

If the coefficient of kinetic friction between the 100. N block and the table is 0.230, (a) what is the acceleration of the masses?

(b) What is the tension in the string?

$W_A = 100 \text{ N}$   
 $F_{gA} = m_A \cdot g$   
 $\frac{100}{9.8} = m_A = 10.2 \text{ kg}$   
 $F_{gB} = m_B \cdot g$   
 $\frac{50}{9.8} = m_B = 5.10 \text{ kg}$

$F_N = 100 \text{ N}$   
 $\vec{F}_f (-)$   
 $\vec{F}_T (+)$   
 $W = F_{gA} = 100 \text{ N}$   
 $F = m \cdot a_{\text{net}}$   
 $F_T - F_f = m_A \cdot a$   
 $F_T - \mu \cdot F_N = m_A \cdot a$   
 $F_T - 0.23 \cdot 100 = 10.2 \cdot a$   
 $F_T - 23 = 10.2 \cdot a$

$F_f = \mu \cdot F_N$   
 $\vec{a} = \frac{\vec{F}_{\text{net}}}{m}$   
 a)  $a = 1.764 \frac{\text{m}}{\text{s}^2}$   
 b)  $F_T = 41.0 \text{ N}$

$F_T = ?$   
 $a = ?$  } need another equation!  
 $F_{\text{net}y} = m_B \cdot a_y$   
 $F_{gB} - F_T = m_B \cdot a$   
 $50 - F_T = 5.1 \cdot a$

$F_T - 23 = 10.2 \cdot a$  I  
 $50 - F_T = 5.1 \cdot a$  II  

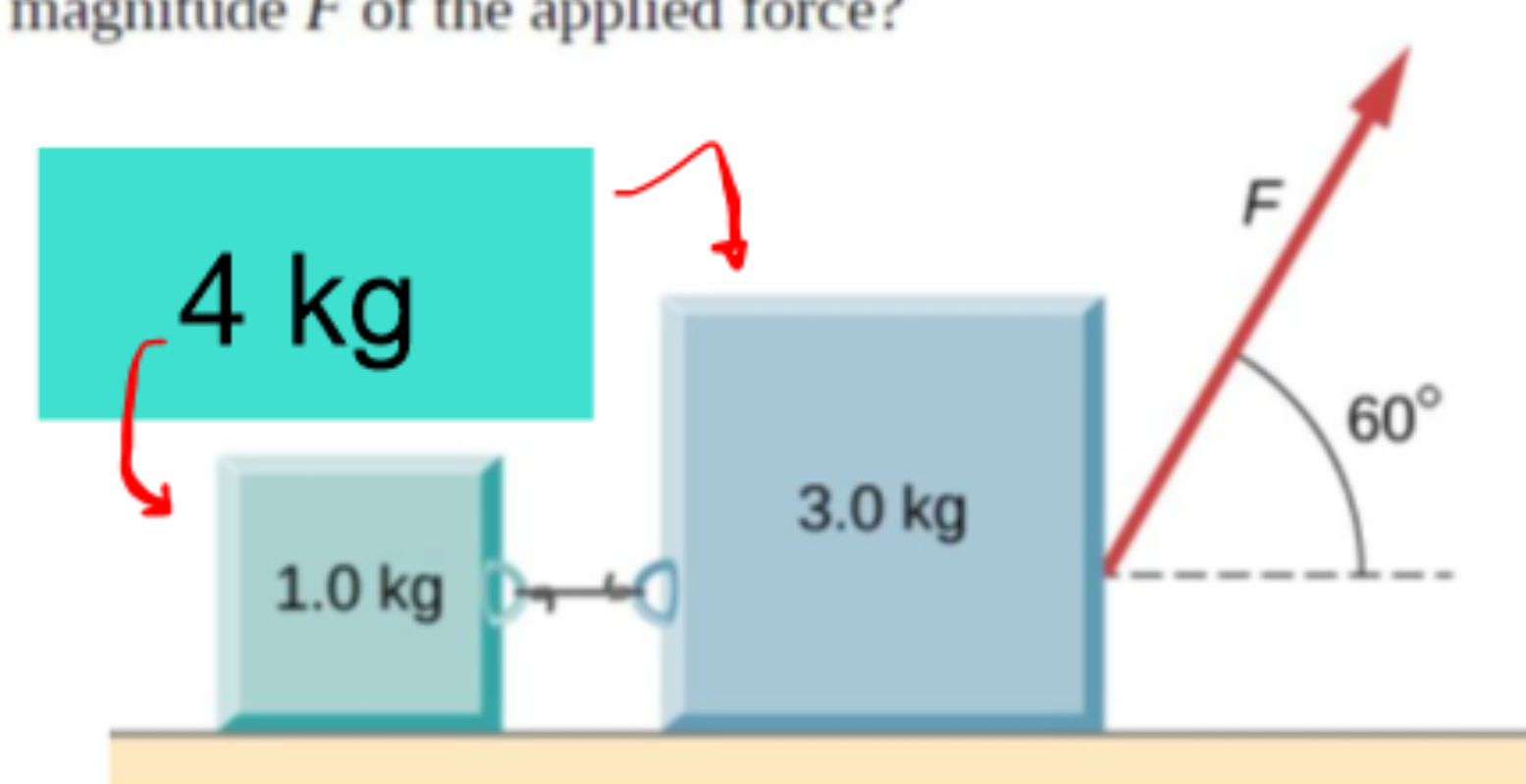

---

 $50 - 23 = 10.2 \cdot a + 5.1 \cdot a = a(10.2 + 5.1)$   
 $27 = 15.3 \cdot a$   
 $\frac{27}{15.3} = a = 1.764 \frac{\text{m}}{\text{s}^2}$

$50 - F_T = 5.1 \cdot a$   
 $50 - F_T = 5.1 \cdot 1.764$   
 $50 - 9.0 = F_T$   
 $41.0 \text{ N} = F_T$

From (II)

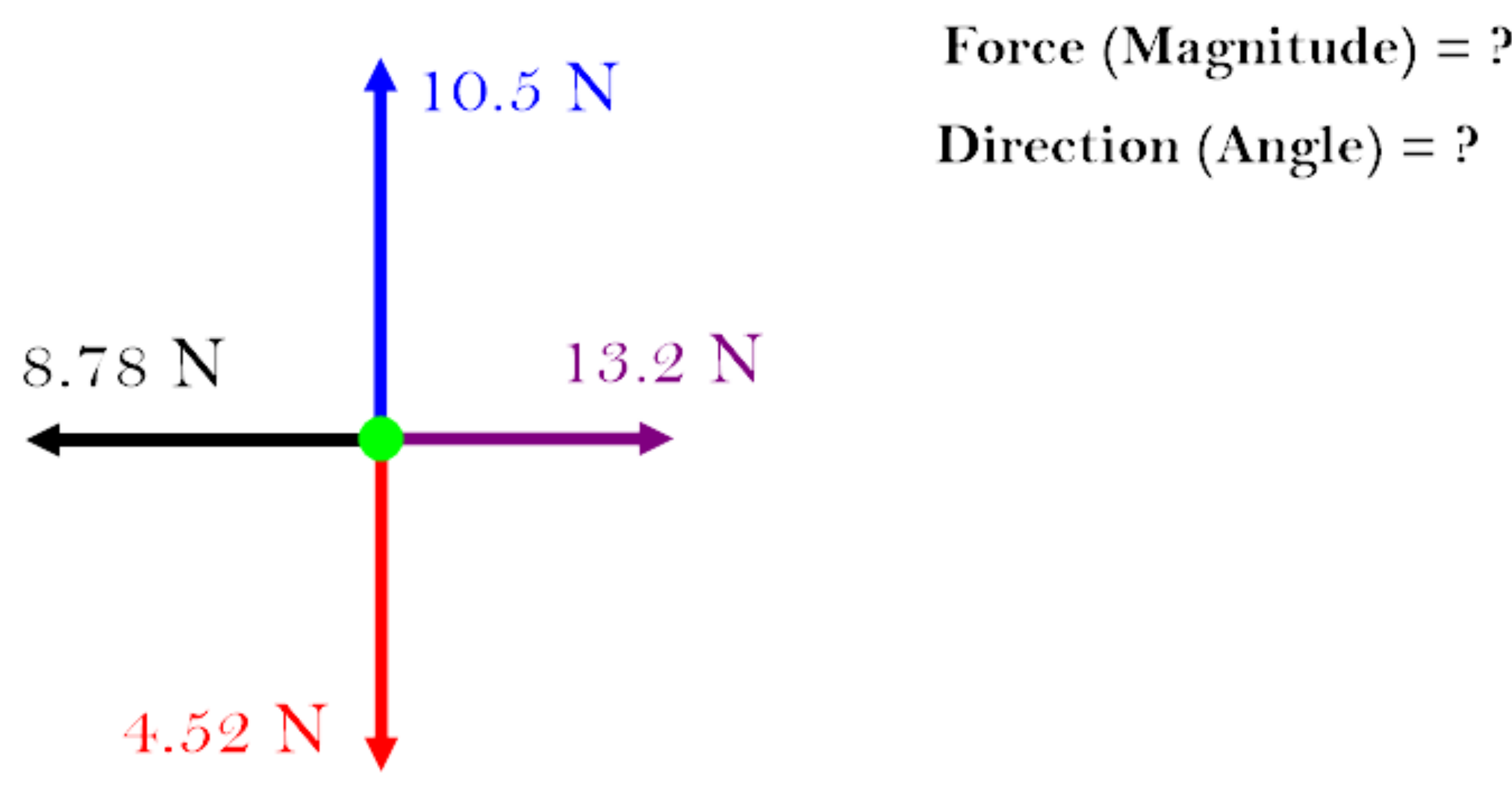
Two blocks connected by a string are pulled across a horizontal surface by a force applied to one of the blocks, as shown below. The coefficient of kinetic friction between the blocks and the surface is 0.25. If each block has an acceleration of  $2.0 \text{ m/s}^2$  to the right, what is the magnitude  $F$  of the applied force?



$\vec{a} = \frac{\vec{F}_{\text{net}}}{m}$   
 $F_g = m \cdot g = W$   
 $F_f = \mu \cdot F_N$   
 $F \cdot \sin \theta = \vec{F}_y$   
 $\vec{F}_N$   
 $\vec{F}_f$   
 $F_x = F \cdot \cos \theta$   
 $\vec{F} = ?$   
 $60^\circ$

$F_{\text{net}x} = m \cdot a_x$   
 $F_x - F_f = m \cdot a$   
 $F \cos \theta - \mu \cdot F_N = m \cdot a$  (I)  
 $F = ?$  } need another equation!!  
 $F_N = ?$   
 $F \cos \theta - \mu(mg - F \sin \theta) = m \cdot a$   
 $F \cos \theta - \mu mg + \mu F \sin \theta = m \cdot a$   
 $F \cos \theta + \mu F \sin \theta = m \cdot a + \mu mg$   
 $F(\cos \theta + \mu \sin \theta) = m \cdot a + \mu mg$   
 $F = \frac{(m \cdot a + \mu mg)}{(\cos \theta + \mu \sin \theta)} = \frac{(4 \times 2 + 0.25 \times 4 \times 9.8)}{[\cos(60) + 0.25 \cdot \sin(60)]}$   
 $F = 24.8 \text{ N}$

$F_N + F_y - F_g = 0$   
 $F_N = F_g - F_y$   
 $F_N = mg - F \sin \theta$   
 plug into I  
 zero only moves horizontal!



- A race car has a mass of 710 kg. It starts from rest and travels 40.0m in 3.0s. The car is uniformly accelerated during the entire time. How big is the net force acting on the car?
- Suppose that a 1000 kg car is traveling at 25 m/s (55 mph). Its brakes can apply a force of 5000 N. What is the minimum distance required for the car to stop?
- A 65 kg person dives into the water from the 10 m platform.
  - What is her speed as she enters the water?
  - She comes to a stop 4.0 m below the surface of the water. Find the force on the swimmer by the water.
- During a head-on collision, a passenger in the front seat of a car accelerates from 13.3 m/s (30 miles/hour) to rest in 0.10 s.
  - Calculate the acceleration of the passenger.
  - The driver of the car holds out his arm to keep his 25 kg child (who is not wearing a seat belt) from smashing into the dashboard. How much force must he exert on the child?
  - What is the weight of the child?