Constant Acceleration

Average acceleration: $a_{av} = \frac{d}{dt}(v(t))$

Gravity: constant downward acceleration of 9.80 m/s^2

Acceleration and mass: acceleration is independent of mass, assuming no air resistance

Constant Acceleration Formula Summary

$$v_f = v_i + a\Delta t \quad (1)$$

$$\Delta x = v_i \Delta t + \frac{1}{2} a(\Delta t)^2 \quad (2)$$

$$\Delta x = \frac{1}{2}(v_i + v_f)\Delta t \quad (3)$$

$$v_f^2 = v_i^2 + 2a(x_f - x_i) \quad (4)$$

Vectors

Displacement → vector quantity

Distance → scalar quantity

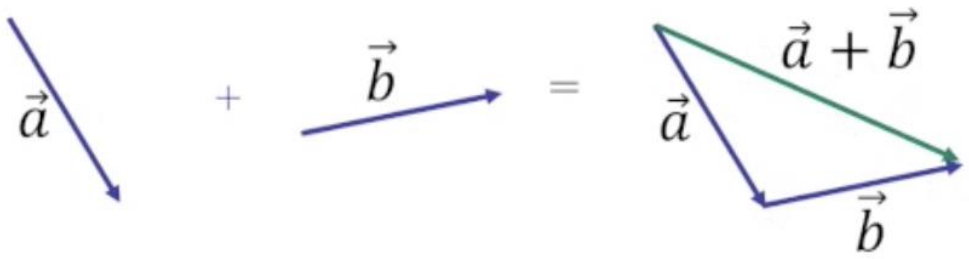
Key difference: scalars are just a number with a unit, but vectors also require a direction, indicated by an arrow

Example:

Scalar – 10 m/s

Vector – 10 m/s in a northwest direction

$$|\tilde{v}| = magnitude\ of\ vector$$



Multiplying by a vector: direction is unchanged, but the magnitude is scaled

Subtracting vectors: same as addition, but with the subtracted vector in the opposite direction

Components of Vectors

Separation of vectors: we can separate vectors into horizontal and vertical components

Projectile Motion

Projectile: an object that is launched with an initial speed and subject to gravity

Horizontal and Independent components: independent of one another

Free falling objects