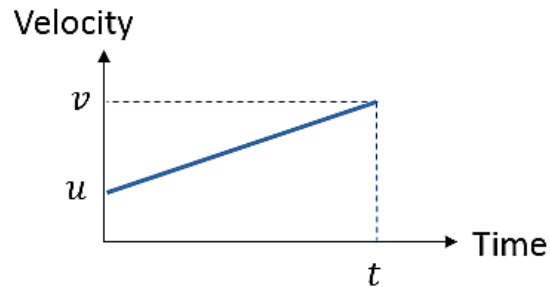


3-4. Constant Acceleration Formulae (SUVAT Equations)

These formulae are used to solve problems where the object is moving in a **straight line with constant acceleration for a specific period of time**. You should memorise these and know how to derive them.



$$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$v =$$

(Equation 1)

For uniform acceleration, the average velocity is the average of v and u . Using the area of the graph (which we know gives distance):

$$s =$$

(Equation 2)

Eliminating v - sub for v from equation 1 into equation 2:

$$s =$$

(Equation 3)

Eliminating t - sub for t from equation 1 into equation 2:

$$v^2 =$$

(Equation 4)

Eliminating u – sub for u from equation 1 into equation 2:

$$s =$$

(Equation 5)

- Work out what you know
- Work out what you need
- Choose the appropriate equation
- Diagrams help!
- Work out which direction will be positive
- Check that your units are consistent

Example

A stone slides in a straight line across a horizontal sheet of ice. It passes a point, A with velocity 14ms^{-1} and a point, B 2.5 seconds later. Assuming the deceleration is uniform and that $AB = 30\text{m}$, find:

- a) The deceleration
- b) The velocity at B
- c) How long after passing A the stone comes to rest

Example – Deceleration Leading to a Change in Direction

A particle travels with uniform deceleration 2ms^{-2} in a horizontal line. The points A and B lie on the line and $AB = 32\text{m}$. At time $t = 0$, the particle passes through A with velocity 12ms^{-1} in the direction AB. Find:

- a) The values of t when the particle is at B
- b) The velocity of the particle for each of these values of t .

Test Your Understanding (EdExcel M1 May 2013 Q4)

A lorry is moving along a straight horizontal road with constant acceleration. The lorry passes a point A with speed $u \text{ m s}^{-1}$, ($u < 34$), and 10 seconds later passes a point B with speed 34 m s^{-1} . Given that $AB = 240 \text{ m}$, find

(a) the value of u , (3)

(b) the time taken for the lorry to move from A to the mid-point of AB . (6)