

3.

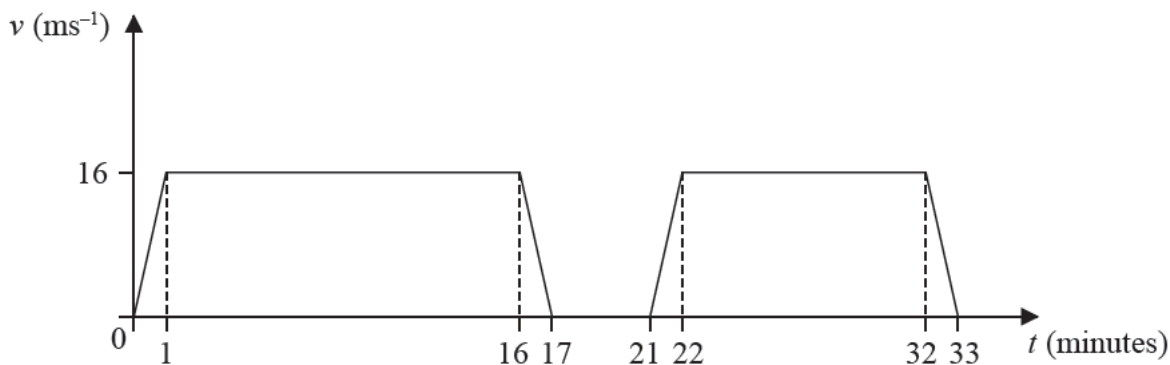


Figure 2

A train  $X$  runs on a straight horizontal track that connects stations  $A$  and  $C$ .

Station  $B$  lies between  $A$  and  $C$ .

Figure 2 shows the graph of the speed,  $v \text{ ms}^{-1}$ , of train  $X$  against the time,  $t$  minutes, after noon. Train  $X$  leaves  $A$  at noon and accelerates uniformly from rest until  $t = 1$ , when it is moving with speed  $16 \text{ ms}^{-1}$ .

Train  $X$  then continues to move along the track at constant speed for 15 minutes, before decelerating uniformly and coming to rest at  $B$  at time  $t = 17$ .

Train  $X$  leaves  $B$  at time  $t = 21$  and accelerates uniformly for one minute, reaching a speed of  $16 \text{ ms}^{-1}$ .

Train  $X$  then moves along the track at a constant speed of  $16 \text{ ms}^{-1}$  for 10 minutes, before decelerating uniformly and coming to rest at  $C$  at time  $t = 33$ .

(a) Find the distance of  $C$  from  $A$ , stating the units of your answer.

(3)

A second train,  $Y$ , leaves  $A$  at  $T$  minutes after noon and moves in the same direction as train  $X$  on a parallel straight horizontal track.

Train  $Y$  accelerates uniformly from rest for 2 minutes, reaching a speed of  $24 \text{ ms}^{-1}$ .

Train  $Y$  then moves along the track at a constant speed of  $24 \text{ ms}^{-1}$  and passes  $C$  at this speed.

Train  $Y$  passes  $C$  at the instant train  $X$  stops at  $C$ .

(b) Find the value of  $T$ .

(5)

(c) State one assumption made in your working that could affect the accuracy of your answer to part (b).

(1)