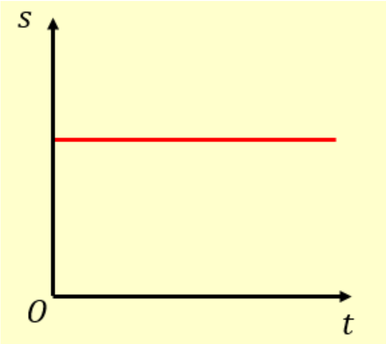
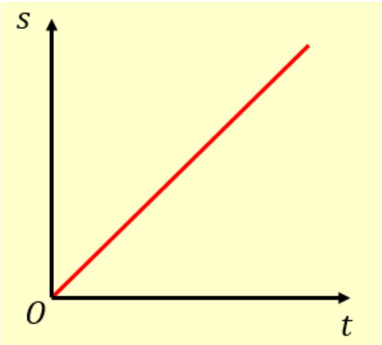
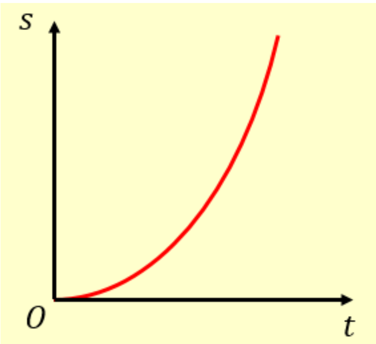
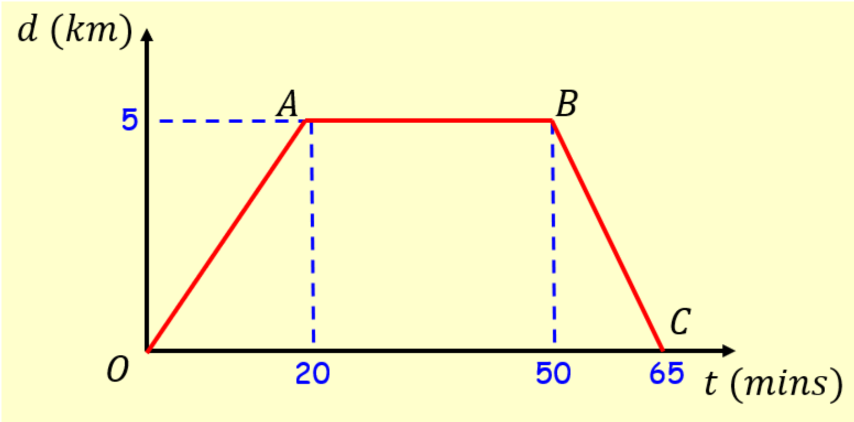
9A Time-Distance Graphs







1. A cyclist rides in a straight line for 20 minutes. She waits for half an hour, then returns in a straight line to her starting point in 15 minutes. Below is a displacement-time graph for her journey.

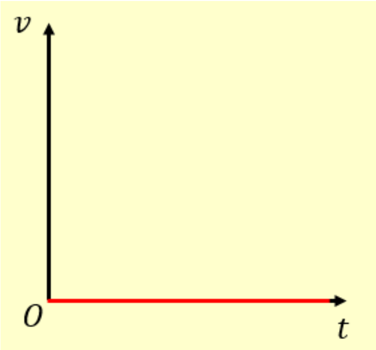


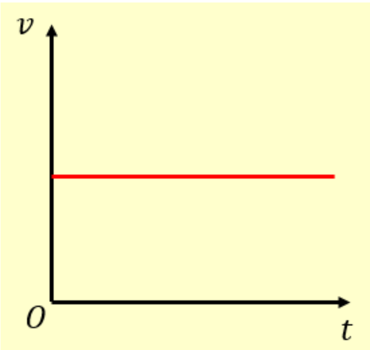
a) Work out the average velocity for each stage of her journey, in kmh^{-1}

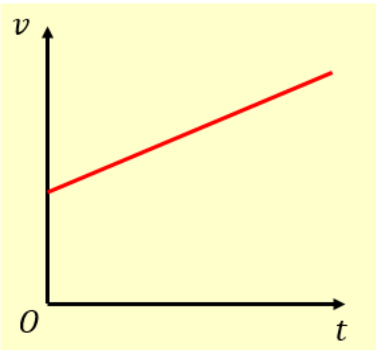
b) Write down the average velocity for the whole journey

c) Work out the average speed for the whole journey

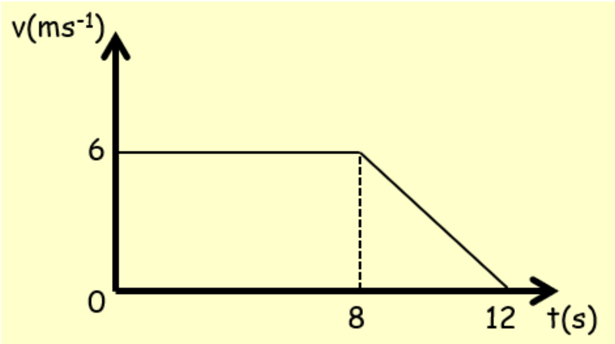
<u>9B Time-Speed Graphs</u>







1. The diagram below shows a velocity-time graph for the motion of a cyclist moving along a straight road for 12 seconds. For the first 8 seconds, she moves at a constant speed of $6ms^{-1}$. She then decelerates at a constant rate, stopping after a further 4 seconds. Find:



a) The distance travelled by the cyclist

b) The rate of deceleration of the cyclist

2. A particle moves along a straight line. It accelerates uniformly from rest to a speed of $8ms^{-1}$ in T seconds. The particle then travels at a constant speed for 5T seconds. It then decelerates to rest uniformly over the next 40 seconds.

a) Sketch a velocity-time graph for this motion

b) Given that the particle travels 600m, find the value of T

<u>9C First Two SUVAT Equations</u>

1. A cyclist is travelling along a straight road. She accelerates at a constant rate from a speed of $4ms^{-1}$ to a speed of $7.5ms^{-1}$ in 40 seconds. Find:

a) The distance travelled over this 40 seconds

b) The acceleration over the 40 seconds

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

a) The time taken for the particle to get from A to B

b) The distance from A to B

After reaching B the particle continues to move along the straight line with the same deceleration. The particle is at point C, 6 seconds after passing through A. Find:

c) The velocity of the particle at C

d) The distance from A to C

9D Final Three SUVAT Equations

1. A particle is moving in a straight line from A to B with constant acceleration $5ms^{-2}$. The velocity of the particle at A is $3ms^{-1}$ in the direction AB. The velocity at B is $18ms^{-1}$ in the same direction. Find the distance from A to B.

2. A particle is moving in a straight horizontal line with constant deceleration $4ms^{-2}$. At time t = 0 the particle passes through a point O with speed $13ms^{-1}$, travelling to a point A where OA = 20m. Find:

a) The times when the particle passes through A

b) The total time the particle is beyond A

c) The time taken for the particle to return to O

3. A particle is travelling along the x-axis with constant deceleration $2.5ms^{-2}$. At time t = O, the particle passes through the origin, moving in the positive direction with speed $15ms^{-1}$. Calculate the distance travelled by the particle by the time it returns to the origin.

<u>9E Movement Under Gravity</u>

1. A ball is projected vertically upwards from a point O with a speed of $12ms^{-1}$. Find:

a) The greatest height reached by the ball

b) The total time the ball is in the air

2. A book falls off the top shelf of a bookcase. The shelf is 1.4m above the ground. Find:

a) The time it takes the book to reach the floor

b) The speed with which the book strikes the floor

3. A ball is projected upwards from a point X which is 7m above the ground, with initial speed $21ms^{-1}$. Find the time of flight of the ball.

4. A particle is projected vertically upwards from a point O with initial speed u ms^{-1}. The greatest height reached by the particle is 62.5m above the ground. Find:

a) The speed of projection

b) The total time for which the ball is 50m or more above the ground

5. A ball, A, falls vertically from rest from the top of a tower 63m high. At the same time as A begins to fall, another ball, B, is projected vertically upwards from the bottom of the tower with velocity $21ms^{-1}$. The balls collide. Find the height at which this happens.