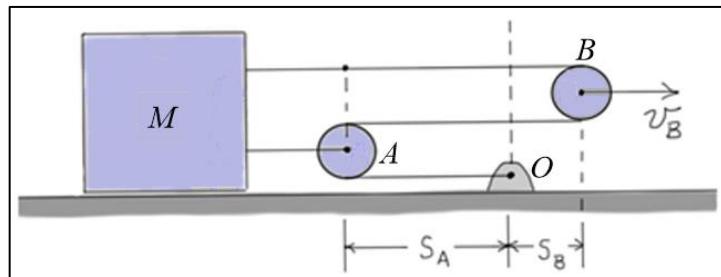


### Elementary Dynamics Example #11: (2D Motion, Relative Motion: Pulley Problem)

Given:  $v_B = 3 \text{ (ft/s)}$  ... to the right

Find:  $v_M$



Solution:

First, define the distances  $s_A$  and  $s_B$  as the distances of the two pulleys relative to a fixed vertical reference line at  $O$ . Then we can write the “no stretch” condition for the cable:

$$3s_A + 2s_B = \text{constant}$$

Differentiating with respect to time:

$$3\dot{s}_A + 2\dot{s}_B = 0 \Rightarrow -3v_M + 2v_B = 0 \Rightarrow v_M = \frac{2}{3}v_B = 2 \text{ (ft/s)} \text{ ... to the right}$$