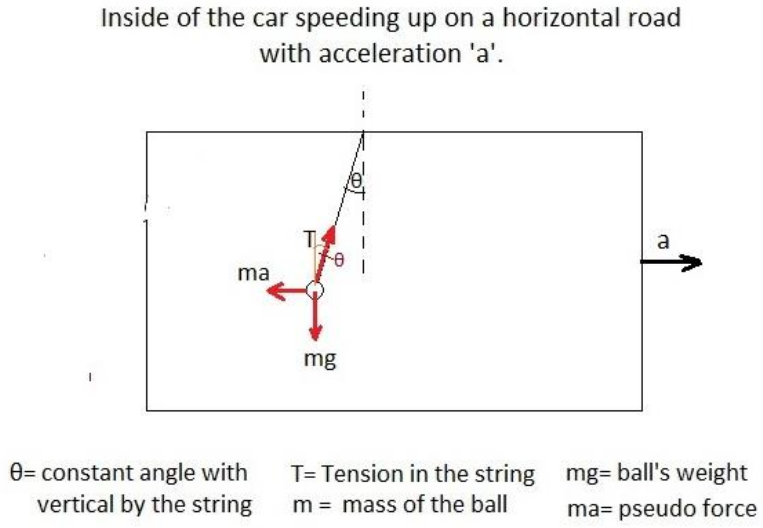
Answer on Question #61021-Physics-Mechanics-Relativity

A particle m is suspended by a massless string inside a trolley of mass m. Force F is being applied on trolley to move it on friction less surface. The angle theta between the string and vertical when particle is in equilibrium with respect to trolley.

Solution



$$a = \frac{F}{m+m} = \frac{F}{2m}.$$

$$\tan\theta = \frac{g}{a} = \frac{g}{\frac{F}{2m}} = \frac{2mg}{F}$$

$$\theta = \tan^{-1}\left(\frac{2mg}{F}\right).$$