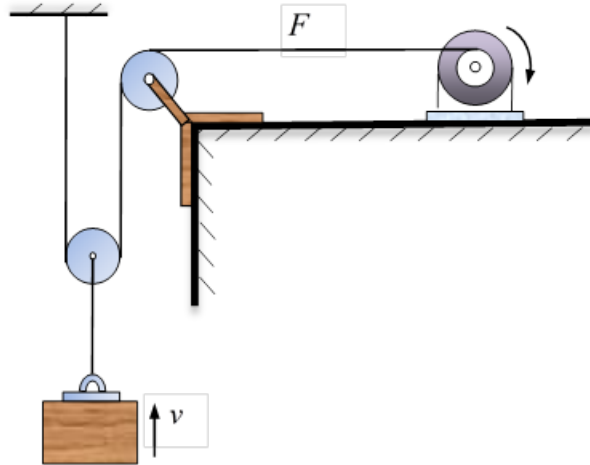


2-21. The motor draws through the cable with a horizontal force $F \sim N(150, 2^2)$ N. The initial velocity of the block is $v_0 \sim N(1, 0.1^2)$ m/s. If F and v_0 are independent, determine the speed of the 30 kg block when $t = 10$ s.



Solution:

$$mv_0 + 2Ft - mgt = mv$$

$$v = v_0 + \frac{2Ft}{m} - gt$$

$$\mu_v = \mu_{v_0} + \frac{2\mu_F t}{m} - gt = 1 + \frac{2(150)(10)}{30} - 9.81(10) = 2.9 \text{ m/s}$$

$$\sigma_v = \sqrt{\sigma_{v_0}^2 + \left(\frac{2t}{m}\right)^2 \sigma_F^2} = 1.34 \text{ m/s}$$

Therefore, $v \sim N(2.9, 1.34^2)$ m/s.

Ans.