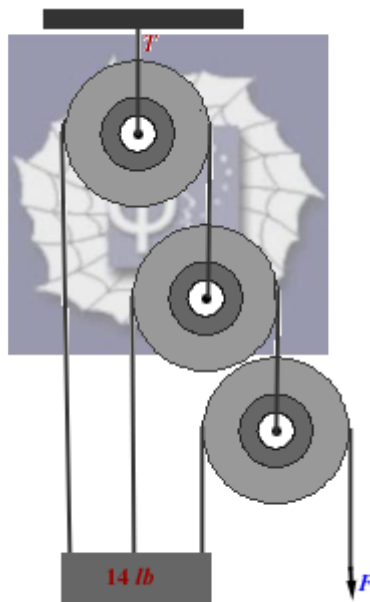


44.

Problem 13.22P (HRW)

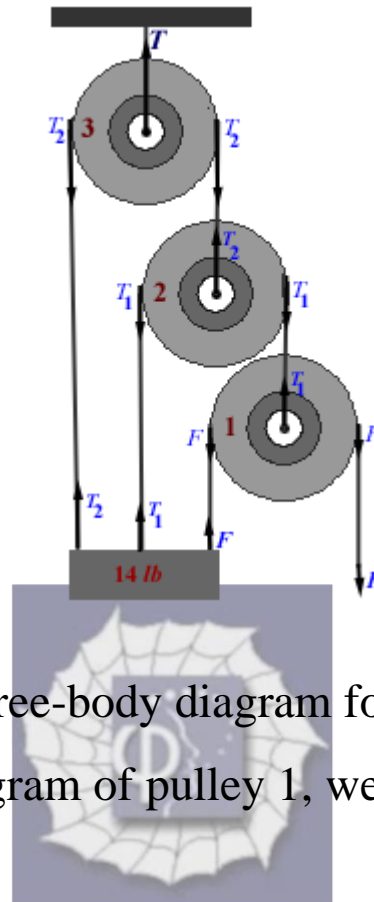
The force F is just sufficient to hold the 14 lb block and weightless pulleys in equilibrium. There is no appreciable friction. We have to calculate the tension T in the upper cable.



Solution:

We will solve this problem by requiring that forces of tension exerted by each cable passing around its pulley have the same magnitude except their directions at ends are opposite to each other. As the pulleys are assumed to

be massless, forces relevant to the problem will be as shown in the following diagram.



We will analyse free-body diagram for each pulley. From the free-body diagram of pulley 1, we note

$$T_1 = 2F.$$

From the free-body diagram of pulley 2, we note

$$T_2 = 2T_1 = 4F.$$

From the free-body diagram of pulley 3, we note

$$T = 2T_2 = 8F.$$

From the free-body diagram of the block of weight 14 lb , we note

$$F + T_1 + T_2 = 14\text{ lb}.$$

Substituting for T_1 and T_2 in terms of F , we get

$$F = 2\text{ lb}.$$

Therefore, the tension T in the upper cable is 16 lb.

