**3** A trolley A moves along a horizontal surface at a constant velocity towards another trolley B which is moving at a lower constant speed in the same direction. Fig. 3.1 shows the trolleys at time $t = 0$.

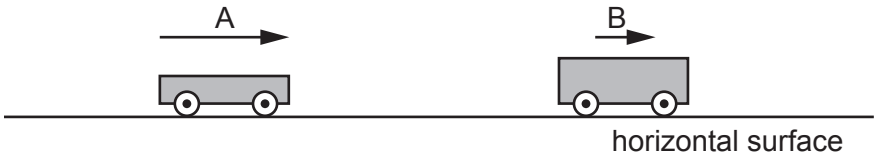


**Fig. 3.1**

Table 3.1 shows data for the trolleys.

**Table 3.1**

| trolley | mass / kg | initial speed / m s$^{-1}$ |
|---|---|---|
| A | 0.25 | 0.48 |
| B | 0.75 | 0.12 |

The two trolleys collide elastically and then separate. Resistive forces are negligible.

Fig. 3.2 shows the variation with time $t$ of the velocity $v$ for trolley B.

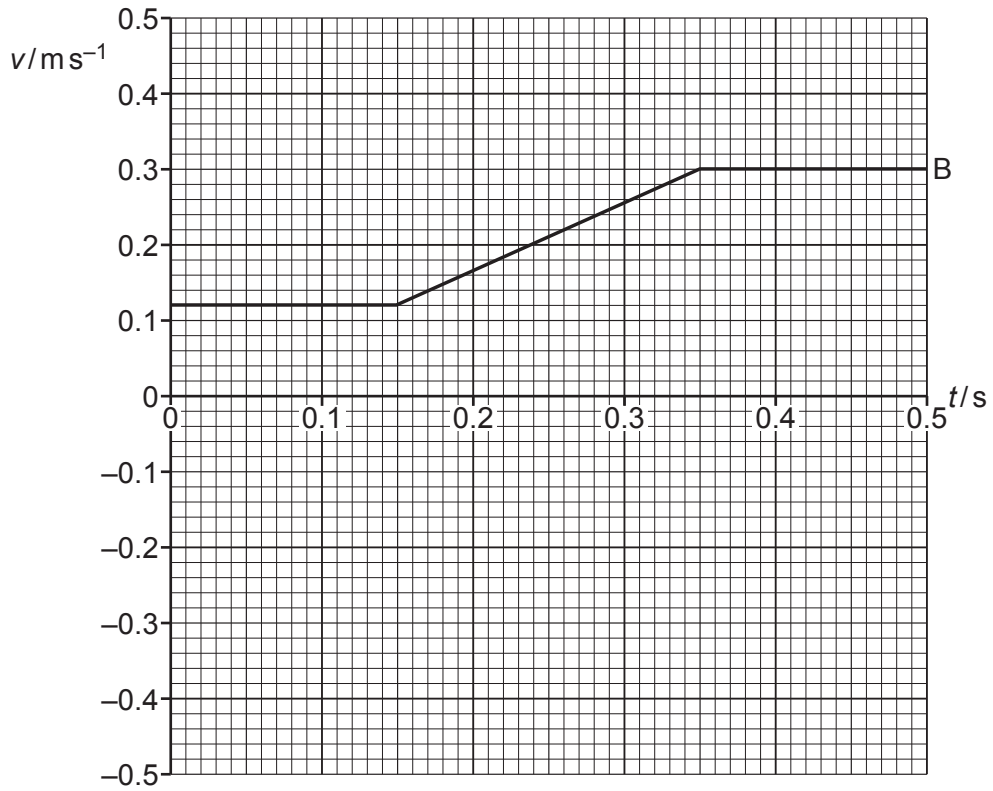


**Fig. 3.2**

**(a)** State what is represented by the area under a velocity–time graph.

..... [1]

**(b)** Use Table 3.1 and Fig. 3.2 to determine:

**(i)** the acceleration of trolley B during the collision

acceleration of B = ..... $m\,s^{-2}$ [2]

**(ii)** the magnitude and direction of the final velocity of trolley A.

magnitude = ..... $m\,s^{-1}$

direction .....
[3]

**(c)** On Fig. 3.2, sketch the variation of the velocity of trolley A with time $t$ from $t = 0$ to $t = 0.50\,s$.
[3]

[Total: 9]