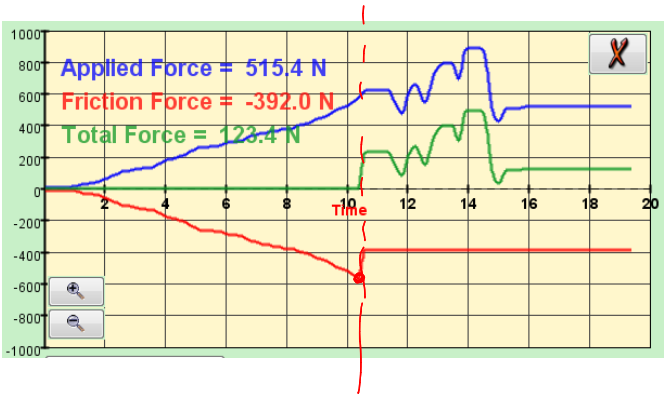
Friction



$F_s = \mu_s N$

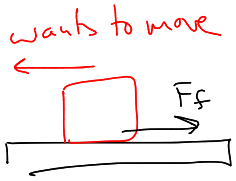
↑ maximum.

2 A crate is sitting in the center of a flatbed truck. As the truck accelerates to the east, the crate moves with it, not sliding on the bed of the truck. In what direction is the friction force exerted by the bed of the truck on the crate?

A To the west

B To the east

C There is no friction force because the crate does not move



Equilibrium

$$\Sigma \vec{F} = m\vec{a}$$

$$\Sigma F = 0 \qquad 0 = ma$$

The key question to ask is, "Is it **ACCELERATING**?"

3 If an object of mass m moves with constant velocity *v*, the net force on the object is

A *mg*
B *mv*
C *ma*
D 0
E None of the above

4 If an object is in equilibrium, which of the following statements is NOT true?

A The speed of the object remains constant.

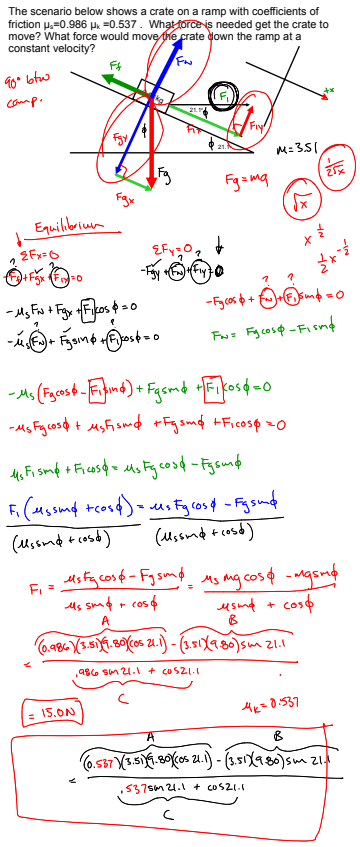
B The acceleration of the object is zero

C The net force acting on the object is zero

D The object must be at rest.

E The velocity is constant.

$\Sigma F = 0$



A certain orthodontist uses a wire brace to align a patient's crooked tooth as in the figure below. The tension in the wire is adjusted to have a magnitude of 18.0 N. Find the magnitude of the net force exerted by the wire on the crooked tooth.

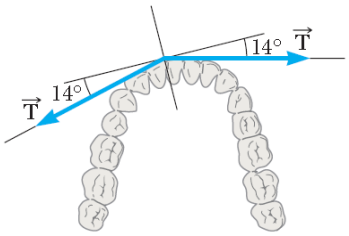
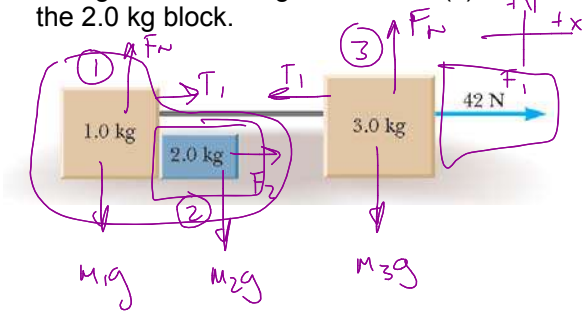


FIGURE P4.18

Assume the three blocks portrayed in the figure below move on a frictionless surface and a 42-N force acts as shown in the 3.0 kg block. Determine (a) the acceleration given this system, (b) the tension in the cord connecting the 3.0 kg and the 1.0 kg blocks, and (c) the force exerted by the 1.0 kg block on the 2.0 kg block.

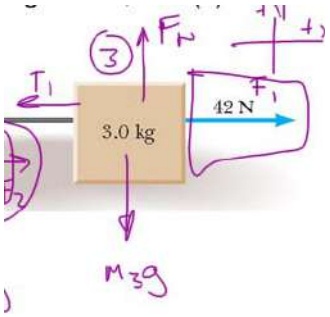


System

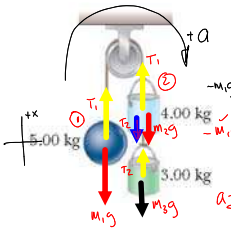
$F_1 - T_1 + T_1 = m_s a_s$

$a_s = \frac{F_1 - T_1 + T_1}{m_s}$

$a_s = \frac{42}{6} = 7.00\ m/s^2$



Three objects are connected by light strings as shown in the figure. The string connecting the 4.00 kg object and the 5.00 kg object passes over a light frictionless pulley. Determine (a) the acceleration of each object and (b) the tension in the two strings.



$F_g = mg$

System

$\Sigma F_s = m_s a_s$

$-m_1g + m_2g - m_3g = (m_1+m_2+m_3)a_s$

$a_s = \dfrac{-m_1g + m_2g - m_3g}{m_1+m_2+m_3}$

Individual

$a_s = \dfrac{g(-m_1+m_2+m_3)}{(m_1+m_2+m_3)}$

$a_s = \dfrac{9.80(-5+4+3)}{5+4+3}$

$a_s = \dfrac{9.80(2)}{12}$

$a_s = 1.63\ m/s^2$

$\Sigma F_b = ma_b$

$T_1 - m_1g = m_ba_b$

$T_1 = m_ba_b + m_1g$

$T_1 = 5(1.63) + (5)(9.8)$

$T_1 \approx 57.2\ N$

$\Sigma F_3 = m_3a_3$

$-T_2 + m_3g = m_3a_3$

$T_2 = m_3g - m_3a_3$

$= m_3(g - a_3)$

$= 3(9.80 - 1.63)$

$= 24.5\ N$ magnitude