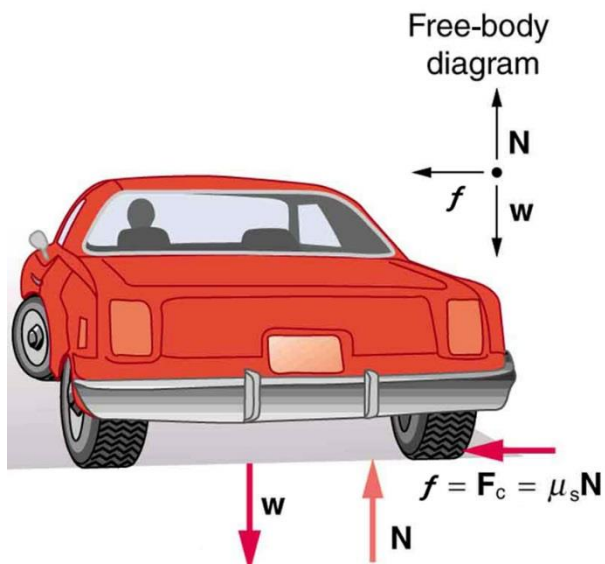# Answer on Question #58067, Physics / Mechanics | Relativity

A turn of radius 20 m is banked for the vehicles going at a speed of 36 km/h. If the coefficient of static friction between the road and the tyre is 0.4, what are the possible speeds of a vehicle so that it neither slips down nor skids up ?

Solution:

Free-body
diagram

$f = F_c = \mu_s N$

The net force must be horizontal--pointing toward the center of the circle--and only the friction force is available to provide it. The normal force and the weight simply cancel each other.

The centripetal force,

$$F_c = \frac{Mv^2}{r}$$

For this flat curve, the centripetal force is supplied by the friction force, F$_f$,

$$F_f = \mu N = \mu M g$$

$$F_f = F_c$$

Thus,

$$\frac{Mv^2}{r} = \mu M g$$

$$v = \sqrt{\mu g r} = \sqrt{0.4 \cdot 9.8 \cdot 20} = 8.85\frac{m}{s} = 8.85 \cdot 3.6\frac{km}{h} \approx 31.9\frac{km}{h}$$

Answer: $31.9\frac{km}{h}$