**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.



1. Work out the average velocity for each stage of her journey, in kmh-1
2. Write down the average velocity for the whole journey
3. Work out the average speed for the whole journey

**9B Time-Speed Graphs**







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:



1. The distance travelled by the cyclist
2. The rate of deceleration of the cyclist
3. 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.
4. Sketch a velocity-time graph for this motion
5. Given that the particle travels 600m, find the value of T

**9C & D SUVAT Equations**

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:
2. The distance travelled over this 40 seconds
3. The acceleration over the 40 seconds
4. 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:
5. The time taken for the particle to get from A to B
6. 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:

1. The velocity of the particle at C
2. The distance from A to C
3. 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.
4. 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:
5. The times when the particle passes through A
6. The total time the particle is beyond A
7. The time taken for the particle to return to O
8. 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.

**9E Movement Under Gravity**

1. A ball is projected vertically upwards from a point O with a speed of 12ms-1. Find:
2. The greatest height reached by the ball
3. The total time the ball is in the air
4. A book falls off the top shelf of a bookcase. The shelf is 1.4m above the ground. Find:
5. The time it takes the book to reach the floor
6. The speed with which the book strikes the floor
7. 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.
8. 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:
9. The speed of projection
10. The total time for which the ball is 50m or more above the ground
11. 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.