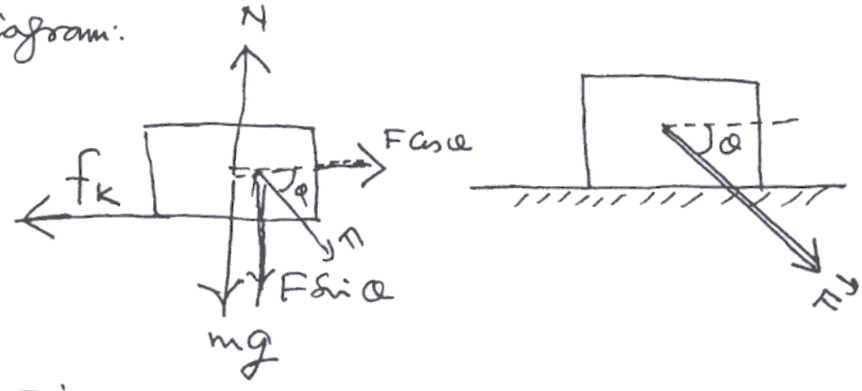
Solutions: H.W. CH.#6, PHYS 101, Fall (011)

16:

free-body diagram:



$m = 3.5\,kg$

$F = 5\,N$

$\theta = 40^\circ$

a) $= \mu_k N$

$N = mg + F\sin\theta$

$\therefore f_k = \mu_k (mg + F\sin\theta) = 0.25\,(3.5*9.8 + 5\sin 40^\circ$

$f_k = 10.98\,N = \underline{11\,N}$

b) $(F\cos\theta - f_k) = ma \Rightarrow a = \dfrac{(F\cos 40^\circ - 11)}{3.5} = \underline{0.14\,m/s}$

and direction is to the right

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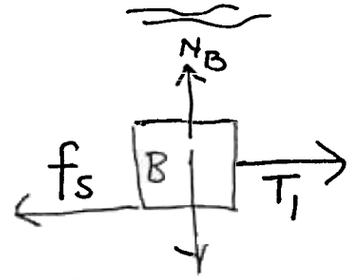
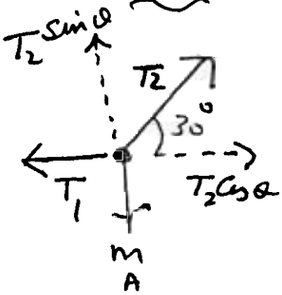
free-body diagrams for the Block and the Knot:





B: $T_1 - f_s = 0$

$-m_B g = 0$

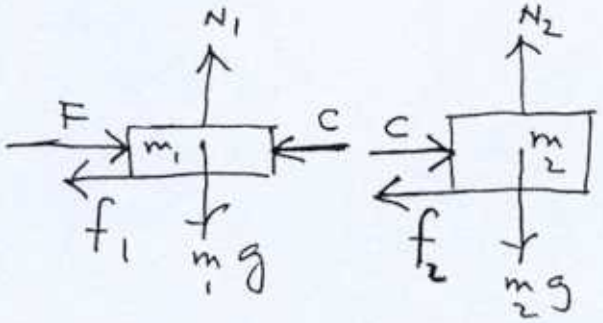
Now $f_s \quad \mu_s N_B = 0.25*711 = \underline{177.75\,N}$

$T_1 =$

Knot: $T_1 = T_2\cos 30^\circ \Rightarrow T_2 = \quad = \dfrac{17.8}{0.866} = \underline{20.6\,N}$

$T_2\sin\theta = m_A g \Rightarrow W_A = m_A g = \underline{10.3\,N}$

24:



$m_1: -f_1 + F - C = m_1 a$ $\qquad -f_2 + C = m_2 a$

$f_1 = 2.0\,N$ $\qquad f_2 = 4\,N$

$F = 12\,N$ $\qquad \therefore \cancel{C} - 4 = m_2 a$ (2)

$12 - 2 - C = m_1 a$ (1) $\qquad 10 - \cancel{C} = m_1 a$ (1)

(1) + (2): $\quad 6 = (m_1 + m_2)a \Rightarrow a = \dfrac{6}{m_1 + m_2} = 1.5\,m/s^2$

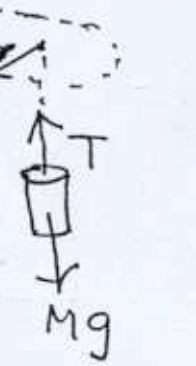
$\therefore$ force on the box by wheatie $= C = m_2 a + 4$

$= 3 \times 1.5 + 4 = 8.5\,N$

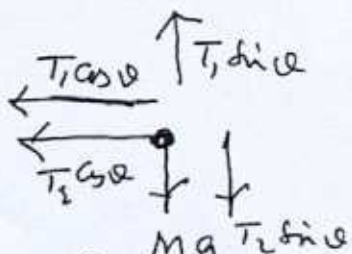
41: If M is stationary, then $T = Mg$

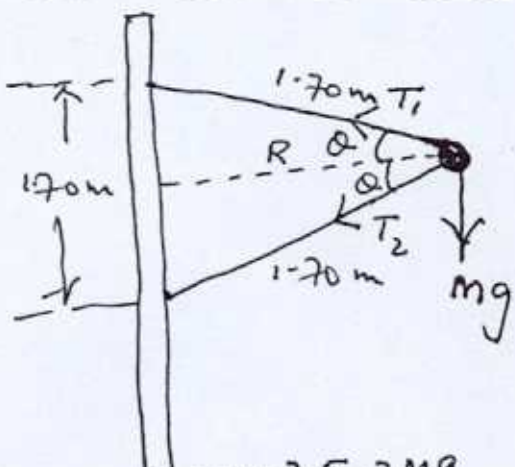
But $T = \dfrac{mv^2}{r} \Rightarrow Mg = \dfrac{mv^2}{r}$

$\therefore v = \left(\dfrac{Mgr}{m}\right)^{1/2}$



47:





$\therefore (T_1 + T_2)\cos\theta = \dfrac{mv^2}{R}$ (1)

$T_1 \sin\theta - T_2 \sin\theta = Mg$

$T_1 - T_2 = \dfrac{Mg}{\sin 30^\circ} = 2Mg \Rightarrow$ $T_2 = 35 - 2Mg$

$= 8.73\,N$

$T_1 = T_2 + 2Mg$ (2)

from (1) $\quad (T_2 + 2Mg + T_2)0.866 = \dfrac{1.34v^2}{1.42} \Rightarrow$ $v = 6.45\,m/s$