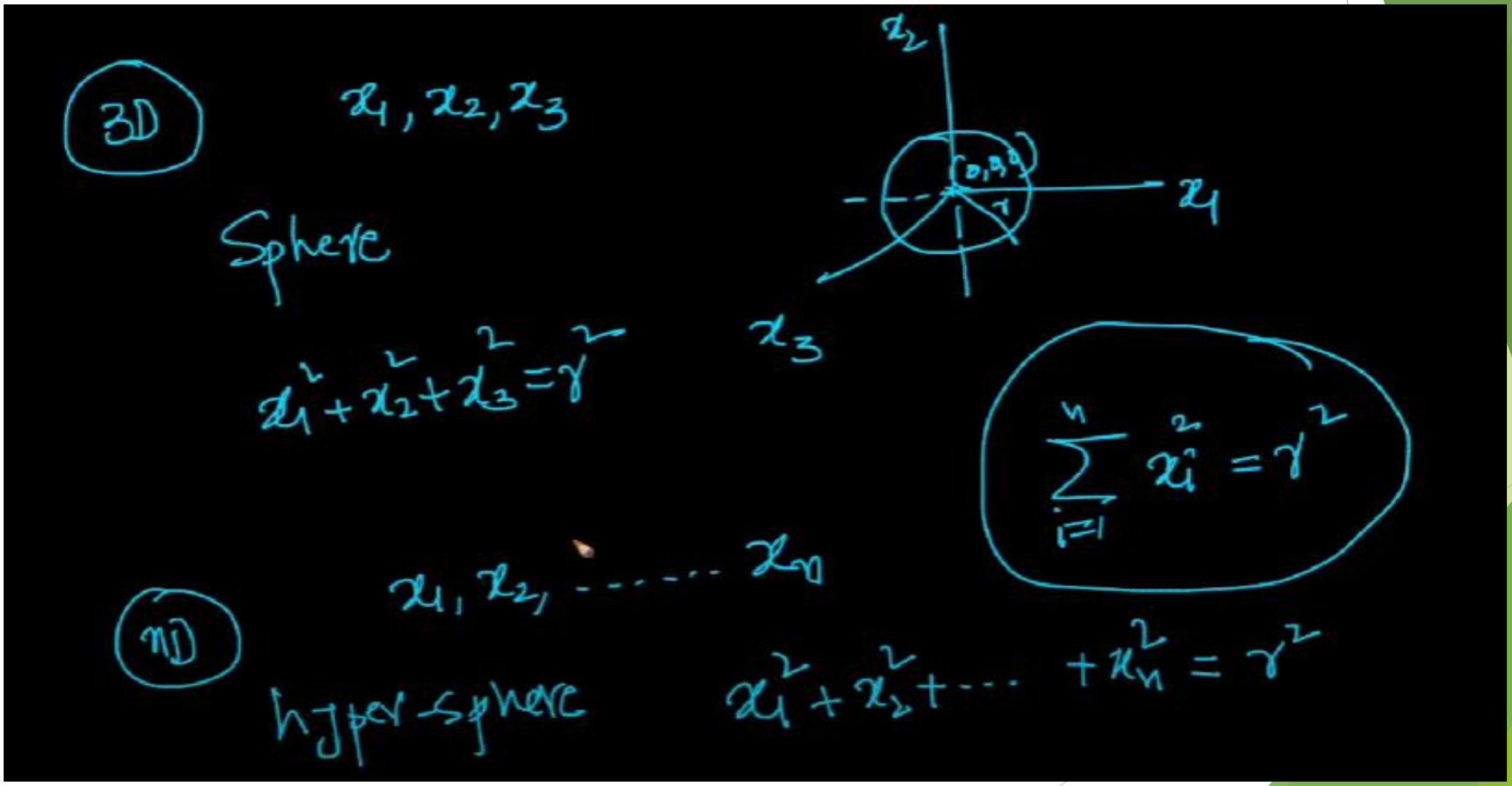


Circle


Circle:
y = x2
r
C
(0,0)
x = x1
x² + y² = r²
C: (h,k) ; (x-h)² + (y-k)² = r²

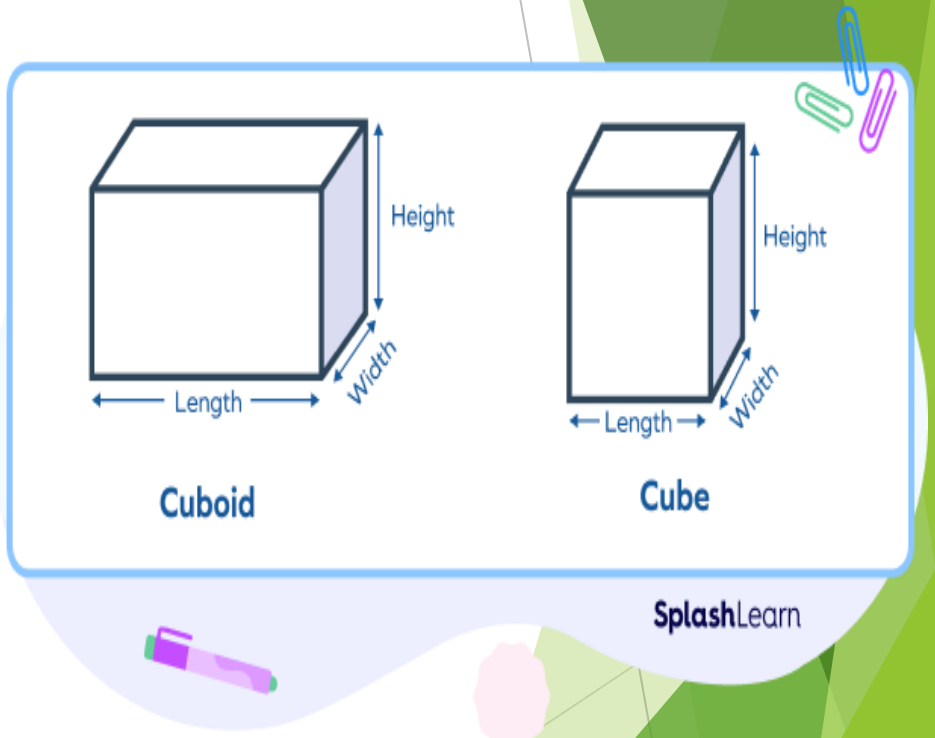

Similarities
Circle
Sphere

Circle continued



Square/rectangle

- In 2d we have two axis x,y (rectangle) and x,x (square)
- In 3d we have three axis x,y,z (cuboid) and x,x,x (cube)
- In nd we have n axis x1,x2,x3…xn (hyper cuboid) and x,x,x…x (hyper cube)



SQUARE

RECTANGLE

Importance of Maths in ML

- Every shape can be extended to n dimensions and therefore we can perform operations in n dimensions
- Human eye can only see upto 3 dimensions but with the help of mathematics we can reach upto any number of dimensions.