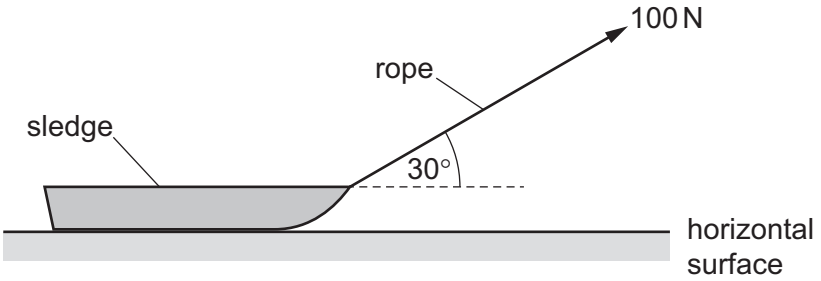
17 A rope is attached to a sledge and a boy uses the rope to pull the sledge along a horizontal surface with a constant velocity. The tension in the rope is 100 N and the rope is held at 30° to the horizontal.



How much work does the boy do on the sledge when he pulls it a distance of 5.0 m along the surface?

A 250 J **B** 290 J **C** 430 J **D** 500 J

18 The kinetic energy E_k of an object of mass m moving at speed v is given by the equation shown.

$$E_k = \tfrac{1}{2}mv^2$$

Which equation is **not** used in the derivation of this equation?

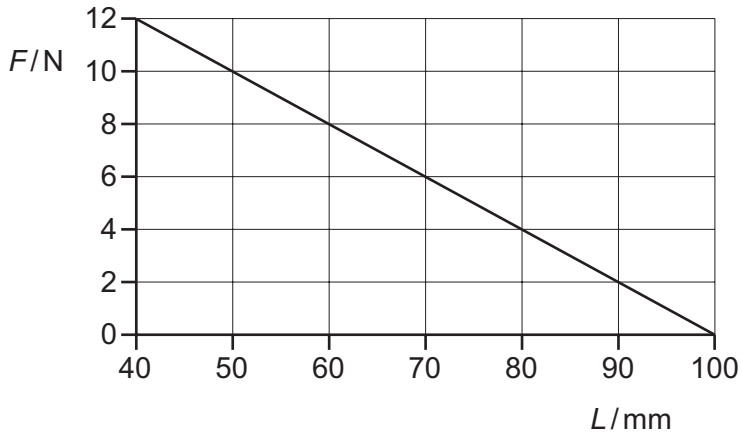
A $F = ma$ **B** $s = vt$ **C** $v^2 = u^2 + 2as$ **D** $W = Fs$

19 A grasshopper of mass 0.12 g jumps vertically. It uses its back legs over a time of 0.020 s to jump, leaving the ground with a velocity of 3.0 m s^{-1}.

What is the average power developed by the legs of the grasshopper?

A 9.0×10^{-3} W **B** 1.8×10^{-2} W **C** 2.7×10^{-2} W **D** 37 W

20 A spring of original length 100 mm is compressed by a force. The graph shows the variation of the compressing force F with the length L of the spring.



What is the energy stored in the spring when the length is 70 mm?

A 0.090 J **B** 0.21 J **C** 0.27 J **D** 0.63 J