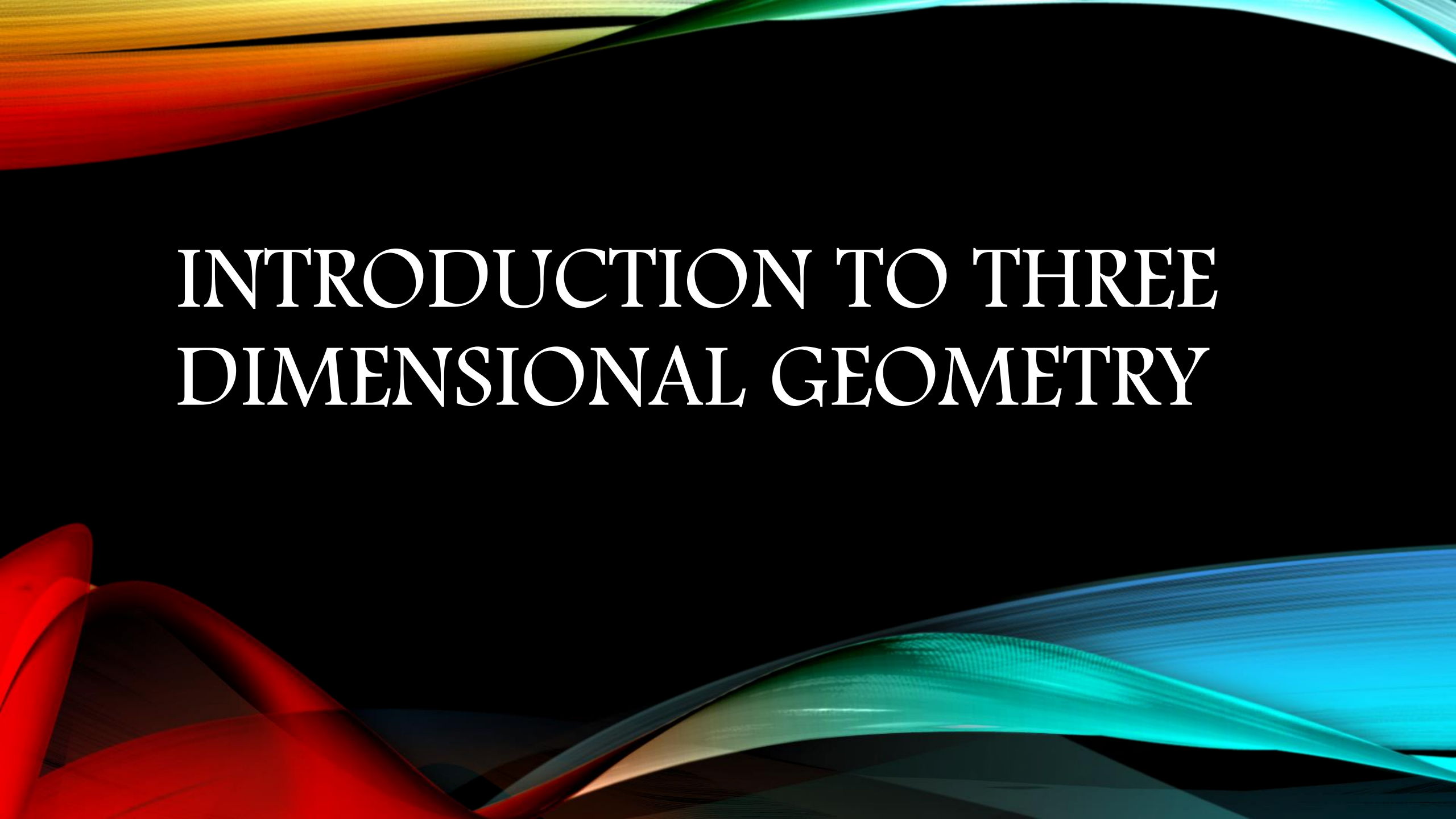


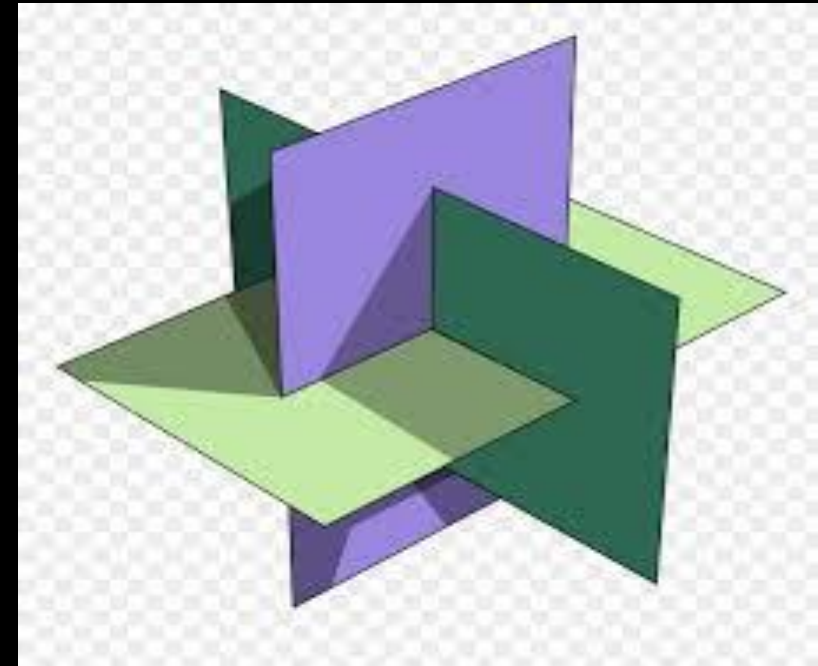
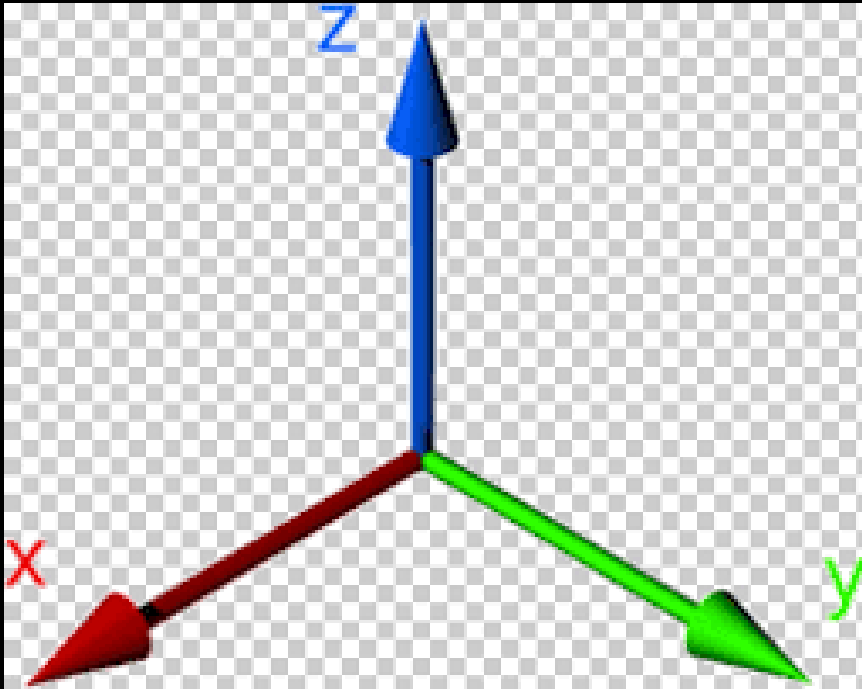


INTRODUCTION TO THREE DIMENSIONAL GEOMETRY



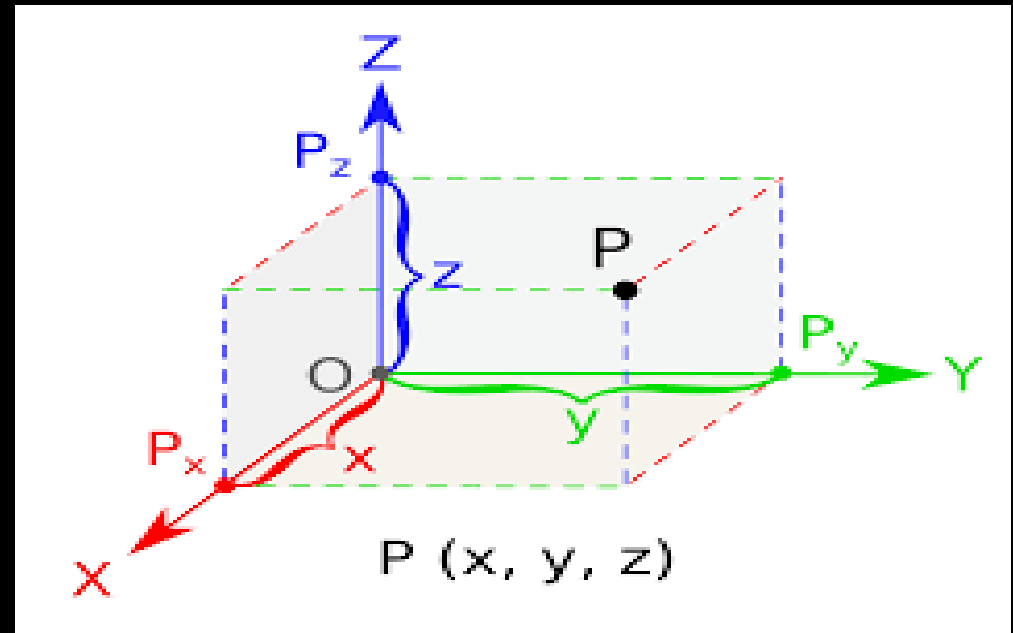
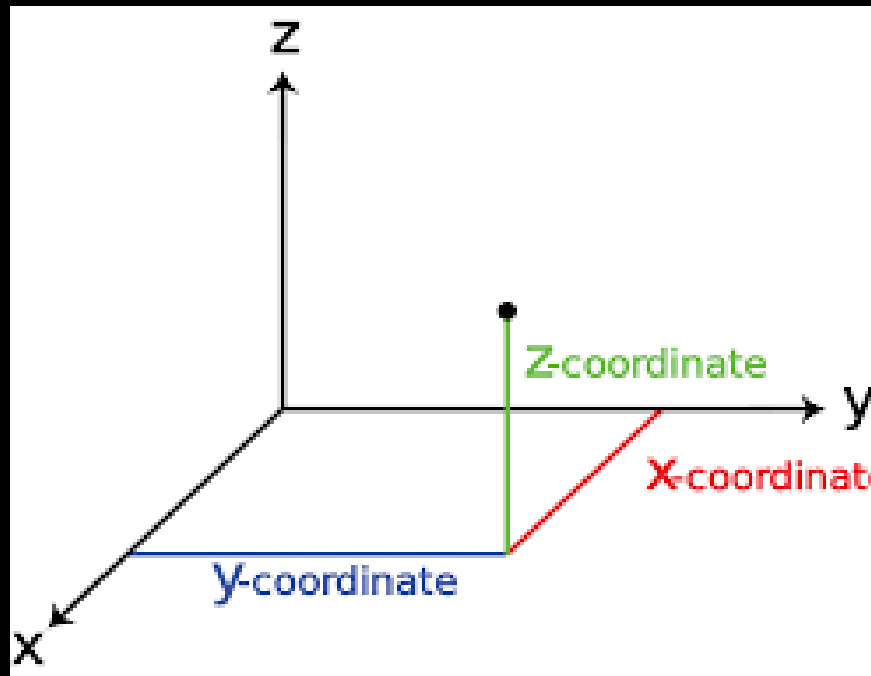
IS IT POSSIBLE TO
CALCULATE THE
EXACT POSITION
OF ROCKET OR
ASTRONAUT IN
THE SPACE?

COORDINATE PLANES IN THREE DIMENSIONAL



Here we get total Eight octants

COORDINATES OF POINT IN SPACE

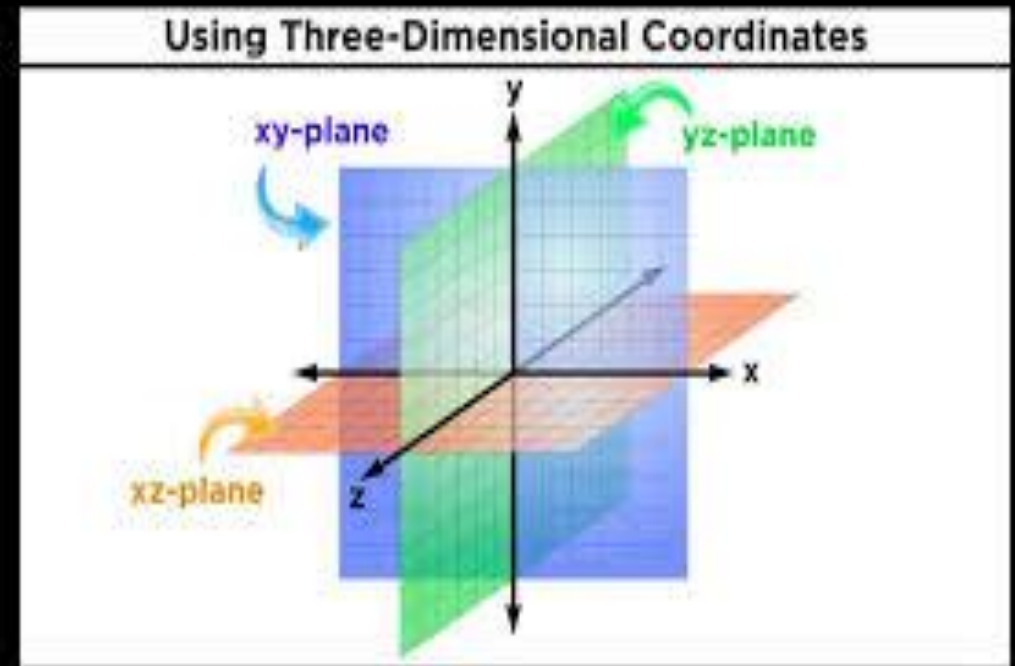


COORDINATES OF POINT IN COORDINATE PLANES

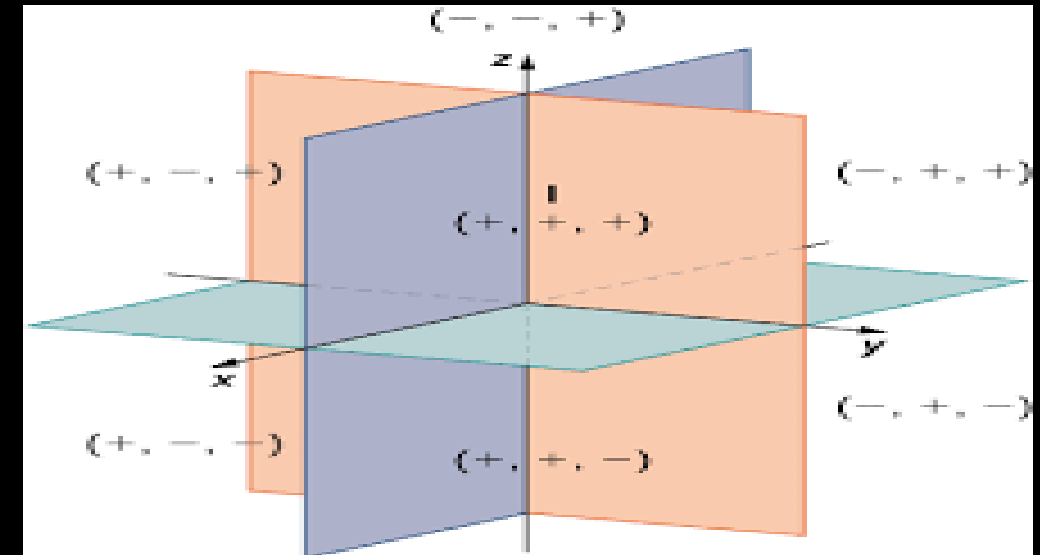
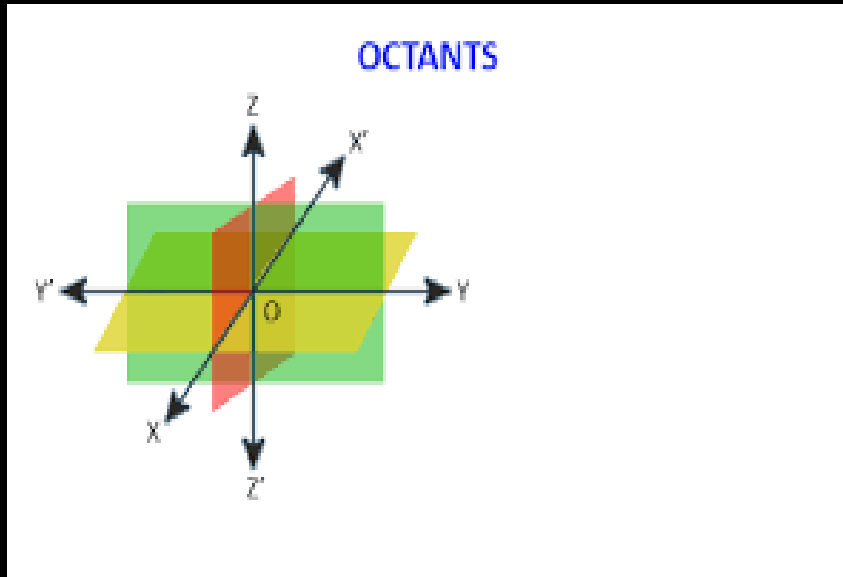
❖ In XY plane, Z coordinate = Zero.
So coordinates of a point in XY planes is of the form $(a,b,0)$.

❖ In YZ plane X coordinate = Zero.
So coordinates of a point in YZ planes is of the form $(0,b,c)$.

❖ In ZX plane Y coordinate = Zero.
So coordinates of a point in ZX planes is of the form $(a,0,c)$.



EIGHT OCTANTS WITH SIGN OF COORDINATES OF A POINT

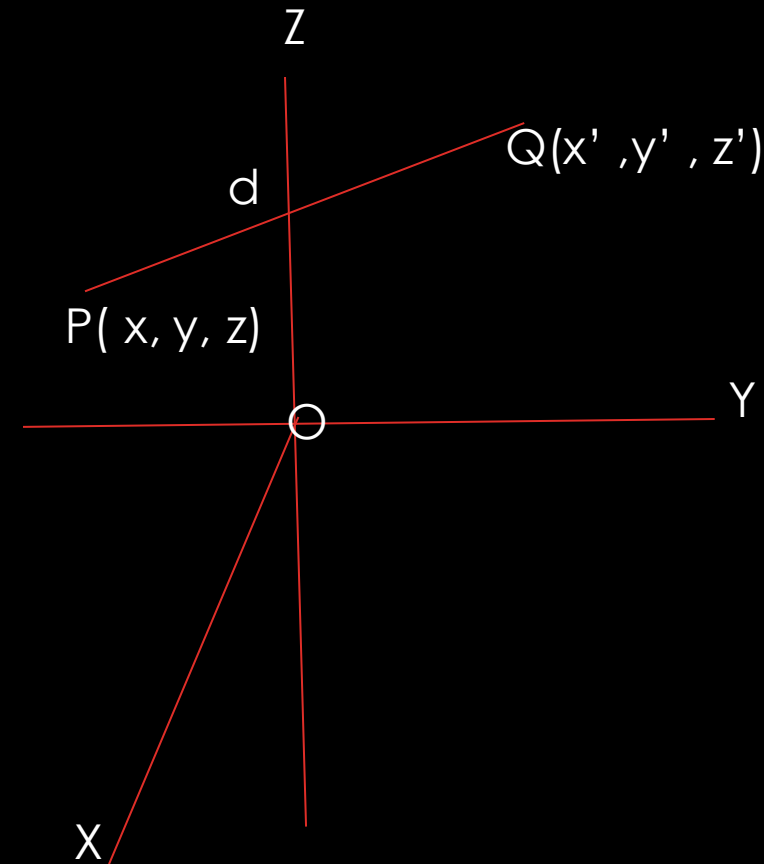


Octant/ coordinates	I	II	III	IV	V	VI	VII	VIII
X	+	-	-	+	+	-	-	+
Y	+	+	-	-	+	+	-	-
Z	+	+	+	+	-	-	-	-

DISTANCE FORMULA

If $P(x,y,z)$, $Q(x',y',z')$ are two points then distance between these two points is

$$PQ = \sqrt{(x' - x)^2 + (y' - y)^2 + (z' - z)^2}$$



APPLICATIONS OF DISTANCE FORMULA IN GEOMETRY

To Identify the Geometric Figure ,here distance formula is very applicable.

- Properties of triangles:
- **Scalene Triangle:** All three sides are unequal.
- **Right Angled Triangle:** Sum of square of any two sides of a triangle is equal to square of other third side.
- **Isosceles Triangle:** Any two sides of a triangle are equal.
- **Equilateral Triangle:** All three sides of a Triangle are equal.

APPLICATIONS OF DISTANCE FORMULA IN GEOMETRY

- Properties of Quadrilateral:
- **Rectangle:** Opposite sides are equal and diagonals are equal.
- **Parallelogram:** Opposite sides are equals and diagonals are unequal.
- **Rhombus:** All four sides are equals and diagonals are unequal .
- **Square:** All four sides are equals and diagonals are equal.

Section Formula:

let $A(x, y, z)$ and $B(x', y', z')$ be the end point of a line segment AB and c be any point on AB which divide AB in the ratio $m:n$

○ **Internally**, then coordinates of c are

$$\begin{array}{c} \text{A}(x, y, z) \quad \xrightarrow{\quad m \quad} \quad \text{c} \quad \xrightarrow{\quad n \quad} \quad \text{B}(x', y', z') \\ \left[\frac{mx' + nx}{m+n}, \frac{my' + ny}{m+n}, \frac{mz' + nz}{m+n} \right] \end{array}$$

○ **Externally**, then coordinates of c are

$$\begin{array}{c} \left[\frac{mx' - nx}{m-n}, \frac{my' - ny}{m-n}, \frac{mz' - nz}{m-n} \right] \\ \text{○} \quad \text{A}(x, y, z) \quad \xrightarrow{\quad m \quad} \quad \text{B}(x', y', z') \quad \xrightarrow{\quad n \quad} \quad \text{C} \end{array}$$

Special Case:

If c is the midpoint of AB then $m:n=1:1$ and coordinates of c are

$$x = \frac{x + x'}{2}, \quad Y = \frac{y + y'}{2}, \quad Z = \frac{z + z'}{2}$$

CENTROID FORMULA

- Let $A(x, y, z), B(x', y', z'), C(x'', y'', z'')$ be three points of a triangle then centroid of triangle is denoted by G is calculated by

$$G = \left\{ \frac{x + x' + x''}{3}, \frac{y + y' + y''}{3}, \frac{z + z' + z''}{3} \right\}$$

