3. A car of mass 900 kg is moving on a straight road that is inclined at angle θ to the horizontal where $\sin\theta = \frac{1}{15}$

When the car moves **down** the road with constant speed $18\,\text{m s}^{-1}$

- the engine of the car is working at a rate of P watts
- the resistance to the motion of the car is modelled as a constant force of magnitude R newtons

When the car moves **up** the road with constant speed $12\,\text{m s}^{-1}$

- the engine of the car is working at a rate of $6P$ watts
- the resistance to the motion of the car from non-gravitational forces is modelled as a constant force of magnitude R newtons

(a) Find

(i) the value of P

(ii) the value of R

(7)

When the car is moving **up** the road, the speed of the car increases from $12\,\text{m s}^{-1}$ to $16\,\text{m s}^{-1}$

- the car travels a distance of 40 m as its speed increases from $12\,\text{m s}^{-1}$ to $16\,\text{m s}^{-1}$
- the resistance to the motion of the car from non-gravitational forces is still modelled as a constant force of magnitude R newtons

(b) Find the **total** work done by the engine of the car as the speed increases from $12\,\text{m s}^{-1}$ to $16\,\text{m s}^{-1}$

(5)

(Total for Question 3 is 12 marks)