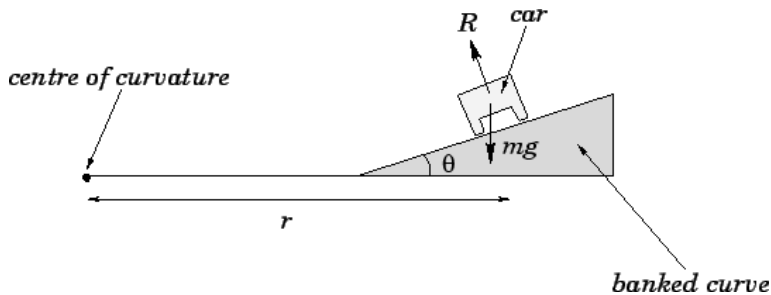**Answer on Question #55214-Physics-Mechanics-Kinematics-Dynamics**

A racing car of mass 1000kg moves around a banked track at a constant speed of 30ms. Assuming the total reaction at the wheels is normal to the track and the horizontal radius is 100m. Calculate the angle of inclination of the track to the horizontal.

Solution

Consider a car of mass m going around the curve. The car's weight, mg, acts vertically downwards. The road surface exerts an upward normal reaction R on the car. The vertical component of the reaction must balance the downward weight of the car, so

$$R\cos\theta = mg.$$

The horizontal component of the reaction, $R\sin\theta$, acts towards the centre of curvature of the road. This component provides the force $\dfrac{mv^2}{r}$ towards the centre of the curvature which the car experiences as it rounds the curve. In other words,

$$R\sin\theta = \frac{mv^2}{r}.$$

Thus,

$$\tan\theta = \frac{v^2}{rg}.$$

$$\theta = \tan^{-1}\frac{v^2}{rg} = \tan^{-1}\frac{30^2}{100\cdot 9.8} = 42.56°.$$

Answer: $42.56°$.