9.2) Velocity-time graphs

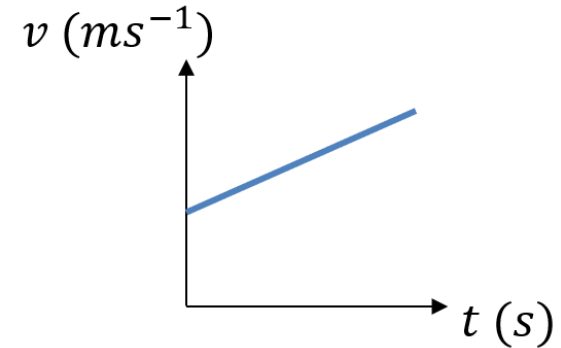# Worked example

Describe the motion of each object from the velocity-time graph:

$v \ (ms^{-1})$

$t \ (s)$

$v \ (ms^{-1})$

$t \ (s)$
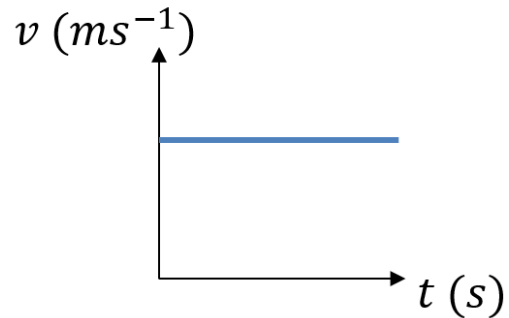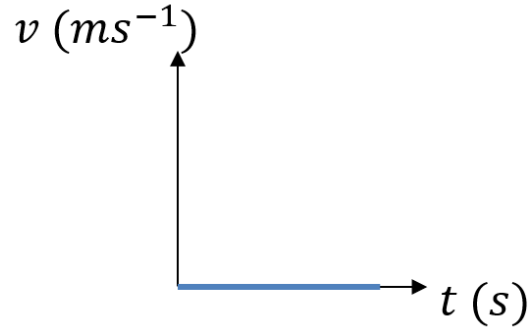
Your turn

Describe the motion of each object from the velocity-time graph:

$v \ (ms^{-1})$

$t \ (s)$

Object has constant acceleration. Velocity is increasing at a constant rate.

Worked example	Your turn

Worked example

A cyclist is moving along a straight road for a period of 21 seconds. For the first 6 seconds, she moves at a constant speed of 8 ms^{-1}. She then decelerates at a constant rate, stopping after a further 15 seconds.
(a) Find the displacement from the starting point of the cyclist after this 21 second period.
(b) Work out the rate at which the cyclist decelerates.

$v\ (ms^{-1})$

8

6   21 $t\ (s)$
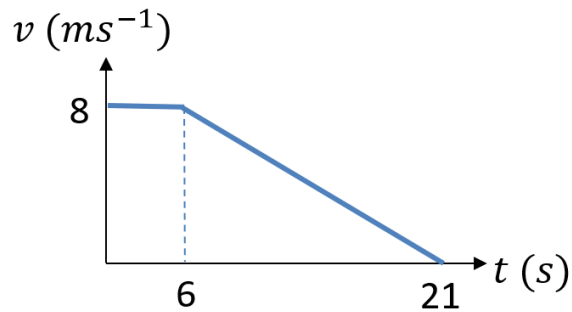
Your turn

A cyclist is moving along a straight road for a period of 12 seconds. For the first 8 seconds, she moves at a constant speed of 6 m s^{-1}. She then decelerates at a constant rate, stopping after a further 4 seconds.
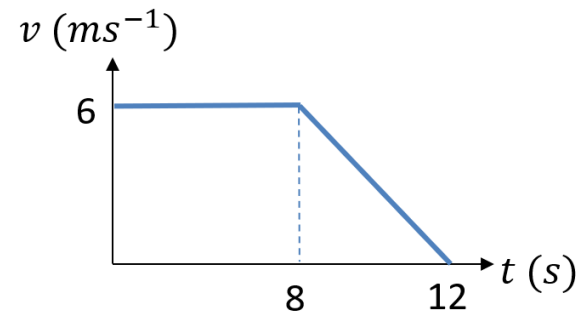(a) Find the displacement from the starting point of the cyclist after this 12 second period.
(b) Work out the rate at which the cyclist decelerates.

$v\ (ms^{-1})$

6

8   12 $t\ (s)$

a) $60\ m$
b) $1.5\ ms^{-2}$

Worked example

A particle moves along a straight line. The particle accelerates uniformly from rest to a velocity of 16 ms^{-1} in T seconds. The particle then travels at a constant velocity of 16 ms^{-1} for $3T$ seconds. The particle then decelerates uniformly to rest in a further 4 s.

(a) Sketch a velocity-time graph to illustrate the motion of the particle.

Give then the total displacement of the particle is 592m.

(b) find the value of T.

Your turn

A particle moves along a straight line. The particle accelerates uniformly from rest to a velocity of 8 ms^{-1} in T seconds. The particle then travels at a constant velocity of 8 ms^{-1} for $5T$ seconds. The particle then decelerates uniformly to rest in a further 40 s.

(a) Sketch a velocity-time graph to illustrate the motion of the particle.

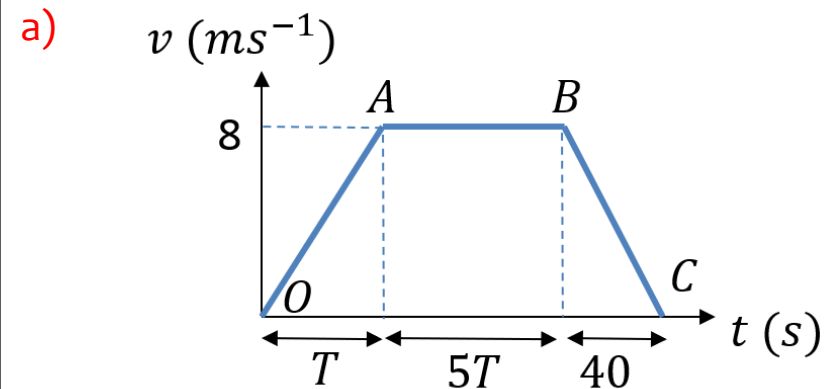Give then the total displacement of the particle is 600m.

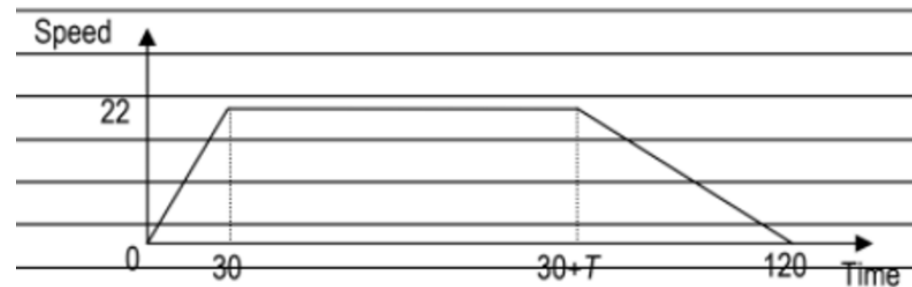(b) find the value of T.

a)

b) $T = 10$

Worked example

A car is travelling along a straight horizontal road. The car takes 60 s to travel between two sets of traffic lights which are 1072.5 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 15 s until its speed is 11 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights.
a)   Sketch a speed-time graph for the motion of the car between the two sets of traffic lights
b)   Find the value of T

Your turn

A car is travelling along a straight horizontal road. The car takes 120 s to travel between two sets of traffic lights which are 2145 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 30 s until its speed is 22 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights.
a)   Sketch a speed-time graph for the motion of the car between the two sets of traffic lights
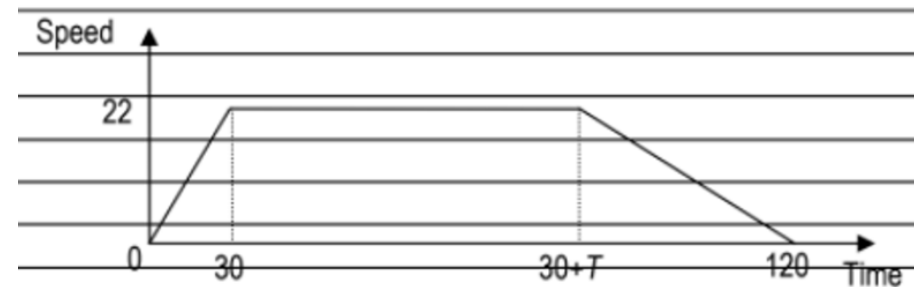b)   Find the value of T

a)

b) $T = 75$

Worked example	Your turn
A car is travelling along a straight horizontal road. The car takes 60 s to travel between two sets of traffic lights which are 1072.5 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 15 s until its speed is 11 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights. a) Sketch a speed-time graph for the motion of the car between the two sets of traffic lights b) Find the value of T	A car is travelling along a straight horizontal road. The car takes 120 s to travel between two sets of traffic lights which are 2145 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 30 s until its speed is 22 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights. a) Sketch a speed-time graph for the motion of the car between the two sets of traffic lights b) Find the value of T a)

b) $T = 75$

Worked example	Your turn
A car is travelling along a straight horizontal road. The car takes 60 s to travel between two sets of traffic lights which are 1072.5 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 15 s until its speed is 11 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights. A motorcycle leaves the first set of traffic lights 15 s after the car has left the first set of traffic lights. The motorcycle moves from rest with constant acceleration, and passes the car at the point A which is 495 m from the first set of traffic lights. When the motorcycle passes the car, the car is moving with speed 11 ms^{-1} c) Find the time it takes for the motorcycle to move from the first set of traffic lights to the point A	A car is travelling along a straight horizontal road. The car takes 120 s to travel between two sets of traffic lights which are 2145 m apart. The car starts from rest at the first set of traffic lights and moves with constant acceleration for 30 s until its speed is 22 $m\ s^{-1}$. The car maintains this speed for T seconds. The car then moves with constant deceleration, coming to rest at the second set of traffic lights. A motorcycle leaves the first set of traffic lights 10 s after the car has left the first set of traffic lights. The motorcycle moves from rest with constant acceleration, and passes the car at the point A which is 990 m from the first set of traffic lights. When the motorcycle passes the car, the car is moving with speed 22 ms^{-1} c) Find the time it takes for the motorcycle to move from the first set of traffic lights to the point A c) 50 seconds

Worked example	Your turn
A car is moving along a straight horizontal road. At time $t = 0$, the car is moving with speed $10 \ ms^{-1}$ and is at the point A. The car maintains this speed for $50 \ s$. The car then moves with constant deceleration $0.6 \ ms^{-2}$, reducing its speed from $10 \ ms^{-1}$ to $4 \ ms^{-1}$. The car then moves with constant speed $4 \ ms^{-1}$ for $30 \ s$. The car then moves with constant acceleration until it is moving with speed $10 \ ms^{-1}$ at the point B. Given that the distance from A to B is $980 \ m$, find the time taken for the car to move from A to B	A car is moving along a straight horizontal road. At time $t = 0$, the car is moving with speed $20 \ ms^{-1}$ and is at the point A. The car maintains this speed for $25 \ s$. The car then moves with constant deceleration $0.4 \ ms^{-2}$, reducing its speed from $20 \ ms^{-1}$ to $8 \ ms^{-1}$. The car then moves with constant speed $8 \ ms^{-1}$ for $60 \ s$. The car then moves with constant acceleration until it is moving with speed $20 \ ms^{-1}$ at the point B. Given that the distance from A to B is $1960 \ m$, find the time taken for the car to move from A to B

155 seconds |