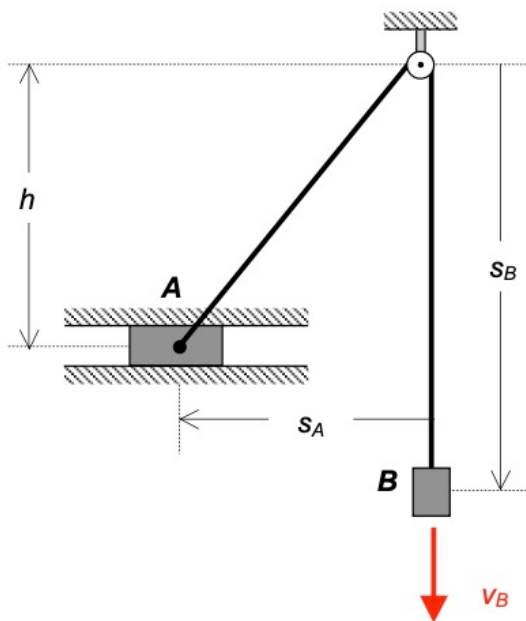


Blocks A and B are connected by an inextensible cable, as shown in the figure below. Assume that the radius of the pulley is small compared to the other dimensions of the problem. Block A moves along a horizontal path, and block B moves along a vertical path. At the instant shown, B is moving downward with a speed of v_B . Circle the answer below that most accurately describes the speed of A, v_A , as compared to the speed of B:

- (a) $v_A > v_B$
- (b) $v_A = v_B$
- (c) $v_A < v_B$
- (d) More information is needed about the problem in order to answer this question.

Provide an mathematical justification for your answer.



$$L = \sqrt{s_A^2 + h^2} + s_B + \text{constant} = \text{length of cable} = \text{constant}$$

$$\frac{dL}{dt} = 0 = \frac{1}{2} \frac{2s_A \dot{s}_A}{\sqrt{s_A^2 + h^2}} + \dot{s}_B \Rightarrow \dot{s}_B = -\frac{s_A \dot{s}_A}{\sqrt{s_A^2 + h^2}} \Rightarrow v_B = \frac{s_A}{\sqrt{s_A^2 + h^2}} v_A$$

Since $\frac{s_A}{\sqrt{s_A^2 + h^2}} < 1$ for $h \neq 0$ and all values of s_A , then $v_B < v_A$.