Power

Power is defined as the rate of doing work. It is measured in watts, where one watt is work at a rate of one joule per second. The power of an engine is frequently given in kilowatts. One kilowatt is 1000 watts. An engine which develops a power of 1 kW is doing 1000 joules of work every second.

$$Power = \frac{work\ done}{time\ taken}$$

Moving Vehicles

If the engine of a vehicle is producing a driving force (often called the tractive force) of F newtons when the vehicle has a speed of v ms^{-1} then the work done per second is

$$F \text{ x distance moved in 1 second} = F \text{ x } v$$

Because work done per second is the power developed by the engine

$$Power = F \text{ x } v$$

Eg12 A car of mass 1200kg is moving up a hill of slope $\sin^{-1}(1/15)$ at a constant speed of 20 ms^{-1}. If the power developed by the engine is 25kW find the resistance to motion.

At the top of the hill the road becomes horizontal. Find the initial acceleration, assuming the resistance to be unchanged.

Exercise 3D Pg 77 Odd's

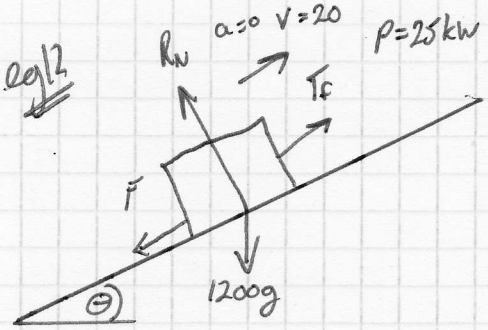
$P = \frac{wd}{t}$

$P = \frac{F \times s}{t}$

but $\frac{s}{t} = v$

$\therefore P = Fv$

eg 12



$\Sigma F_{x\,NEL}$: $T_F - F - 1200g\sin\theta = 0$

$\therefore F = T_F - 1200g\sin\theta$.

Now $P = T_F \times V$

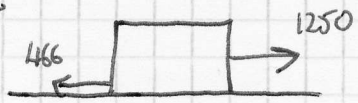
$25000 = T_F \times 20$

$\therefore T_F = 1250N$

$\therefore F = 1250 - 1200g\sin\theta$

$F = 1250 - 1200g \times \frac{1}{17} = 466N$.

Now



NEL $1250 - 466 = 1200a$

$a = 0.653\ ms^{-2}$