Daily Question – Applied Mathematics - Statistics - Day 2

Topic: Forces – Constant acceleration

Question

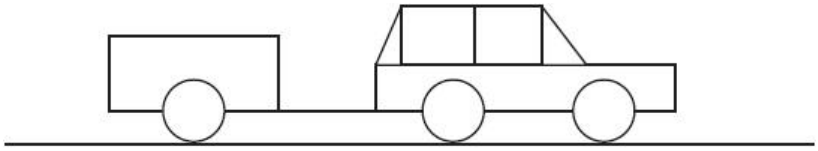

Figure 2

Figure 2 shows a car towing a trailer along a straight horizontal road.

The mass of the car is 800 kg and the mass of the trailer is 600 kg.

The trailer is attached to the car by a towbar which is parallel to the road and parallel to the direction of motion of the car and the trailer.

The towbar is modelled as a light rod.

The resistance to the motion of the car is modelled as a constant force of magnitude 400 N.

The resistance to the motion of the trailer is modelled as a constant force of magnitude R newtons.

The engine of the car is producing a constant driving force that is horizontal and of magnitude 1740 N.

The acceleration of the car is 0.6 ms^{-2} and the tension in the towbar is T newtons.

Using the model,

(a) show that $R = 500$ **(3)**

(b) find the value of T **(3)**

At the instant when the speed of the car and the trailer is 12.5 ms^{-1} , the towbar breaks.

The trailer moves a further distance d metres before coming to rest.

The resistance to the motion of the trailer is modelled as a constant force of magnitude 500 N.

Using the model,

(c) show that, after the towbar breaks, the deceleration of the trailer is $\frac{5}{6}\,ms^{-2}$ **(1)**

(d) find the value of d. **(3)**

In reality, the distance d metres is likely to be different from the answer found in part (d).

(e) Give two **different** reasons why this is the case.

(2)

(Total for question = 12 marks)