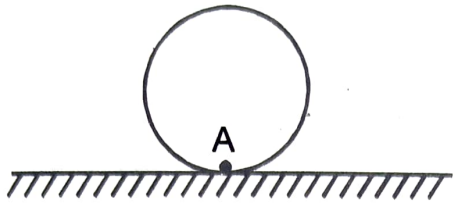
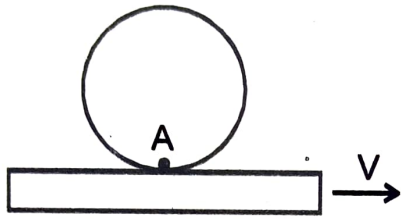
PURE ROLLING (OR ROLLING WITHOUT SLIDING) :

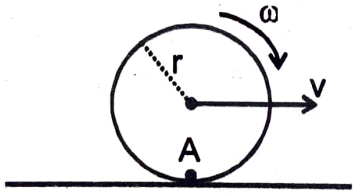
Pure rolling is a special case of general rotation of a rigid body with circular cross section (e.g. wheel, disc, ring, sphere) moving on some surface. Here, there is no relative motion between the rolling body and the surface of contact, at the point of contact



Here contact point is A & contact surface is horizontal ground. For pure rolling velocity of A w.r.t. ground = 0 $\Rightarrow V_A = 0$.



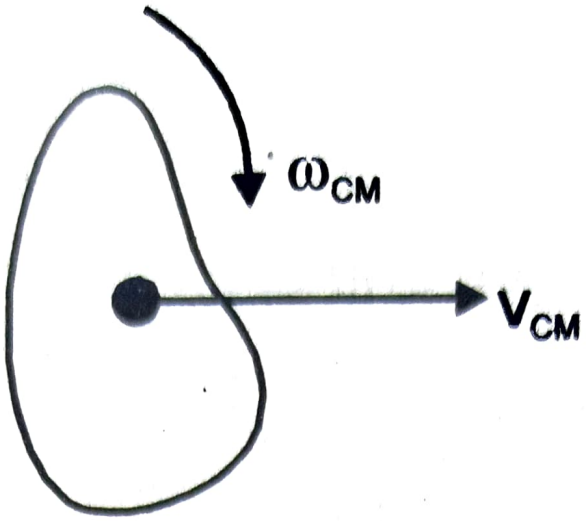
From above figure, for pure rolling, velocity of A w.r.t. to plank is zero $\Rightarrow V_A = V$.

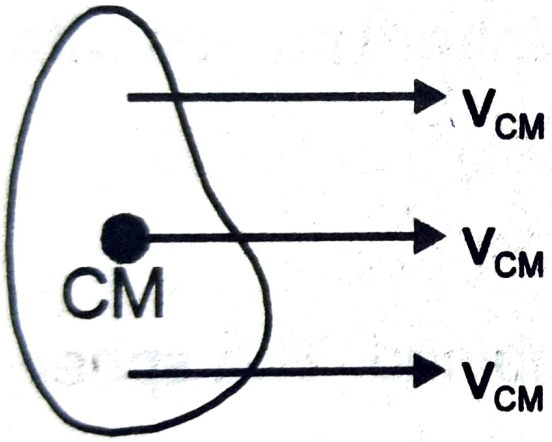


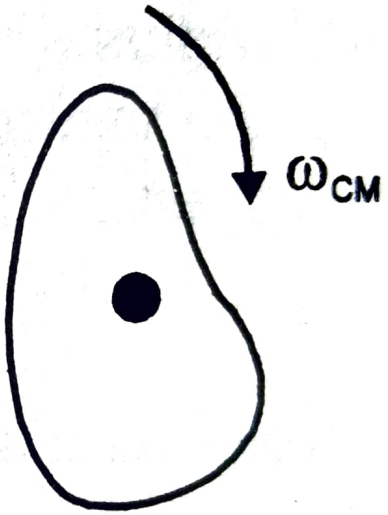
From above figure for, pure rolling, velocity of A w.r.t. ground is zero.

$\Rightarrow v - \omega r = 0 \quad v = \omega r$

Similarly $\quad a = \alpha r$







$$K = \frac{1}{2} m v_{CM}^2$$

Pure translation

$$K = \frac{1}{2} I_{CM} \omega_{CM}^2$$

Pure rotation

$$K = \frac{1}{2} m v_{CM}^2 + \frac{1}{2} I_{CM} \omega^2$$

= Kinetic energy corresponds to pure rotation + kinetic energy corresponds to pure rotation