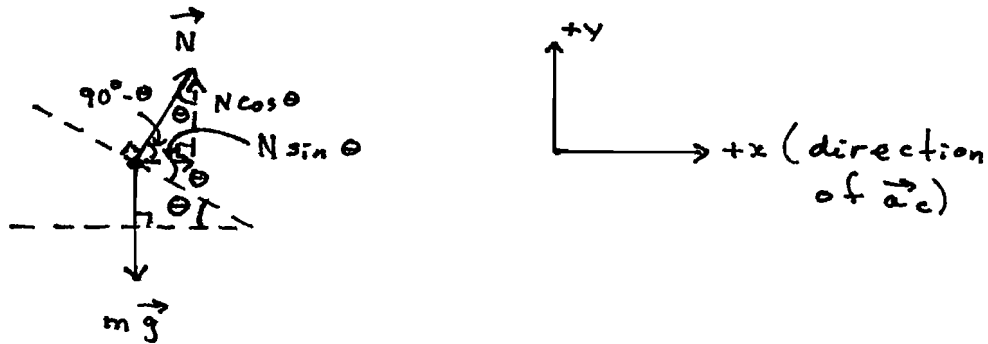


(a) FBD for car (view from front or rear):



The normal force  $\vec{N}$  has a horizontal component,  $N \sin \theta$ , which points toward the centre of the circle. Hence, this horizontal component of  $\vec{N}$  constitutes the centripetal force.

(b)

$$\Sigma F_x = m a_x = m a_c \therefore N \sin \theta = m \frac{v^2}{r} \quad [1]$$

$$\Sigma F_y = m a_y = 0 \therefore N \cos \theta - mg = 0$$

$$\therefore N \cos \theta = mg \quad [2]$$

$$[1] \div [2] \Rightarrow \tan \theta = \frac{v^2}{gr}$$

$$v = 100 \frac{\text{km}}{\text{h}} \times \frac{1 \text{ h}}{3600 \text{ s}} \times \frac{1000 \text{ m}}{1 \text{ km}} = 27.78 \text{ m/s}$$

$$\therefore \tan \theta = \frac{(27.78 \text{ m/s})^2}{(9.80 \text{ m/s}^2)(500 \text{ m})}$$

$$\Rightarrow \theta = 8.95^\circ$$