OCR Additional Maths Exam Questions - Constant Acceleration

5 Parcels slide down a ramp. Due to resistance the deceleration is $0.25\,\text{m s}^{-2}$.

(i) One parcel is given an initial velocity of $2\,\text{m s}^{-1}$. Find the distance travelled before the parcel comes to rest. **[3]**

(ii) A second parcel is given an initial velocity of $3\,\text{m s}^{-1}$ and takes 4 seconds to reach the bottom of the ramp. Find the length of the ramp. **[3]**

6 An aeroplane touches down at a point A on a runway, travelling at $90\,\text{m s}^{-1}$. It then decelerates uniformly until it reaches a speed of $6\,\text{m s}^{-1}$ at a point B on the runway, 2016 m from A.

(i) Find the deceleration. **[3]**

(ii) Find the time taken to travel from A to B. **[2]**

4 A car moves from rest with constant acceleration on a straight road. When the car passes a point A it is travelling at $10\,\text{m s}^{-1}$ and when it passes a point B further along the road it is travelling at $16\,\text{m s}^{-1}$.

The car takes 10 seconds to travel from A to B.

Find

- the distance AB,
- the constant acceleration. **[4]**

12 A train normally travels between two points A and D at a constant speed of 30 metres per second. The distance AD is 12 kilometres.

(i) Find the time taken for the train to travel between A and D at $30\,\mathrm{m\,s^{-1}}$. [1]

Between A and D there are two other points, B and C, which are placed such that AB = 2 km, BC = 6 km and CD = 4 km. On one day there is a speed restriction of $10\,\mathrm{m\,s^{-1}}$ between B and C.

The train decelerates uniformly from $30\,\mathrm{m\,s^{-1}}$ at A to $10\,\mathrm{m\,s^{-1}}$ at B. It travels the distance BC at $10\,\mathrm{m\,s^{-1}}$. The train then accelerates uniformly from $10\,\mathrm{m\,s^{-1}}$ at C to $30\,\mathrm{m\,s^{-1}}$ at D.

Find

(ii) the time taken to travel from A to B, [2]

(iii) the acceleration over the distance CD, [3]

(iv) the extra time taken in travelling from A to D as a result of the speed restriction. [6]

5 A car is travelling along a motorway at $30\,\mathrm{m\,s^{-1}}$. At the moment that it passes a point A the brakes are applied so that the car decelerates with constant deceleration. When it reaches a point B, where AB = 300 m, the speed of the car is $10\,\mathrm{m\,s^{-1}}$.

Calculate

(i) the constant deceleration, [3]

(ii) the time taken to travel from A to B. [2]

1 A driver of a car, initially moving at $30\,\mathrm{m\,s^{-1}}$, applies the brakes so that the car comes to rest with constant deceleration in 10 seconds.

(i) Find the value of the deceleration. [2]

(ii) Find the distance travelled in this time. [2]