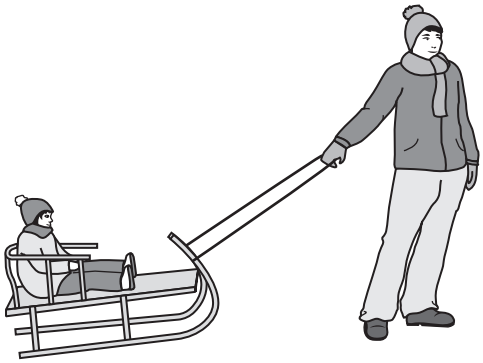
**8** (a) The diagram shows a man pulling a child on a sledge.



The mass of the child and sledge is 45 kg.

The unbalanced force acting on the sledge is 49 N.

(i) State the equation linking unbalanced force, mass and acceleration.

**(1)**

(ii) Calculate the acceleration of the child and sledge.

**(2)**

acceleration = ..... $m/s^2$

(iii) Suggest a reason why the man must pull the sledge with a force that is greater than 49 N.

**(1)**

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(b) The sledge is then placed at the top of a hill.

When it slides down the hill, it accelerates at 1.3 m/s$^2$.

The sledge accelerates from rest for 2.4 s.

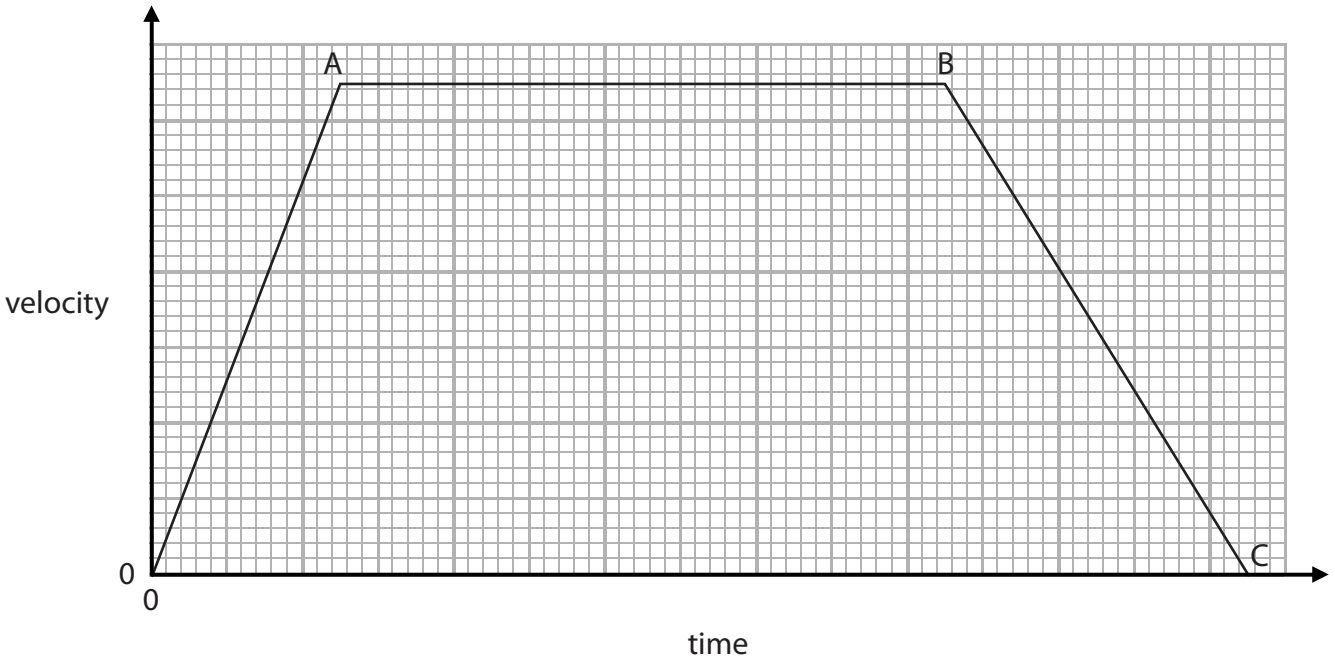
(i) State the equation linking acceleration, velocity and time.

**(1)**

(ii) Show that the sledge reaches a speed of approximately 3 m/s after it has accelerated for 2.4 s.

**(2)**

(c) This velocity-time graph shows the motion of another sledge.




(i) Which feature of the velocity-time graph shows the distance travelled by the sledge?

**(1)**

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(ii) Describe the motion of the sledge during the journey shown by the velocity-time graph.

**(3)**

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**(Total for Question 8 = 11 marks)**

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