Answer on Question#49708 – Physics – Mechanics | Kinematics | Dynamics

1. $P_1 = 4\frac{kJ}{s}$
2. $P_2 = 5.364\frac{kJ}{s}$

Solution

1.

Velocity $v = 10\frac{m}{s}$
Frictional force $F_f = 400\ N$
Time t
Distance $l = vt$

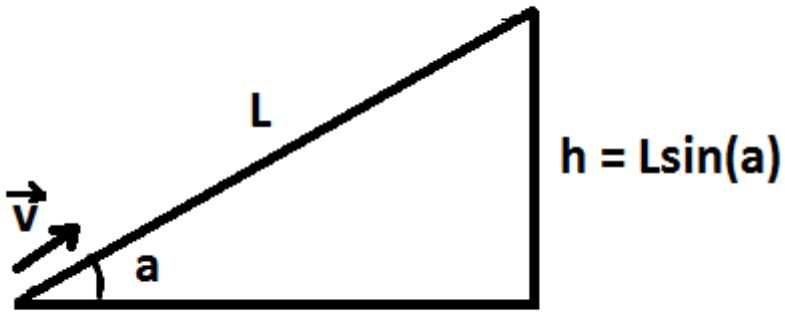
Power of engine P is nothing else, but the energy required to compensate inhibitory effect of frictional force in unit time.

$$P_1 = \frac{A_1}{t} = \frac{F_f l}{t} = F_f v$$

$$P_1 = 400 \times 10 = 4000\ \left(\frac{J}{s}\right) = 4\ \left(\frac{kJ}{s}\right)$$

2.

Angle $\alpha = 8^\circ$
Change of height h
Change of potential energy $\Delta U = mgh$



We have additional addendum in equation due to the change of car's potential energy in Earth's gravity field. Consider gravitational acceleration g constant $\left(g = 9.8\frac{m}{s^2}\right)$.

$$P_2 = \frac{A_2}{t} = \frac{F_f l + \Delta U}{t} = \frac{F_f l + mgh}{t} = F_f v + mgvsin(\alpha) = P_1 + mgvsin(\alpha)$$

$$P_2 = 4000 + 100 \times 9.8 \times 10 \times \sin(8^\circ) \approx 4000 + 1364 = 5364\ \left(\frac{J}{s}\right) = 5.364\ \left(\frac{kJ}{s}\right)$$