A cyclist is riding along a straight horizontal road. The total mass of the cyclist and her bicycle is 70 kg. At an instant when the cyclist's speed is $4\,\mathrm{m\,s^{-1}}$, her acceleration is $0.3\,\mathrm{m\,s^{-2}}$. There is a constant resistance to motion of magnitude 30 N.

(a) Find the power developed by the cyclist. [3]

The cyclist comes to the top of a hill inclined at 5° to the horizontal. The cyclist stops pedalling and freewheels down the hill (so that the cyclist is no longer supplying any power). The magnitude of the resistance force remains at 30 N. Over a distance of d m, the speed of the cyclist increases from $6\,\text{m}\,\text{s}^{-1}$ to $12\,\text{m}\,\text{s}^{-1}$.

(b) Find the change in kinetic energy. [2]

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(c) Use an energy method to find d. [3]

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