

Vectors

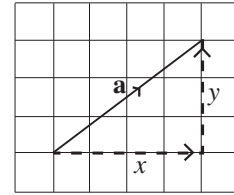
Essential information

Scalar this means 'a number'

Vector a quantity that has magnitude and direction; for example, velocity

Magnitude (modulus) is the length of the vector, denoted by $|\mathbf{a}|$ if

$$\mathbf{a} = \begin{pmatrix} x \\ y \end{pmatrix}, \text{ then } |\mathbf{a}| = \sqrt{x^2 + y^2}$$



Zero vector $\mathbf{0} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$

Parallel vectors vectors in the same direction but not necessarily of the same magnitude; for example, \mathbf{a} and $2\mathbf{a}$

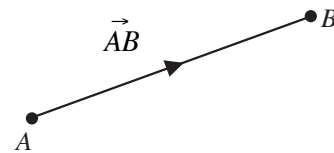
Unit vector a vector that has magnitude 1; that is $|\mathbf{a}| = 1$

Position vector a vector that starts at the origin (O)

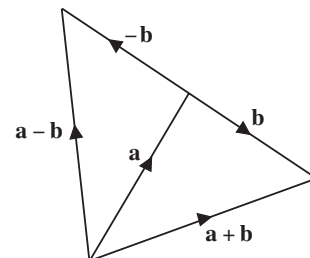
- Multiplying a vector by a scalar means multiplying all components of the vector by the scalar.

For example, $k \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} kx \\ ky \end{pmatrix}$

- The vector \vec{AB} starts at position A and finishes at position B.



- Vector addition, i.e. $\begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} a + c \\ b + d \end{pmatrix}$ and geometric interpretation – see diagram.



- Multiplication of a vector by a scalar

For example, $k \begin{pmatrix} a \\ b \end{pmatrix} = \begin{pmatrix} ka \\ kb \end{pmatrix}$