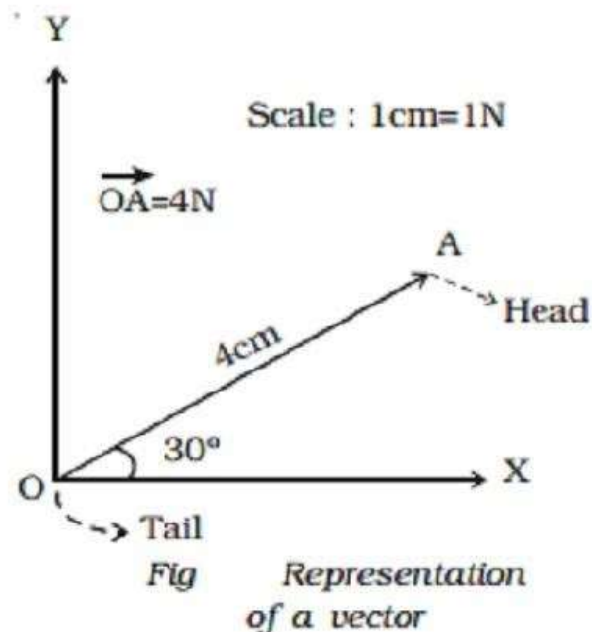


Representation of a vector quantities-

Vector quantities are often represented by a scaled vector diagrams. Vector diagrams represent a vector by the use of an arrow drawn to scale in a specific direction. An example of a scaled vector diagram is shown in Fig.

From the figure, it is clear that



The magnitude and direction of the vector are clearly labelled. In the above case, the diagram shows that the magnitude is 4 N and direction is 30° to x-axis. The length of the line gives the magnitude and arrow head gives the direction. In notation, the vector is denoted in bold face letter such as \mathbf{A} or with an arrow above the letter as Vector \vec{A} , read as vector A or A vector while its magnitude is denoted by A or by $|\vec{A}|$.

Different types of vectors

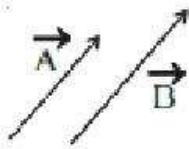


Fig.
Like vectors

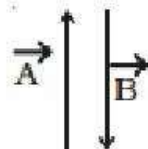


Fig.
Opposite vectors

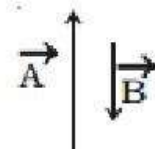


Fig.
Unlike Vectors

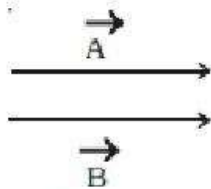


Fig.
Equal vectors

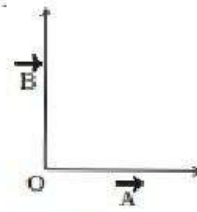


Fig.
Co initial vectors

- (i) Equal vectors
- (ii) Like vectors
- (iii) Opposite vectors
- (iv) Unlike vectors
- (v) Unit vector and orthogonal unit vectors
- (vi) Null vector or zero vector
- (vii) Proper vector
- (viii) Co-initial vectors
- (ix) Coplanar vectors

(i) Equal vectors

Two vectors are said to be equal if they have the same magnitude and same direction, wherever be their

Initial positions. In Fig. above the vectors A and B have the same magnitude and direction. Therefore A and B are equal vectors.

(ii) Like vectors

Two vectors are said to be like vectors, if they have same direction but different magnitudes as shown in Fig. above.

(iii) Opposite vectors

The vectors of same magnitude but opposite in direction, are called opposite vectors are shown in Fig. above.

(iv) Unlike vectors

The vectors of different magnitude acting in opposite directions are called unlike vectors. In Fig. above the vectors A and B are unlike vectors.

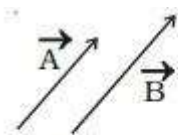


Fig.
Like vectors

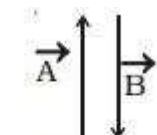


Fig.
Opposite vectors

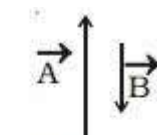


Fig.
Unlike Vectors

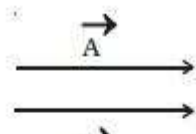


Fig.
Equal vectors

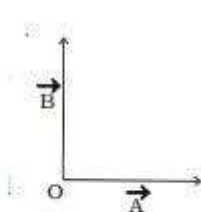


Fig.
Co-initial vectors

(v) Unit vector

A vector having unit magnitude is called a unit vector. It is also defined as a vector divided by its own magnitude. A unit vector in the direction of a vector \vec{A} , is written as \hat{A} and is read as 'A cap' or 'A caret' or 'A hat'. Therefore,

$$\hat{A} = \frac{\vec{A}}{|\vec{A}|} \quad (\text{or}) \quad \vec{A} = \hat{A} |\vec{A}|$$

Thus, a vector can be written as the product of its magnitude and unit vector along its direction.

(vi) Orthogonal unit vectors

There are three most common unit vectors in the positive directions of X,Y and Z axes of Cartesian coordinate system, denoted by i, j and k respectively. Since they are along the mutually perpendicular directions, they are called orthogonal unit vectors.

(vii) Null vector or zero vector

A vector whose magnitude is zero, is called a null vector or zero vector. It is represented by 0 and its starting and end points are the same. The direction of null vector is not known.

(viii) Proper vector

All the non-zero vectors are called proper vectors.

(viii) Co-initial vectors

Vectors having the same starting point are called

Co-initial vectors. In Fig. above vector A and vector B start from the same origin O. Hence, they are called as co-initial vectors.

(ix) Coplanar vectors

Vectors lying in the same plane are called coplanar vectors and the plane in which the vectors lie are called plane of vectors.

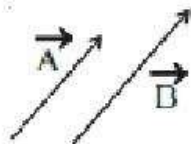


Fig.
Like vectors

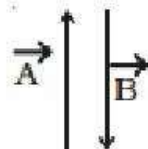


Fig.
Opposite vectors

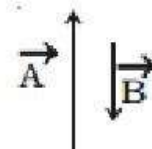


Fig.
Unlike Vectors

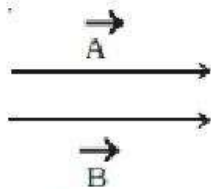


Fig.
Equal vectors

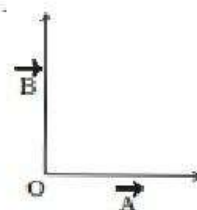


Fig.
Co initial vectors