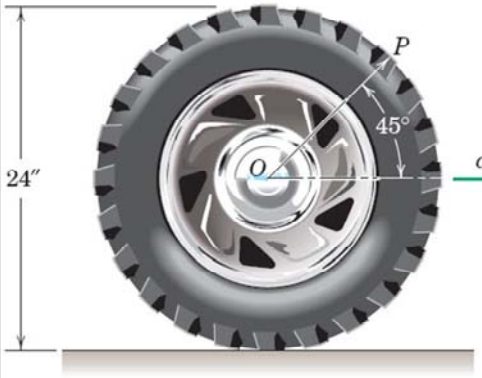
Solution of Relative-Acceleration Eq.: Exercise

A truck has forward ***acceleration*** **a** = 12 ft/s² without slipping its 24″ tires.

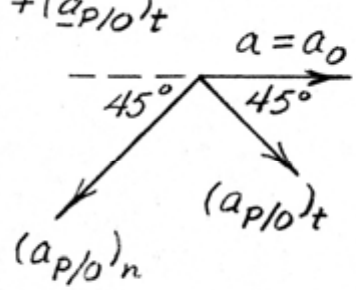


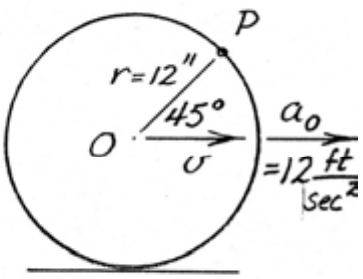
Determine the ***velocity*** of the truck when point ***P*** in the ***position*** shown will have ***zero horizontal component*** of ***acceleration***.

5/128 $\underline{a}_P = \underline{a}_O + (\underline{a}_{P/O})_n + (\underline{a}_{P/O})_t$

$(a_{P/O})_n = r\omega^2 = r\left(\frac{v}{r}\right)^2 = \frac{v^2}{r}$

$(a_{P/O})_t = r\alpha = r\left(\frac{a_O}{r}\right) = a_O$





For $(a_P)_{horiz} = 0$, $\frac{v^2}{1}\cos 45° = 12 + 12\cos 45°$

$v^2 = 29.0\ ft^2/sec^2$

$v = 5.38\ ft/sec$ or $v = 3.67\ mi/hr$