17 A buggy is pulling a roller-skater, in a straight line along a horizontal road, by means of a connecting rope as shown in the diagram.

The combined mass of the buggy and driver is 410 kg
A driving force of 300 N and a total resistance force of 140 N act on the buggy.

The mass of the roller-skater is 72 kg
A total resistance force of R newtons acts on the roller-skater.

The buggy and the roller-skater have an acceleration of $0.2\,\text{m}\,\text{s}^{-2}$

17 (a) (i) Find R.

[3 marks]

17 (a) (ii) Find the tension in the rope.

[3 marks]

17 (b) State a necessary assumption that you have made.

[1 mark]

17 (c) The roller-skater releases the rope at a point A, when she reaches a speed of $6\,\text{m}\,\text{s}^{-1}$

She continues to move forward, experiencing the same resistance force.

The driver notices a change in motion of the buggy, and brings it to rest at a distance of 20 m from A.

17 (c) (i) Determine whether the roller-skater will stop before reaching the stationary buggy.

Fully justify your answer.

[5 marks]

17 (c) (ii) Explain the change in motion that the driver noticed.

[2 marks]