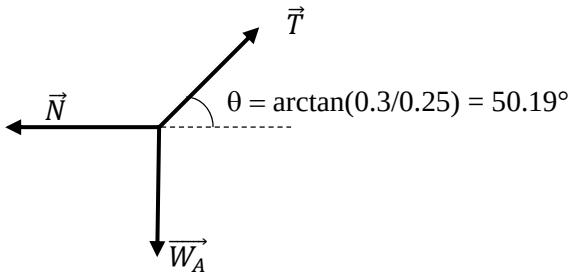
Exercise 3.35

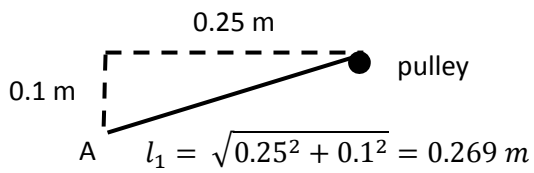
FBD for A



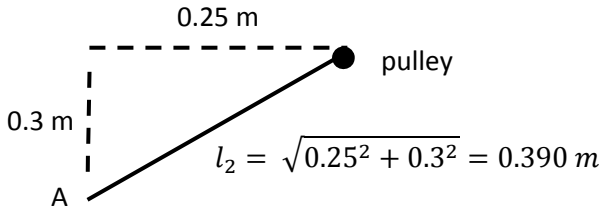
FBD for B

The spring must be stretched. As h changes from 0.1 m to 0.3 m, the length of the rope from the pulley to A increases. The book picture is correct but is better understood by moving the height h to the left where block A is.

When the spring is in its rest position, h = 0.1 m.



When the spring is stretched, h = 0.3 m.



The spring is stretched by the same amount as the length between A and the pulley increases. That is

$$F_s = k(l_2 - l_1) = k\ 0.121$$

Writing the y-component of $\sum \vec{F} = 0$ for A and B, we get

$$\begin{cases} Tsin(\theta) - W_A = 0 \\ T - W_B - F_s = 0 \end{cases} \Longrightarrow F_s = \frac{W_A}{sin(\theta)} - W_B$$

And since W_A = 20 * 9.81, W_B = 10*9.81, $k = \frac{1}{0.121}\left(\frac{196.2}{\sin(50.19)} - 98.1\right) = 1300\ N/m$