Science 10

Unit B: Energy flow in technological systems

Scalars and vectors in motion

Distance and displacement on a lap

- A runner completes 400 m around a track and returns to the starting point.
- The distance is 400 m, but the displacement is 0 m because start and finish positions match.



Speed and velocity

- Speed is a scalar; velocity includes both speed and direction.
- Distance measures path length; displacement compares final and initial position and includes direction.
- Distinguish scalar and vector quantities and calculate displacement, velocity, and acceleration.

Key terms

scalar

A quantity described by magnitude and unit only.

vector

A quantity described by magnitude, unit, and direction.

displacement

Change in position from initial point to final point, including direction. (Δd)

velocity

Rate of change of displacement, including direction. (v)

Key terms

acceleration

Rate of change of velocity. (a)

Scalars and vectors

- Speed tells you how fast. Velocity tells you how fast and which way.
- A full lap can be a long distance with a displacement of zero.
- For a vector, write the size, the unit, and the direction.



ectors need magnitude and direction (displacement, velocity, force

Acceleration

- Acceleration is the change in velocity divided by the time that change takes: $a = \Delta v/\Delta t$.
- Speeding up, slowing down, or turning each count as an acceleration.
- With no friction or drag, an object already moving at constant velocity keeps moving without any push.

Acceleration

$a = \Delta v / \Delta t$



Speed up, slow down, or turn all change velocity

Displacement and velocity

- Calculate distance and displacement for a path, then state an average velocity with direction.
- A complete answer states the reference points, the direction, the units, and the difference between path length and change in position.

Image credits

Santeri Viinamäki, Athletics track start line numbers 1, 2, 3, CC BY-SA 4.0