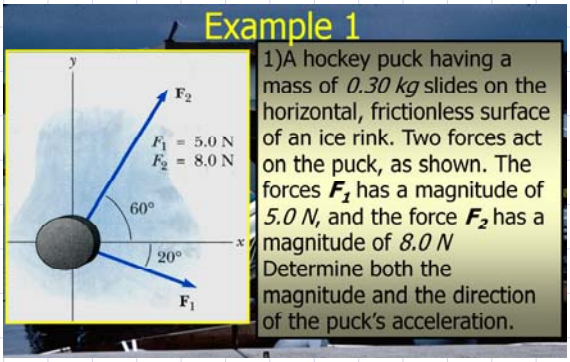
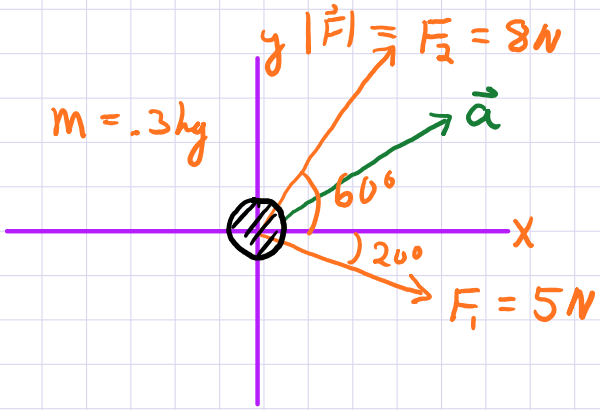
Example 1

Sunday, September 20, 2015 1:26 PM





$$\Sigma F_x = m a_x$$

$$F_1 \cos(20^\circ) + F_2 \cos(60^\circ) = m a_x$$

$$a_x = \frac{F_1 \cos(20^\circ) + F_2 \cos(60^\circ)}{m} = \frac{(5N)\cos(20^\circ) + (8N)\cos(60^\circ)}{.3\,kg}$$ kg m/s²

$$a_x = 28.99\ m/s^2 \simeq 29\ m/s^2$$

$$\Sigma F_y = m a_y$$

$$-F_1 \sin(20^\circ) + F_2 \sin(60^\circ) = m a_y$$

$$a_y = \frac{-\sin(20^\circ) + F_2 \sin(60^\circ)}{m} = \frac{-(5N)\sin(20^\circ) + (8N)\sin(60^\circ)}{.3\,kg}$$

$$a_y = 17.4\ m/s^2$$

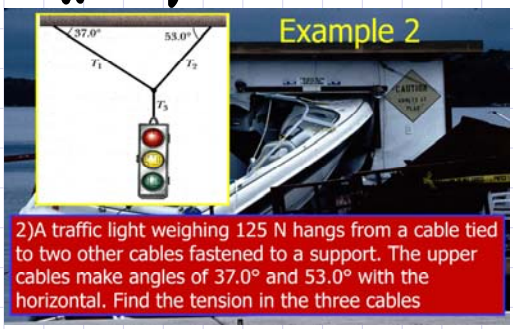
$$|\vec{a}| = \sqrt{a_x^2 + a_y^2} = \sqrt{(29\,m/s^2)^2 + (17.4\,m/s^2)^2} = 33.82\ m/s^2$$

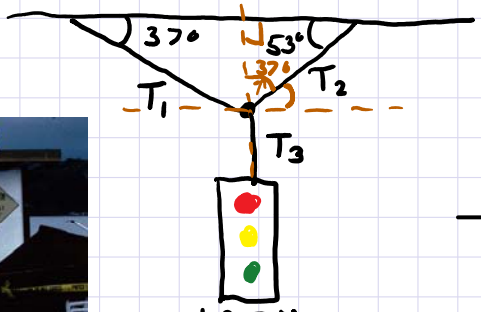
$$\theta = \tan^{-1}\left(\frac{a_y}{a_x}\right) = \tan^{-1}\left(\frac{17.4\,m/s^2}{29\,m/s^2}\right) = 30.96^\circ \simeq 31^\circ$$

Example 2

Sunday, September 20, 2015 1:27 PM

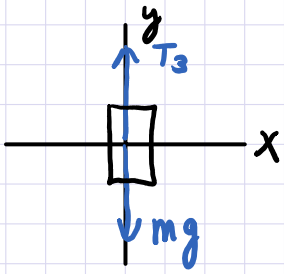
$W = mg$





$$m = \frac{125N}{9.8 m/s^2}$$

$$m = 12.76\ kg$$

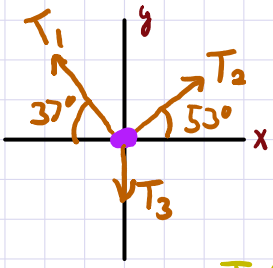


$$\Sigma F_y = 0$$

$$T_3 - mg = 0$$

$$T_3 = mg$$

$$\boxed{T_3 = 125N}$$



$$\Sigma F_x = 0$$

$$+T_2 \cos(53°) - T_1 \cos(37°) = 0$$

$$T_2 \cos(53°) = T_1 \cos(37°)$$

$$T_2 = T_1 \frac{\cos(37°)}{\cos(53°)} = (75.23N)\frac{\cos(37°)}{\cos(53°)} = \boxed{99.83N}$$

$$\Sigma F_y = 0$$

$$+T_1 \sin(37°) + T_2 \sin(53°) - T_3 = 0$$

$$T_1 \sin(37°) + T_1 \frac{\cos(37°)}{\cos(53°)} \sin(53°) = T_3$$

$$T_1 \left[\sin(37°) + \frac{\cos(37°)}{\cos(53°)} \sin(53°)\right] = T_3$$

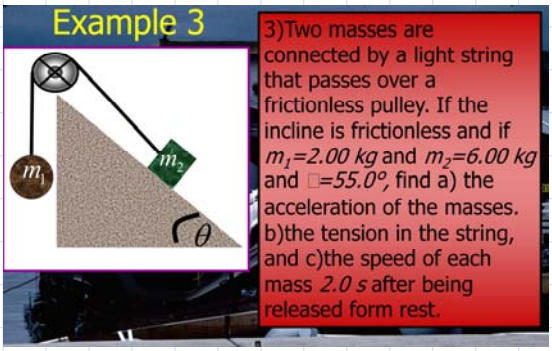
$$T_1 = \frac{T_3}{\sin(37°) + \frac{\cos(37°)}{\cos(53°)} \sin(53°)}$$

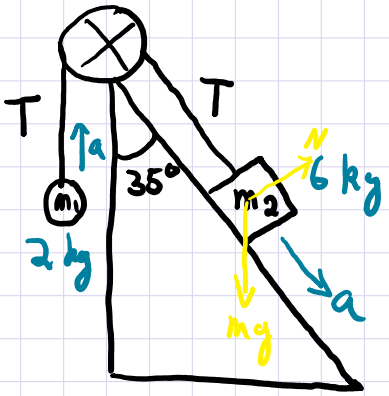
$$T_1 = \frac{125N}{\sin(37°) + \frac{\cos(37°)}{\cos(53°)} \sin(53°)}$$

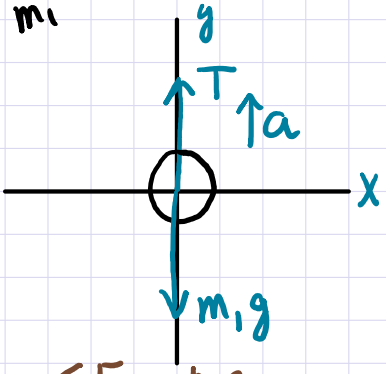
$$\boxed{T_1 = 75.23N}$$

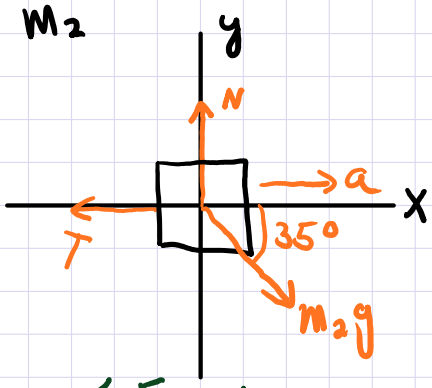
Example 3

Sunday, September 20, 2015 1:27 PM









$\Sigma F_y = 0$

$N - m_2 g \sin(35°) = 0$

$N = m_2 g \sin(35°)$

$\Sigma F_y = m a_y$

$T - m_1 g = m_1 a$

$\Sigma F_x = m a_x$

$m_2 g \cos(35°) - T = m_2 a$

$T = m_1 g + m_1 a = m_1 (g + a)$

$m_2 g \cos(35°) - (m_1 g + m_1 a) = m_2 a$

$T = (2\,kg)(9.8\,m/s^2 + 3.57\,m/s^2)$

$m_2 g \cos(35°) - m_1 g - m_1 a = m_2 a$

$\boxed{T = 26.74\,N}$

$m_1 a + m_2 a = m_2 g \cos(35°) - m_1 g$

$a(m_1 + m_2) = m_2 g \cos(35°) - m_1 g$

$$a = \frac{m_2 g \cos(35°) - m_1 g}{m_1 + m_2} = g\,\frac{(m_2 \cos(35°) - m_1)}{m_1 + m_2}$$

$$a = (9.8\,m/s^2)\,\frac{(6\,kg)\cos(35°) - (2\,kg)}{8\,kg}$$

$\boxed{a = 3.57\,m/s^2}$

$v = \cancel{v_0}^{\,0} + a t$

$v = (3.57\,m/s^2)(2s)$

$v = 7.14\ m/s$