Basic Concepts of Vectors | Difference between Vector and Scalar

The quantities which can be measured and have physical significance are called physical quantities

There are two types of physical quantities.

- Scalar quantities or nondirectional quantities

- Vector quantities or directional quantities

Topic Related Video:

Detailed Introduction to vectors

What is the difference between vector and scalar

Scalar	Vector
It has only the magnitude	It has direction and magnitude
Only one dimensional	It is multidimensional
This quantity changes with the change in magnitude	This changes with magnitude and direction
Normal rules of algebra are applicable here	There is a different set of rules known as vector algebra
volume, density, speed, energy, mass, and time	Force, acceleration, displacement, and momentum.

Representation of a vector

There are two methods for vector representation

- Symbolic representation
- Graphical representation

Symbolic representation

In books

- A vector represents by boldface letters like A, d,r, etc
- The magnitude of the vector is represented by light face letters such as A,d,r, etc

Hand written

A vector is also represented by a letter with an arrow drawn above or below it .such as

$$\vec{A}$$

Graphical representation

- Graphically a vector is represented by a single straight line with an arrowhead at one end

- The length of the line, according to the proper scale, gives the magnitude

- Arrow describes the direction of the vector

If 1cm =1N

Then 10N graphically represent as
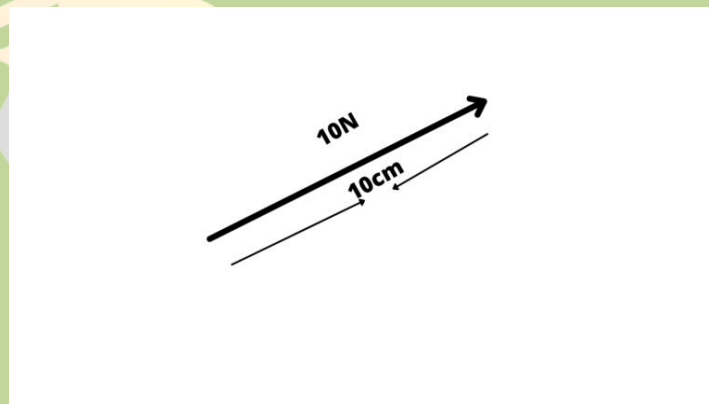
Rectangular coordinate system

The system of coordinate axes is called cartesian or rectangular coordinate system

Coordinate axes

Two lines drawn mutually perpendicular to each other are known as coordinate axes

Origin

The point of intersection of reference or coordinate axes is called the origin. It is denoted by O
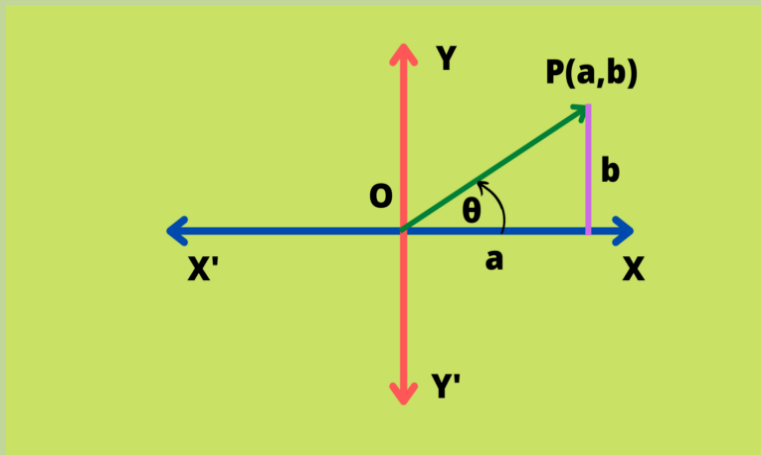
The rectangular coordinate system in two dimension

The line in the horizontal direction is called X-axis. The X-axis is taken positive along (rightward)OX while negative along(leftward)OX'.

The line in the vertical direction is called Y-axis. Y-axis is taken positive along (upward)OY while negative along(downward)OY'.
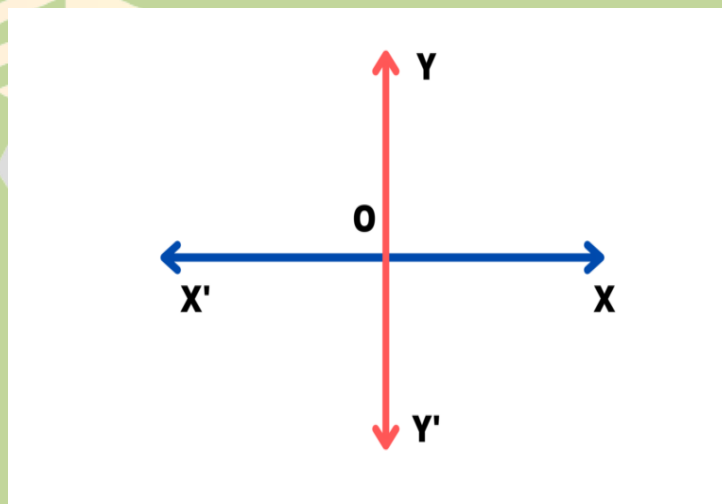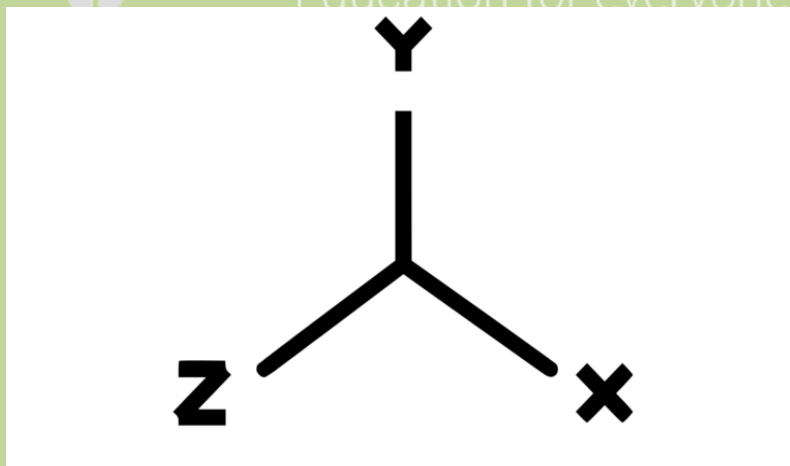

Direction of vector

The direction of a vector in a plane is obtained by the angel which a vector makes with a positive X-axis in the anti-clockwise direction.

The point P has coordinates (a,b) and vector A makes an angel θ with a positive X-axis. We can reach at point P by moving the 'a' unit along the positive X-axis and the 'b' unit along the positive Y-axis from the origin.

The rectangular coordinate system in three dimensions (space)

There are 3 coordinates in space

The direction of a vector in space is specified by three angles, α, β, and γ which a vector makes with X, Y and Z-axis respectively.
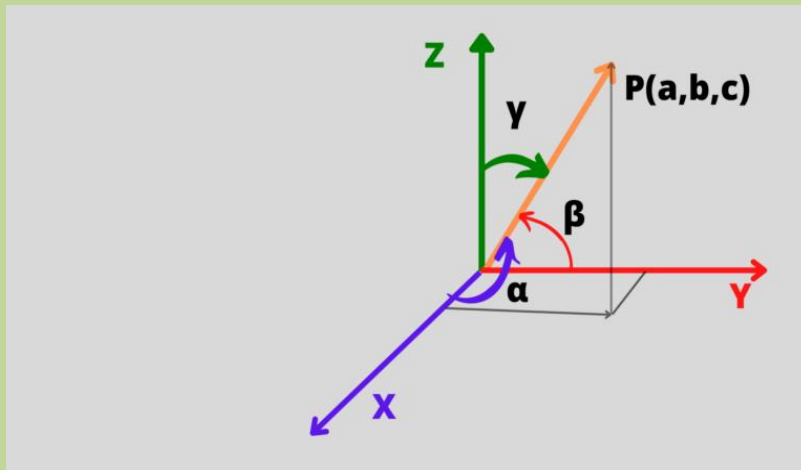
Point P of a vector A has three coordinates (a,b,c). In space, we can reach point P by moving unit 'a' along the positive X-axis 'b' unit along the positive Y-axis, and 'c' along the positive Z-axis from the origin.