b) Frictional force on the system.

$$F_{fr} = \mu F_N$$
$$= \mu mg$$
$$= (0.21)(5.0\text{ kg})(9.81\text{ m/s}^2)$$
$$= 10.3\text{ N}$$

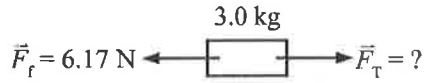
$$F_{net} = F_T - F_{fr}$$
$$= (20.0\text{ N} - 10.3\text{ N})$$
$$= 9.7\text{ N}$$
$$F_{net} = ma$$
$$a = \frac{F_{net}}{m}$$
$$= \frac{9.7\text{ N}}{5.0\text{ kg}}$$
$$= 1.9\text{ m/s}^2$$

Frictional force on 3.0 kg block

$$F_{fr} = \mu F_N$$
$$= \mu mg$$
$$= (0.21)(3.0\text{ kg})(9.81\text{ m/s}^2)$$
$$= 6.18\text{ N}$$

Net force on 3.0 kg block

$$F_{net} = ma$$
$$= (3.0\text{ kg})(1.9\text{ m/s}^2)$$
$$= 5.7\text{ N}$$

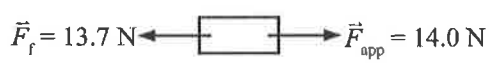


Therefore, magnitude of tension in the string joining the two blocks can be calculated using following relation

$$F_{net} = F_T - F_{fr}$$
$$F_T = F_{net} + F_{fr}$$
$$= 5.7\text{ N} + 6.17\text{ N}$$
$$= 12\text{ N}$$

23. a) $F_{fr} = \mu F_N$

$$= \mu mg$$
$$= (0.35)(4.0\text{ kg})(9.81\text{ m/s}^2)$$
$$= 13.7\text{ N}$$



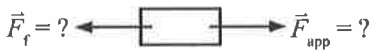
$$F_{net} = F_{app} - F_{fr}$$
$$= 14.0\text{ N} - 13.7\text{ N}$$
$$= 0.28\text{ N}$$

Again

$$F_{net} = ma$$
$$a = \frac{F_{net}}{m}$$
$$= \frac{0.28\text{ N}}{4.0\text{ kg}}$$
$$= 0.070\text{ m/s}^2$$

b) Net force on 1.0 kg mass

$$F_{net} = ma$$
$$= (1.0\text{ kg})(0.070\text{ m/s}^2)$$
$$= 0.070\text{ N}$$
$$F_{fr} = \mu F_N$$
$$= \mu mg$$
$$= (0.35)(1.0\text{ kg})(9.81\text{ m/s}^2)$$
$$= 3.43\text{ N}$$



$$F_{net} = F_{app} - F_{fr}$$
$$F_{app} = F_{net} + F_{fr}$$
$$= 0.070\text{ N} + 3.43\text{ N}$$
$$= 3.5\text{ N}$$

24. $\vec{F}_{T1} = 40.0$ N at 20.0° N of E

x component of this force

$$\vec{F}_{T1x} = F_{T1}\cos\theta$$
$$= (40.0\text{ N})(\cos 20.0°)$$
$$= 37.59\text{ N east}$$

y component of this force

$$\vec{F}_{T1y} = F_{T1}\sin\theta$$
$$= (40.0\text{ N})(\sin 20.0°)$$
$$= 13.68\text{ N north}$$

$\vec{F}_{T2} = 25.0$ N at 30° S of E

x component of this force

$$\vec{F}_{T2x} = F_{T2}\cos\theta$$
$$= (25.0\text{ N})(\cos 30.0°)$$
$$= 21.65\text{ N east}$$