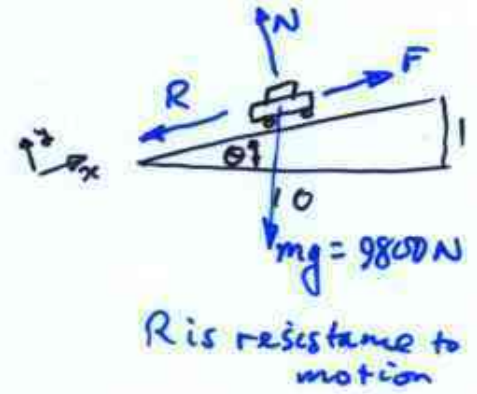


CAR, Mass = 1000kg. ENGINE PRODUCES 21kW G10
 climbs a hill

- (a) when slope is 10%, steady speed of 15ms⁻¹, find resistance to motion
- (b) slope flattens out to 4%, & speed still at initial 15ms⁻¹ find initial accln (assume resistance unchanged).

0-----0

Power = 21 000 W



Power is $\vec{F} \cdot \vec{v}$

$$\Rightarrow (F)(15) = 21000$$

$$\therefore F = \frac{21000}{15} = 1400N$$

(a) Resolve mg into component DOWN HILL & NORMAL TO ROAD. DOWN-HILL $\Rightarrow (1000)(9.8)(\sin \theta) \approx 980N$

No accln

$$\Rightarrow \sum F_x = 0 \Rightarrow F - R - (mg)_x = 0$$

$$R = F - (mg)_x = 1400 - 980 = 420N$$

(b) Slope of 4% $\Rightarrow \sin \theta \approx 0.04$

$$\therefore (mg)_x = (9800)(0.04) = 392N$$

TRACTIVE force is still 1400N (Power & velocity unchanged)

Resistance still 420N (we're told this)

$$\sum F_x = ma_x$$

$$\Rightarrow F - R - (mg)_x = (ma)_x$$

$$\frac{(1400 - 420 - 392)}{1000} = a_x \Rightarrow a_x = 0.59 \text{ ms}^{-2}$$

NOTE if power stays const, over time $v \uparrow \Rightarrow F \uparrow \Rightarrow a \uparrow$ also.