

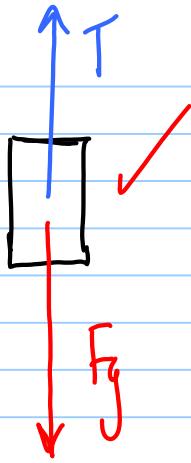
Quiz 1b

A 75 kg prisoner is trying to escape from their window by sliding down a rope which can support a maximum of 650 N of tension. The window is 18 m above the ground.

a) Draw an FBD of the prisoner on the rope.

b) What is the slowest that the prisoner could be traveling when they reach the ground (i.e. without breaking the rope).

a.)



$$F_g > T$$

b.)

$$F_g = mg = (75\text{kg})(9.8\text{m/s}^2) = 735\text{N} \checkmark$$

$$F_{\text{net}} = F_g - T = ma \checkmark$$

$$a = \frac{F_g - T}{m} = \frac{735 - 650}{75} = 1.13\text{m/s}^2 \checkmark$$

$$V = ?$$

$$V_0 = 0$$

$$a = -1.13\text{m/s}^2$$

$$d = -18\text{m}$$

$$t =$$

$$V^2 = \overset{0}{V_0^2} + 2ad$$

$$V = \sqrt{2ad} = \sqrt{2(-1.13)(-18)} = \boxed{-6.4\text{m/s}} \checkmark$$