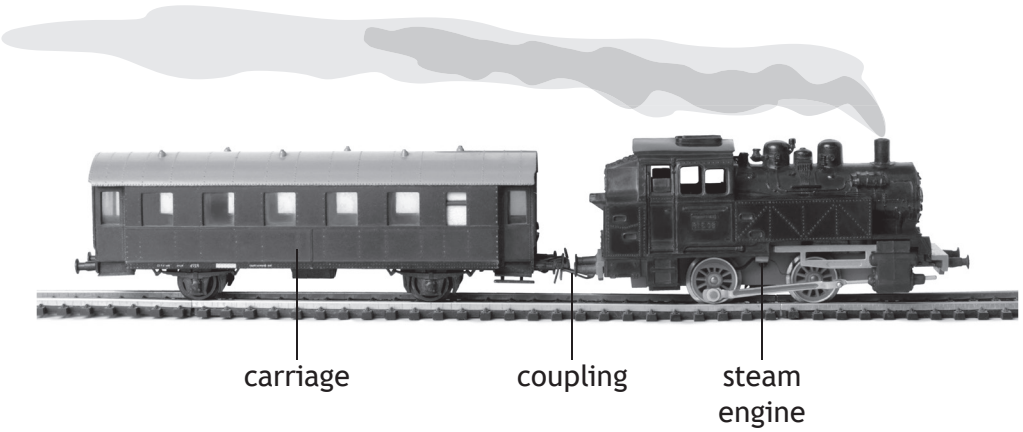
2. A train consists of a steam engine coupled to a carriage. The train is accelerating along a straight level track.



The steam engine provides a driving force of $1{\cdot}15 \times 10^5$ N.

The mass of the steam engine is $9{\cdot}75 \times 10^4$ kg.

The mass of the carriage and passengers is $3{\cdot}56 \times 10^4$ kg.

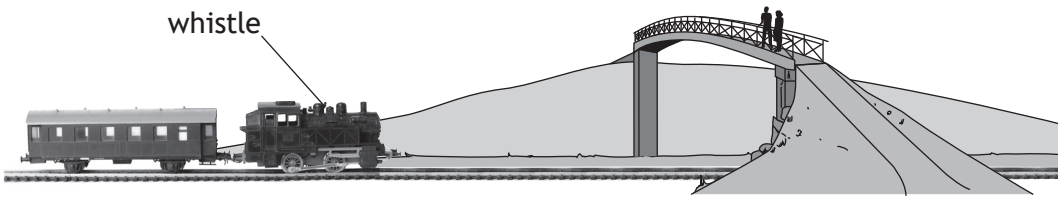
The effects of friction can be ignored.

(a) Determine the tension in the coupling between the steam engine and the carriage. **4**

Space for working and answer

2. (continued)

(b) Later in the journey, the train is travelling at a constant speed as it approaches a bridge. Two students are standing on the bridge.



(i) The engine driver sounds a whistle. The whistle emits sound with a frequency of 511 Hz.

The frequency of the sound heard by the students standing on the bridge is 531 Hz.

The speed of sound in air is 340 $m\,s^{-1}$.

Calculate the speed of the train. **3**

Space for working and answer

(ii) One student suggests that a passenger sitting in the carriage behind the engine will hear a lower frequency of sound than the frequency emitted by the whistle.

State whether the student is correct.

You must justify your answer. **2**