

# Multibody Pr. 11 A

1.



$$F = ma$$

$$100N = 20kg(a)$$

$$5m/s^2 = a$$

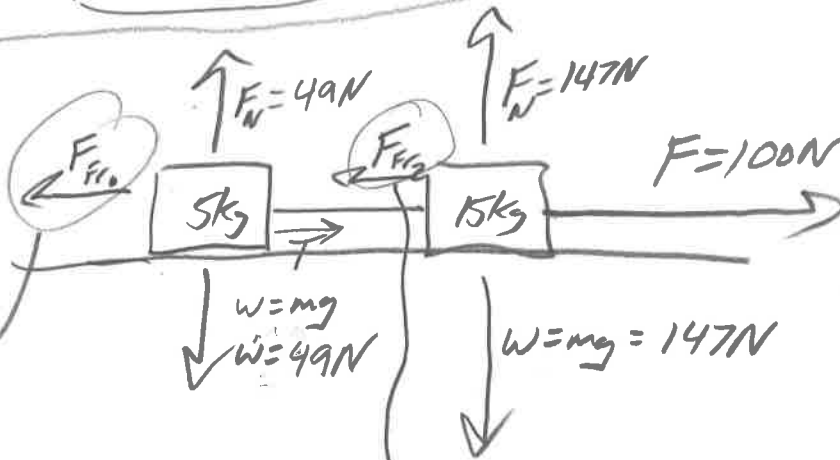
Tension:  
5kg Block only

$$\Sigma F = T = ma$$

$$T = 5kg(5m/s^2)$$

$$T = 25N$$

2.



$$F_{fr} = \mu F_N$$

$$= 0.2(49N)$$

$$F_{fr} = 9.8N$$

$$F_{fr} = 0.2(147N) = 29.4N$$

$$\Sigma F = 100N - F_{fr1} - F_{fr2}$$

$$\Sigma F = 100N - 9.8N - 29.4N = 60.8N$$

$$\Sigma F = ma = 60.8N$$

$$(20kg)a = 60.8N$$

$$a = 3.04m/s^2$$

Tension:  
5kg block only



$$\Sigma F = T - F_r = T - 9.8N$$

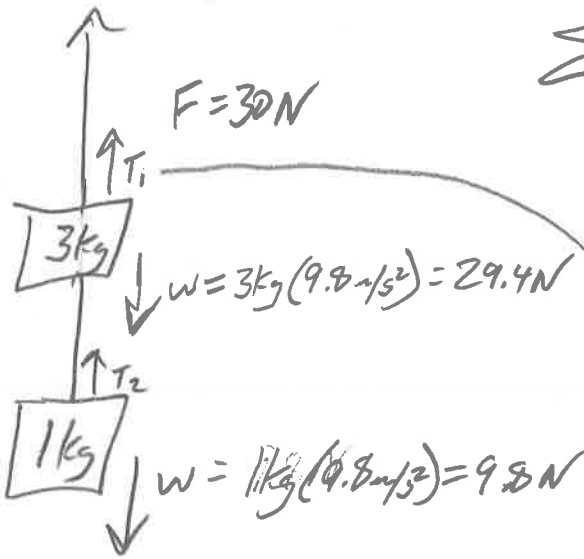
$$\Sigma F = ma = T - 9.8N$$

$$5kg(3.04m/s^2) = T - 9.8N$$

$$15.2N = T - 9.8N$$

$$T = 25N$$

3)



$$\Sigma F = 30N - 29.4N - 9.8N = -9.2N$$

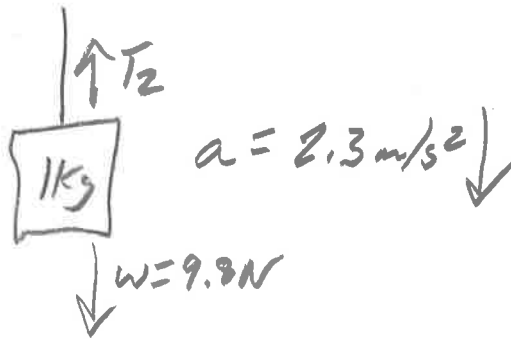
$$\Sigma F = ma = -9.2N$$

$$4kg (a) = -9.2N$$

$$a = -2.3 m/s^2$$

$$T_1 = 30N$$

For  $T_2$ , consider the bottom box and rope



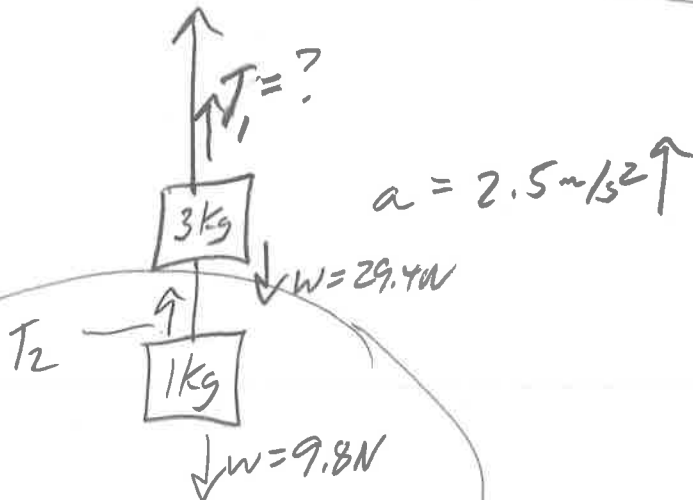
$$\Sigma F = T_2 - 9.8N$$

$$\Sigma F = ma = 1kg (-2.3 m/s^2) = -2.3N$$

$$T_2 - 9.8 = -2.3N$$

$$T_2 = 7.5N$$

4)



$$\Sigma F = ma = 4kg (2.5 m/s^2)$$

$$\Sigma F = 10N \uparrow$$

$$\Sigma F = T_1 - 29.4N - 9.8N$$

$$T_1 - 29.4N - 9.8N = 10N$$

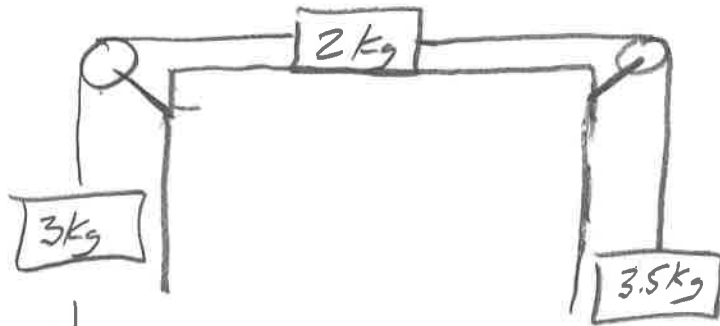
$$T_1 = 49.2N$$

$$\Sigma F = T_2 - 9.8N = ma = 1kg (2.5 m/s^2)$$

$$T_2 - 9.8N = 2.5N$$

$$T_2 = 12.3N$$

5)



$$\begin{aligned} \downarrow W &= mg \\ W &= 3 \text{ kg} (9.8 \text{ m/s}^2) \\ W &= 29.4 \text{ N} \end{aligned}$$

$$\begin{aligned} \downarrow W &= mg = 3.5 \text{ kg} (9.8 \text{ m/s}^2) \\ W &= 34.3 \text{ N} \end{aligned}$$

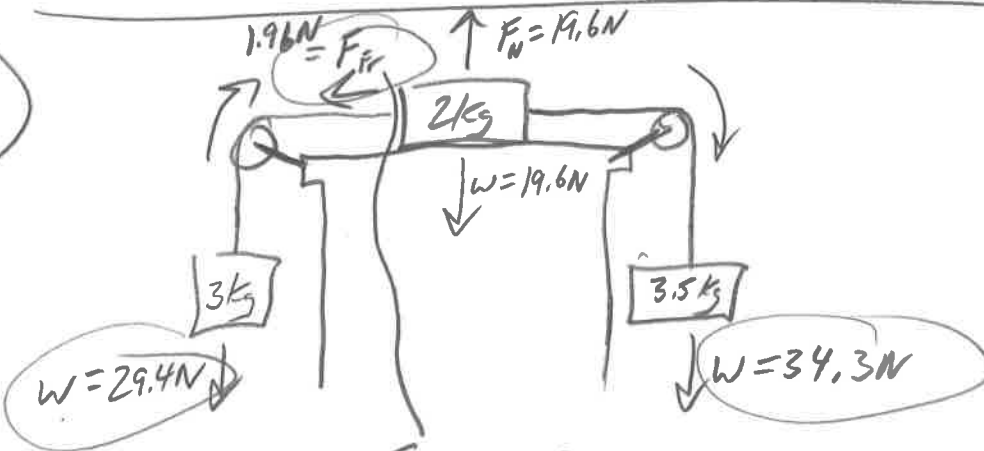
$$\Sigma F = 34.3 \text{ N} - 29.4 \text{ N} = 4.6 \text{ N to the right}$$

$$\Sigma F = ma = 4.9 \text{ N}$$

$$8.5 \text{ kg} (a) = 4.9 \text{ N}$$

$$a = 0.58 \text{ m/s}^2 \text{ to the right}$$

6)



$$\begin{aligned} \Sigma F &= F_f = \mu F_N \\ &= 0.1 (19.6 \text{ N}) = 1.96 \text{ N leftward} \end{aligned}$$

$$\Sigma F = 34.3 \text{ N} - 29.4 \text{ N} - 1.96 \text{ N} = 2.94 \text{ N}$$

$$\Sigma F = ma = 2.94 \text{ N}$$

$$8.5 \text{ kg} (a) = 2.94 \text{ N} \Rightarrow a = 0.35 \text{ m/s}^2$$

