21-P-MOM-AG-049

A *M* kg person is sliding down a *h* meter slide. At the bottom, point B, their angular momentum with respect to the centre of the radius of curvature is $H\ kg \cdot m^2 \cdot s$. What is the normal force that the person is experiencing at point B?

ANSWER:

First, we determine the speed of the person at the bottom of the slide.

$$mgh_1 + \frac{1}{2}mv_1^2 = mgh_2 + \frac{1}{2}mv_2^2$$

$$gh_1 = \frac{1}{2}v_2^2$$

$$v_2 = \sqrt{2gh}$$

Then, we use the angular momentum to figure out the radius of curvature.

$$H_O = m \cdot r \cdot v = M \cdot v_2 \cdot \rho$$

$$\rho = \frac{H_O}{M \cdot v_2}$$

Then, we find the normal force via the force balance.

$$F_N = mg + F_r = M \cdot g + \frac{M \cdot v_2^2}{\rho}$$