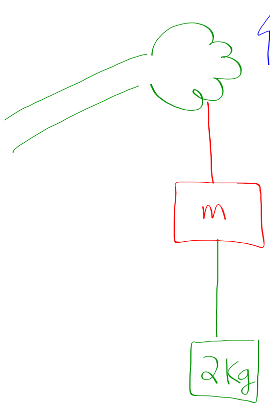
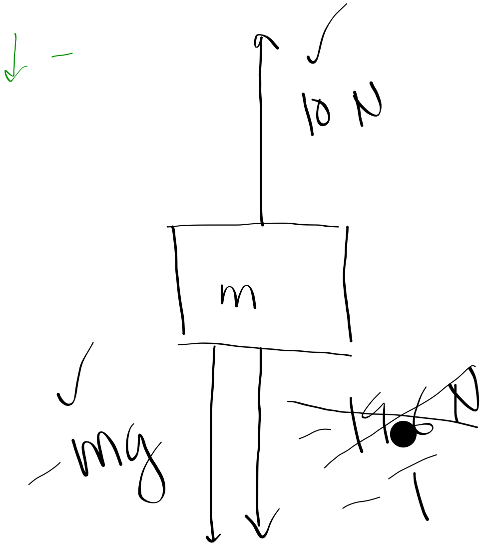
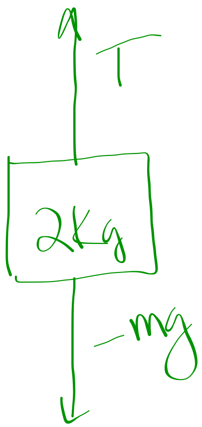


↑ 10 N (from my hand)

$a = 4.7\ m/s^2 \downarrow -$

what is m?





$$\Sigma F = ma$$

$$-mg - T + 10 = ma$$

$$-m(9.8) - 10.2 + 10 = m(-4.7)$$

$$m = -0.04\ kg$$

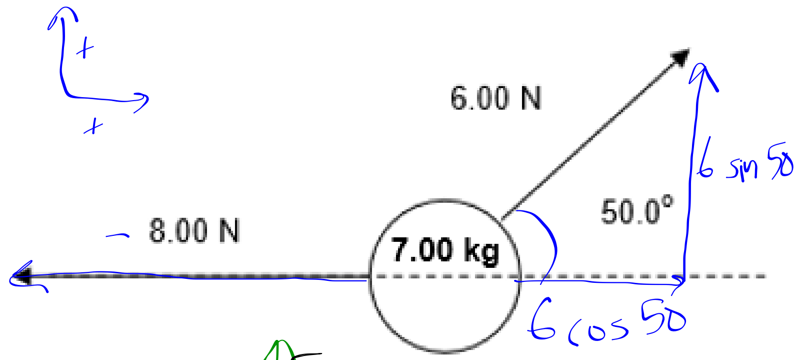
$$\Sigma F = ma$$

$$T - mg = ma$$

$$T - (2)(9.8) = (2)(-4.7)$$

$$T = 10.2\ N$$

2. For this particle in space (there is no gravity), find the accelerations and directions (an angle) of the mass shown.



$$\Sigma F_x = m a_x$$

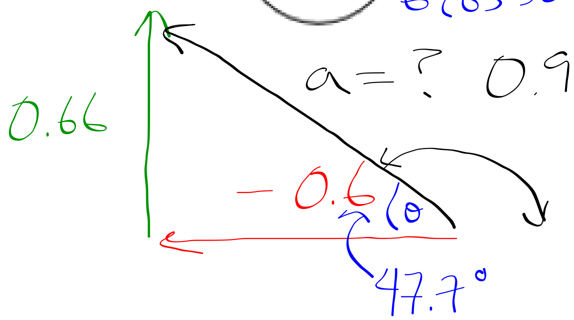
$$-8 + 6\cos 50 = 7 a_x$$

$$a_x = -.6 \ m/s^2$$

$$\Sigma F_y = m a_y$$

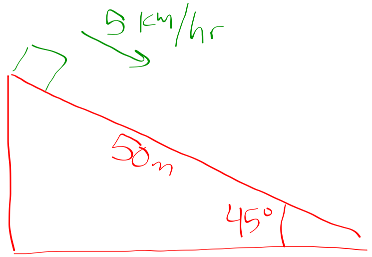
$$6 \sin 50 = (7) a_y$$

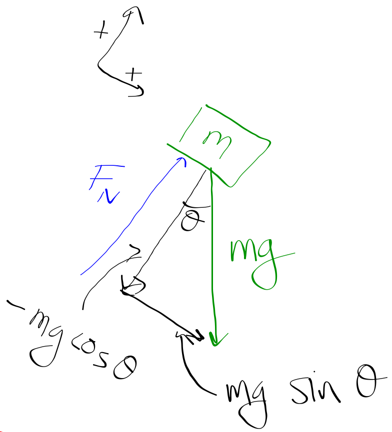
$$a_y = 0.66 \ m/s^2$$



$$a = 0.9 \ m/s^2 \ @ \ 132.3^\circ$$

4. (p. 67 #28) A roller coaster reaches the top of the steepest hill with a speed of 5.0 km/h. It then descends the hill which is at an average angle of 45° and is 50-m long. What will its speed be when it reaches the bottom? <u>Neglect friction.</u> (Hint: what did you just learn about the component of gravity's acceleration down an incline?)





$$\Sigma F_x = ma_x$$

$$\boxed{mg \sin\theta = m a_x} \rightarrow a_x = g \sin\theta$$

$$= 9.8 \sin 45$$

$$= 6.9 \text{ m/s}^2$$

$$\Sigma F_y = ma_y = 0$$

$$F_N - mg\cos\theta = 0$$

$x_0 = 0\text{m}$

$x = 50\text{m}$

$v_0 = 1.39 \text{ m/s}$

$v =$

$a = 6.9 \text{ m/s}^2$

$t =$

$$v^2 = v_0^2 + 2a(x - x_0)$$

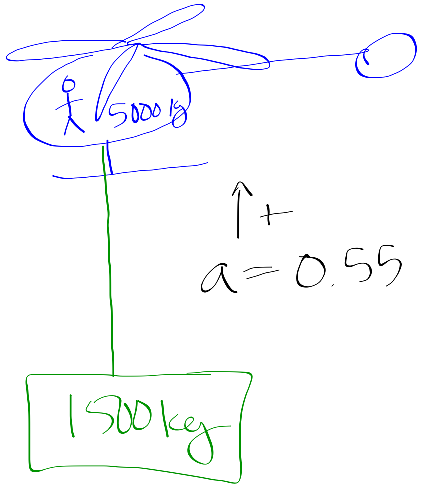
$$v = \pm\sqrt{(1.39^2) + 2(6.9)(50)}$$

$$\boxed{= 26.3 \text{ m/s}}$$

7. (p. 68 #36) A 5000-kg helicopter accelerates upward at 0.550 m/s^2 while lifting a 1500-kg car.

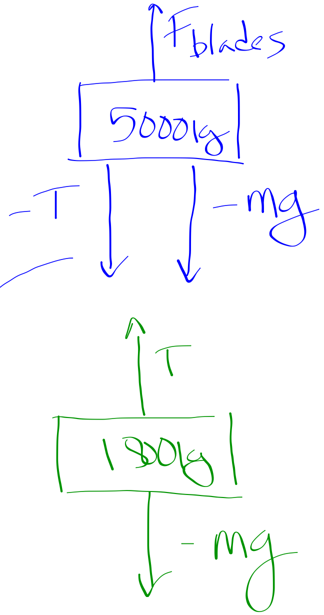
a) What is the lift force exerted by the air on the blades of the helicopter?

b) What is the tension in the cable (ignore its mass) that connects car to helicopter?



$\uparrow +$

$a = 0.55\ m/s^2$



$\Sigma F = ma$

$F_b - T - mg = ma$

$F_b = (15525) + (5000)(9.8) + (5000)(0.55)$

$\boxed{F_b = 67{,}275\ N}$

a

$\Sigma F = ma$

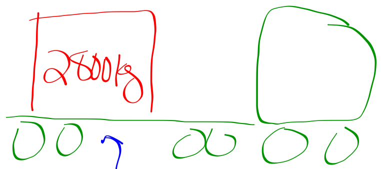
$T - mg = ma$

$T - (1500)(9.8) = (1500)(0.550)$

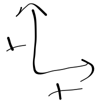
$\boxed{T = 15{,}525\ N}$

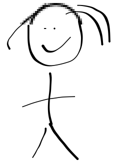
b

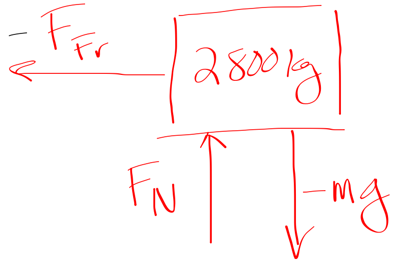
9. (p. 68 #46) A flatbed truck is carrying a 2800-kg crate of bananas. If the coefficient of static friction between the crate and the bed of the truck is 0.55, what is the maximum rate the driver can decelerate when coming to a stop in order to avoid burying himself in squished bananas if the crate were to hit the cab?



$\mu_s = 0.55$







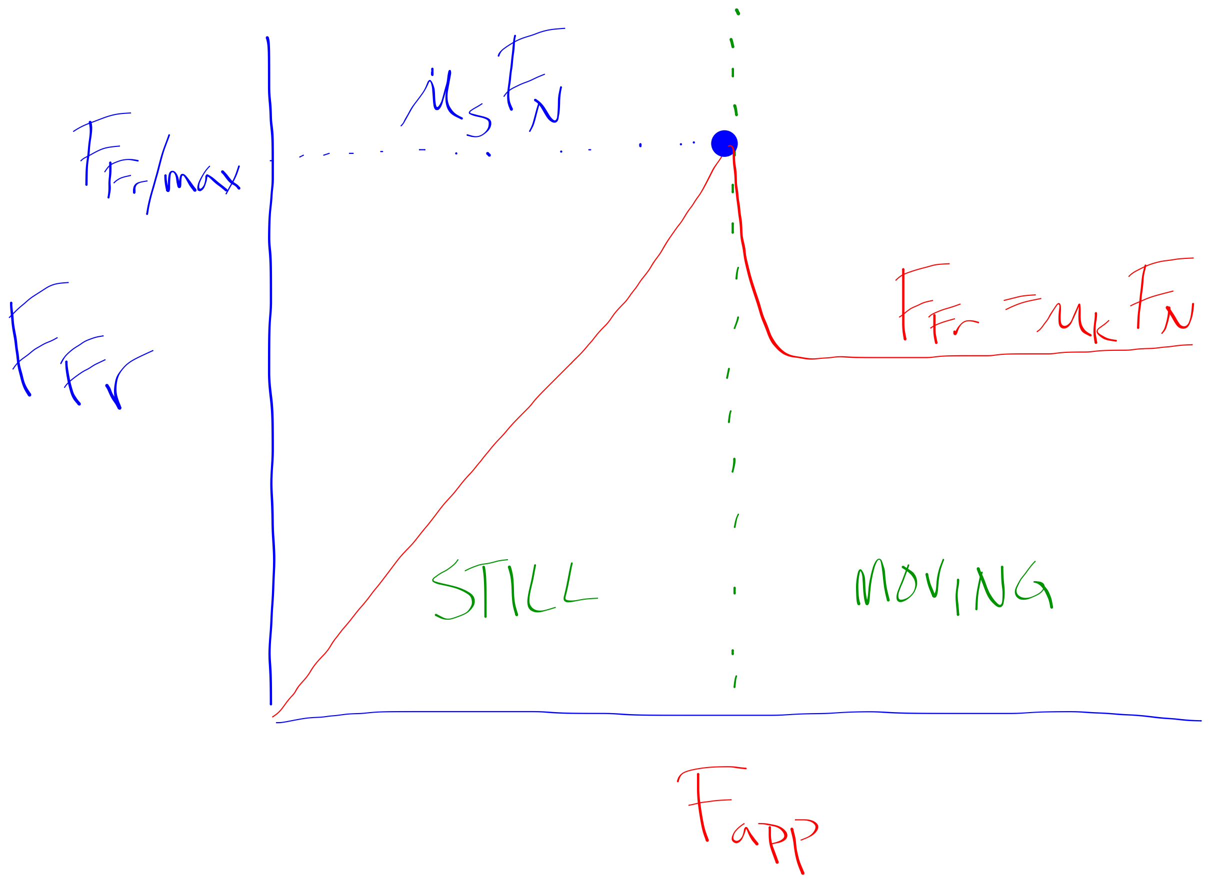
$$F_{Fr/max} = \mu_s F_N$$

$$F_{Fr} = (0.55)\,27{,}440\text{ N}$$
$$= 15{,}092\text{ N}$$

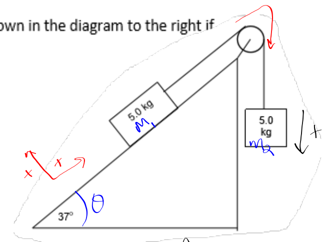
$$\Sigma F_x = ma_x$$
$$\boxed{-F_{Fr} = ma_x}$$

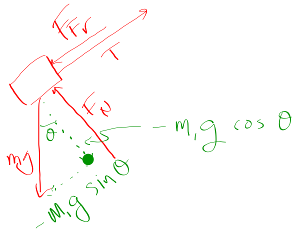
$$\Sigma F_y = ma_y = \emptyset$$
$$F_N - mg = \emptyset$$
$$F_N - (2800)(9.8) = \emptyset$$
$$F_N = 27{,}440\text{ N}$$

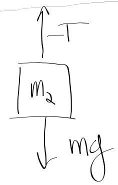
$$-F_{Fr} = ma_x$$
$$-15{,}092 = (2800)a_x$$
$$\boxed{a_x = -5.4\text{ m/s}^2}$$


$\mu_s F_N$
$F_{Fr/max}$
F_{Fr}
$F_{Fr} = \mu_k F_N$
STILL
MOVING
F_{app}

10. (p. 68 #49) What is the acceleration of the system shown in the diagram to the right if the kinetic coefficient of friction is 0.15?







$\Sigma F_x = m_1 a_x$

$-m_1 g \sin\theta - F_{Fr} + T = m_1 a_x$

$\Sigma F_y = m_1 a_y = 0$

$F_N - m_1 g \cos\theta = 0$

$F_N = m_1 g \cos\theta$

$F_{Fr} = \mu F_N$

$= \boxed{\mu m_1 g \cos\theta}$

$\Sigma F = m_2 a$

$-T + mg = m_2 a \quad (a = a_x)$

$T = m_2 g - m_2 a$

$=$

$-m_1 g \sin\theta - \mu m_1 g \cos\theta + T = m_1 a_x$

$T = m_1 a + m_1 g \sin\theta + \mu m_1 g \cos\theta$

$m_1 a + m_1 g \sin\theta + \mu m_1 g \cos\theta = m_2 g - m_2 a$

$m_1 a + m_2 a = m_2 g - m_1 g \sin\theta - \mu m_1 g \cos\theta$

$$a = \frac{m_2 g - m_1 g \sin\theta - \mu m_1 g \cos\theta}{m_1 + m_2}$$