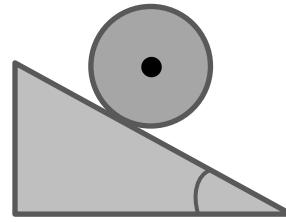


ROTATIONAL DYNAMICS OF ROLLING MOTION

- In some problems, a disc-like object accelerates around a FREE axis.
 - In these, the object will have both rotational AND linear motion.
 - So we use _____ AND _____ for the SAME object!
 - The direction of positive in BOTH will follow the direction of _____.
- Remember: Rolling Motion has an extra equation: $v_{CM} = \text{_____}$.
 - When disc-like objects roll freely, Torque comes from _____.
 - If $\alpha \neq 0$ $\rightarrow$ there is _____.
 - If “without slipping” $\rightarrow$ there is _____.



EXAMPLE: When a solid cylinder of mass M and radius R is released from rest, it rolls down without slipping along an inclined plane that makes an angle θ with the horizontal. Derive an expression for the angular acceleration of the cylinder.

PRACTICE: ROTATIONAL DYNAMICS / SPHERE GOING UP HILL

PRACTICE: A hollow sphere 10 kg in mass and 2 m in radius rolls without slipping along a horizontal surface with 20 m/s. It then reaches an inclined plane that makes 37° with the horizontal, as shown. If it rolls up the incline without slipping, how long will it take to reach its maximum height? (Hint: You will need to first calculate its acceleration)

