Lower 6 Chapter 11

Vectors

Chapter Overview

1. Add/scale factors and show vectors are parallel.
2. Calculate magnitude and direction of a vector.
3. Understand and use position vectors.
4. Solve geometric problems.
5. Understand speed vs velocity.



Vector basics

Whereas a **coordinate** represents a **position** in space, a **vector** represents a **displacement** in space.

* A vector has 2 properties:
* Direction
* Magnitude (i.e. length)

If $P$ and $Q$ are points then $\vec{PQ}$ is the vector between them.

* If two vectors $\vec{PQ}$ and $\vec{RS}$ have the same magnitude and direction, **they’re the same vector** and are **parallel**.
* $\vec{AB}=-\vec{BA} $ and the two vectors are parallel, equal in magnitude but in **opposite directions**.
* Triangle Law for vector addition:

$$\vec{AB}+\vec{BC}=\vec{AC}$$

The vector of multiple vectors is known as the **resultant vector.** (you will encounter this term in Mechanics)

* Vector **subtraction** is defined using vector addition and negation:

$$a-b=a+\left(-b\right)$$

* The zero vector $0$ (a bold 0), represents no movement.

$$\vec{PQ}+\vec{QP}=0$$

In 2D**:** $0=\left(\begin{matrix}0\\0\end{matrix}\right)$

* A **scalar** is a normal number, which can be used to ‘scale’ a vector.
* The **direction** will be the **same**.
* But the **magnitude** will be **different** (unless the scalar is 1).
* Any vector parallel to the vector $a$ can be written as $λa$, where $λ$ is a scalar.

The implication is that if we can write one vector **as a multiple of** another, then we can show they are parallel.

Example



Test your understanding



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