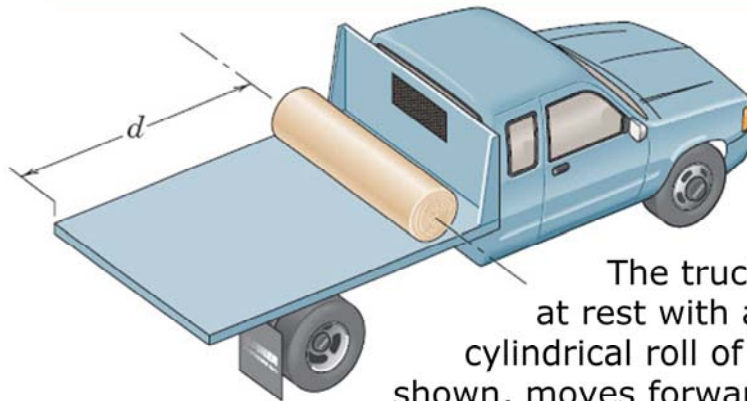


General Plane Motion: Another Exercise

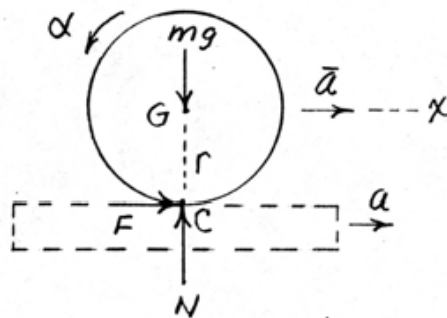


The truck, initially at rest with a solid cylindrical roll of paper shown, moves forward with a constant **acceleration a** .

Determine the **distance s** which the truck goes before the paper rolls (without slipping) off the bed of the truck.

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$$\alpha = \frac{a_c/c}{r} = \frac{a - \bar{a}}{r}$$

$$\sum F_x = m a_x; F = m \bar{a}$$

$$\sum M_G = \bar{I} \alpha; F r = \frac{1}{2} m r^2 \frac{a - \bar{a}}{r}$$

solve & get $\bar{a} = \frac{1}{3} a$

$$a_{G/c} = a - \bar{a} = \frac{2}{3} a \text{ to the left}$$

Rel. to truck, $s = \frac{1}{2} a_{rel} t^2$, $d = \frac{1}{2} \left(\frac{2}{3} a\right) t^2$, $t^2 = \frac{3d}{a}$

Truck $s = \frac{1}{2} a t^2$, $s = \frac{1}{2} a \frac{3d}{a} = \underline{\underline{\frac{3d}{2}}}$