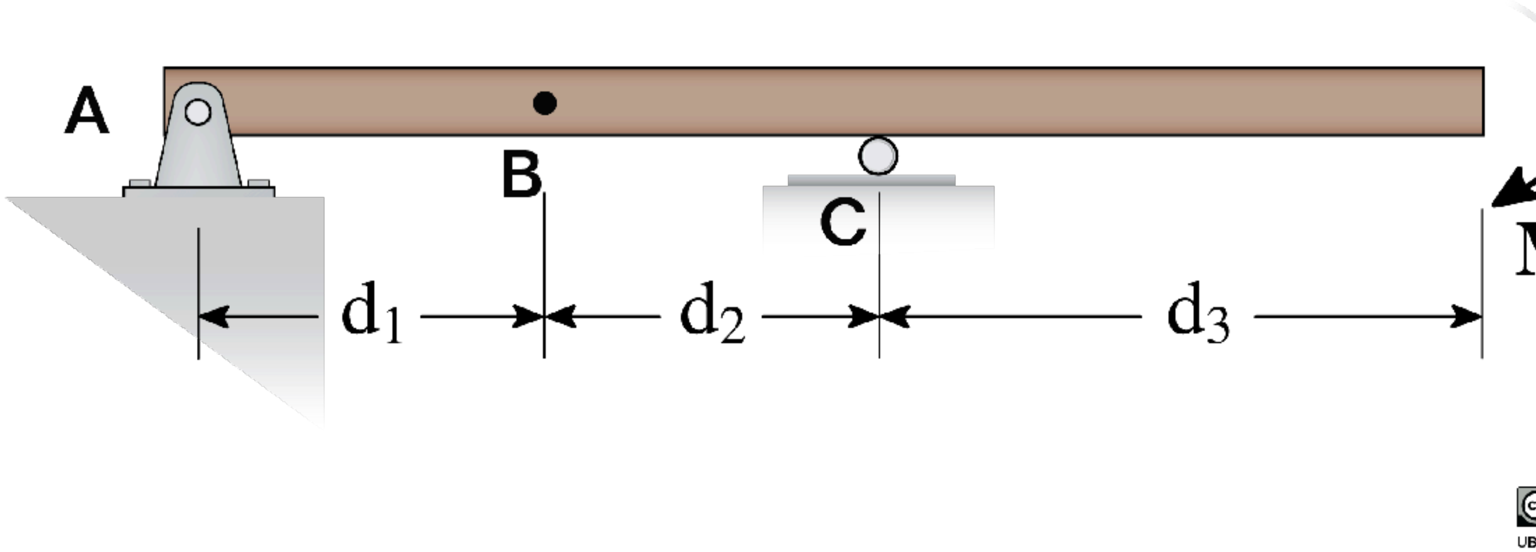

A bar experiencing a couple moment M is supported by a pin at A and a roller at C. Assuming the bar has a total uniform mass of $m\,\mathrm{kg}$, find the magnitudes of the internal loadings in the bar at B. Assume $g = 9.81\ \mathrm{N/kg}$.

Find the mass per unit length, ρ, of the bar.

$$\rho = \frac{m}{d_1 + d_2 + d_3}$$

Find the reaction components at A.

$$\Sigma M_C = 0 \rightarrow -(d_1 + d_2)A_y + (d_1 + d_2 - \frac{d_1 + d_2 + d_3}{2}) \cdot m \cdot g - M = 0$$

$$\Rightarrow A_y = \frac{\frac{d_1 + d_2 - d_3}{2} \cdot m \cdot g - M}{d_1 + d_2}$$

$$+ \rightarrow \Sigma F_x = 0$$
$$\Rightarrow A_x = 0$$

Determine the magnitudes of the internal loadings in the bar at B.

Using the left side of B:

$$+\rightarrow \Sigma F_x = 0 \rightarrow A_x + N_B = 0$$
$$\Rightarrow N_B = 0$$

$$+\uparrow \Sigma F_y = 0 \rightarrow A_y - V_B - \rho \cdot d_1 = 0$$
$$\Rightarrow V_B = A_y - \rho \cdot g \cdot d_1$$

$$\Sigma M_B = 0 \rightarrow M_B - d_1 \cdot A_y - \frac{d_1}{2} \cdot d_1 \cdot \rho \cdot g = 0$$

$$\Rightarrow M_B = d_1 \cdot (A_y + \frac{d_1}{2} \cdot \rho \cdot g)$$