9.3) Constant acceleration formulae 1

Worked example

A cyclist is travelling along a straight road.
She accelerates at a constant rate from a velocity of 5 ms^{-1} to a velocity of 7.4 ms^{-1} in 50 seconds.
Find:
(a) the distance she travels in these 50 seconds
(b) her acceleration in these 50 seconds.

Your turn

A cyclist is travelling along a straight road.
She accelerates at a constant rate from a velocity of 4 ms^{-1} to a velocity of 7.5 ms^{-1} in 40 seconds.
Find:
(a) the distance she travels in these 40 seconds
(b) her acceleration in these 40 seconds.

a) $230\ m$
b) $0.0875\ ms^{-2}$

Worked example

A particle moves in a straight line from a point A to a point B with a constant deceleration $3\ ms^{-2}$. The velocity of the particle at A is $16\ ms^{-1}$ and the velocity of the particle at B is $4\ ms^{-1}$. Find:

(a) the time taken for the particle to move from A to B.

(b) the distance from A to B.

After reaching B the particle continues to move along the straight line with constant deceleration $3\ ms^{-2}$.
The particle is at the point C 12 seconds after passing through the point A. Find:

(c) the velocity of the particle at C.

(d) The distance from A to C.

Your turn

A particle moves in a straight line from a point A to a point B with a constant deceleration $1.5\ ms^{-2}$. The velocity of the particle at A is $8\ ms^{-1}$ and the velocity of the particle at B is $2\ ms^{-1}$. Find:

(a) the time taken for the particle to move from A to B.

(b) the distance from A to B.

After reaching B the particle continues to move along the straight line with constant deceleration $1.5\ ms^{-2}$.
The particle is at the point C 6 seconds after passing through the point A. Find:

(c) the velocity of the particle at C.

(d) The distance from A to C.

a) 4 s

b) $20\ m$

c) $1\ ms^{-1}$ in the direction $\overrightarrow{BA}$

d) $21\ m$

Worked example

A car moves from traffic lights along a straight road with constant acceleration.
The car starts from rest at the traffic lights and 20 seconds later the car passes a speed-trap where it is registered as travelling at $54\ km\ h^{-1}$. Find:

(a) the acceleration of the car
(b) the distance between the traffic lights and the speed-trap.

Your turn

A car moves from traffic lights along a straight road with constant acceleration.
The car starts from rest at the traffic lights and 30 seconds later the car passes a speed-trap where it is registered as travelling at $45\ km\ h^{-1}$. Find:

(a) the acceleration of the car
(b) the distance between the traffic lights and the speed-trap.

a) $\frac{5}{12}\ ms^{-2} = 0.417\ ms^{-2}$ (3 sf)

b) $187.5\ m$