

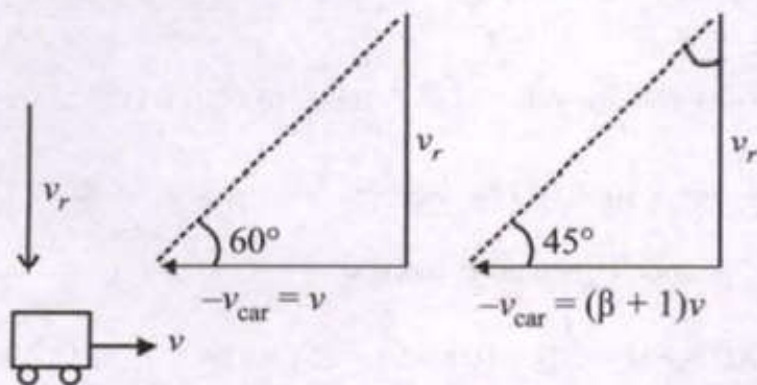
Q 02

A block of 200 g mass moves with a uniform speed in a horizontal circular groove, with vertical side walls of radius 20 cm. If the block takes 40 s to complete one round, the normal force by the side walls of the groove is :

[March 16, 2021 (I)]

- (a) $9.859 \times 10^{-2} \text{ N}$ (b) $9.859 \times 10^{-4} \text{ N}$
 (c) $6.28 \times 10^{-3} \text{ N}$ (d) 0.0314 N

ans (d) The given situation is shown in the diagram. Here v_r be the velocity of rain drop.



When car is moving with speed v ,

$$\tan 60^\circ = \frac{v_r}{v} \quad \dots(i)$$

When car is moving with speed $(1 + \beta)v$,

$$\tan 45^\circ = \frac{v_r}{(\beta + 1)v} \quad \dots(ii)$$

Dividing (i) by (ii) we get,

$$\sqrt{3}v = (\beta + 1)v \Rightarrow \beta = \sqrt{3} - 1 = 0.732.$$