

Question 1 (9 marks)

A commuter train runs on a straight track. Station **B** is 450 m along the track from station **A**. The train leaves **A** from rest at time $t = 0$ seconds and comes to rest at **B** exactly 30 seconds later.

For $0 \leq t \leq 30$, the distance of the front of the train from **A** is modelled by $x(t) = pt^2 + qt^3$ metres, where p and q are constants.

a. Show that $p = \frac{3}{2}$ and $q = -\frac{1}{30}$.

3 marks

Question 2 (8 marks)

A level crossing is 126 m along the track from **A**, between **A** and **B**.

- d. The train is 25 m long. The boom gates at the crossing come down 7 seconds before the front of the train reaches the crossing, and go up 3 seconds after the back of the train has passed it. Find the length of time for which the boom gates are down, correct to the nearest second.

3 marks