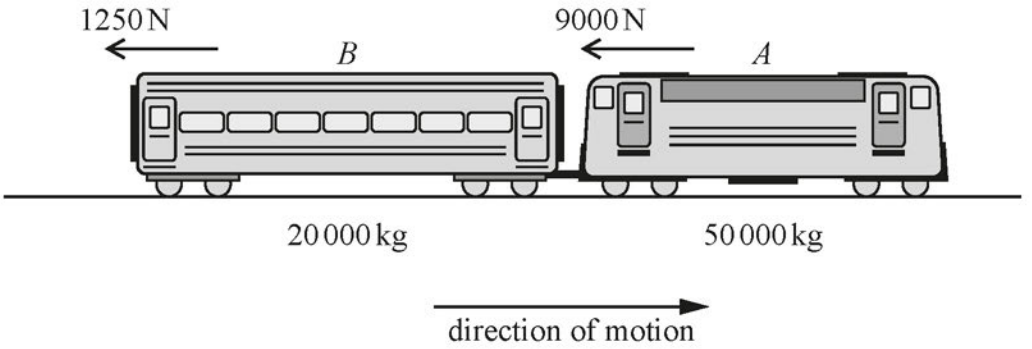
11



A train consists of an engine A of mass 50 000 kg and a carriage B of mass 20 000 kg. The engine and carriage are connected by a rigid coupling. The coupling is modelled as light and horizontal.

The resistances to motion acting on A and B are 9000 N and 1250 N respectively (see diagram).

The train passes through station P with speed $15\ \text{m s}^{-1}$ and moves along a straight horizontal track with constant acceleration $0.01\ \text{m s}^{-2}$ towards station Q. The distance between P and Q is 12.95 km.

(a) Determine the time, in minutes, to travel between P and Q. **[3]**

For the train's motion between P and Q, determine the following.

(b) The driving force of the engine. **[2]**

(c) The tension in the coupling between A and B. **[2]**