

## Solutions

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### 2.1

$$W = Fs = 60 \times 8.0 = \mathbf{480 \text{ J}}$$

(substitution 1, answer with unit 1)

**2.2** Rearrange first:  $s = W/F$  (C1).

$$s = \frac{350}{50} = \mathbf{7.0 \text{ m}}$$

**2.3** The object's (and surface's) temperature rises – energy transfers to thermal stores;  $1 \text{ J} = 1 \text{ N} \cdot \text{m}$ .

**3.1** (a) Force parallel to the motion.

$$W = Fs = 2.0 \times 4.5 = \mathbf{9.0 \text{ J}}$$

(C1 substitution, A1 answer, A1 unit) (b) The same work is done in less time, so the useful energy arrives faster – more power (and on carpet more of it went to friction and thermal stores of the carpet and wheels). (c) The force is at right angles to the displacement, and  $s$  must be along the line of action of the force – there is no component of this force along the motion, so no work is done on the car by it.

**3.2** (a) Only the component of the force along the motion counts: use 120 N over 12 m. (b)

$$W = F_s s = 120 \times 12 = \mathbf{1440 \text{ J}}$$

(C1, A1) (c) Work against friction =  $100 \times 12 = \mathbf{1200 \text{ J}}$  (C1); this energy transfers to the thermal stores of the blade, grass and surroundings – their temperature rises; the remaining 240 J of the input went to other transfers (e.g. kinetic/gravity along uneven ground).