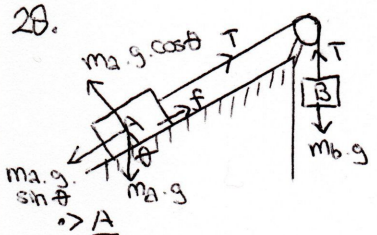
yohandi - assignment 5

28.



-> A

$\Sigma F = 0$

$m_a \cdot g \sin\theta - f - T = 0$

$m_a \cdot g \cdot \sin\theta = m_a \cdot g \cdot \cos\theta \cdot \mu + T$

-> B

$\Sigma F = 0$

$T - m_b \cdot g = 0$

$T = m_b \cdot g$

A & B

$m_a \cdot g \sin\theta = m_a \cdot g \cdot \cos\theta \cdot \mu + m_b \cdot g$

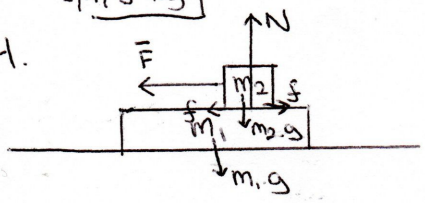
$m_b = \frac{m_a \cdot g (\sin\theta - \mu \cdot \cos\theta)}{g}$

$m_b = m_a (\sin\theta - \mu \cdot \cos\theta)$

$= 15 (\sin 30° - \frac{1}{5} \cdot \cos 30°)$ kg

$= \boxed{4,9 \text{ kg}}$

34.



a. -> 2

$\Sigma F = m \cdot a$

$-F + f = m_2 \cdot a_{21}$

$a_{21} = \frac{-F + m_2 \cdot g \cdot \mu}{m_2}$

$= \frac{-120 + 12 \cdot 9,8 \cdot 0,4}{12}$ m/s²

$= \boxed{-6,1 \text{ m/s}^2 (\leftarrow)}$

b. -> 1

$\Sigma F = m \cdot a$

$-f = m_1 \cdot a_{10}$

$a_{10} = -\frac{m_2 \cdot g \cdot \mu}{m_1}$

$= -\frac{12 \cdot 9,8 \cdot 0,4}{40}$ m/s² $\boxed{= -1,2 \text{ m/s}^2 (\leftarrow)}$

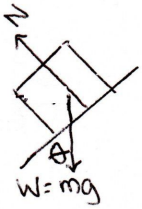
36. $\frac{F_{D1}}{F_{D2}} = \frac{\frac{1}{2} C_D \cdot A_1 \rho_1 v_1^2}{\frac{1}{2} \cdot C_D \cdot A_2 \cdot \rho_2 v_2^2}$

$= \frac{A_1 \rho_1 \cdot v_1^2}{A_2 \rho_2 (\frac{1}{4} v_1)^2}$

$= 16 \cdot \frac{4\pi(2)^2 \cdot 10,2)}{4\pi(3)^2 \cdot 0,7)}$

$= \boxed{\frac{128}{63}}$

56.

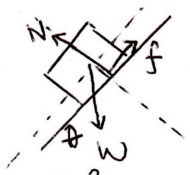


$\Sigma F_x = N \sin\theta = \frac{mv^2}{R}$

$\Sigma F_y = N \cos\theta - mg = 0$

$\tan\theta = \frac{v^2}{gR}$

$\theta = \tan^{-1}\left(\frac{v^2}{gR}\right) = 9,4°$



$F = \frac{mv^2}{R}$

$a_S = \frac{v^2}{R}$

$a_{Sx} = \frac{v^2}{R} \cdot \cos\theta$

$a_{Sy} = \frac{v^2}{R} \cdot \sin\theta$

$\Sigma F_x = mg \cdot \sin\theta - f = m \cdot a_{Sx}$

$f = m(g \cdot \sin\theta - \frac{v^2}{R} \cos\theta)$

$\Sigma F_y = N - mg \cdot \cos\theta = m \cdot a_{Sy}$

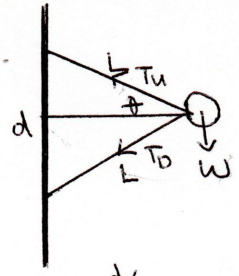
$N = m(g \cos\theta + \frac{v^2}{R} \cdot \sin\theta)$

$\mu_S = \frac{f}{N} = \frac{g \sin\theta - \frac{v^2}{R} \cos\theta}{g \cos\theta + \frac{v^2}{R} \cdot \sin\theta}$

$= \frac{9,8 \cdot \sin(9,4°) - \frac{11^2}{200} \cos(9,4°)}{9,8 \cos(9,4°) + \frac{11^2}{200} \sin(9,4°)}$

$= \boxed{0,10}$

59.



$\sin\theta = \frac{d/2}{L} = \frac{1}{2} \cdot \frac{d}{L}$

$\Sigma F_y = 0$

a. $T_D \cdot \sin\theta + W = T_U \cdot \sin\theta$

$T_D = \frac{T_U \cdot \sin\theta - W}{\sin\theta}$

$= T_U - \frac{2 \cdot W \cdot L}{d}$

$= 35 - \frac{2 \cdot 1,34 \cdot 9,8 \cdot 1,7}{1,7}$ N

$= \boxed{8,7 \text{ N}}$ (210° to the positive x-axis)

b. $\Sigma F = \Sigma F_x = T_D \cdot \cos\theta + T_U \cdot \cos\theta$

$= \cos\theta (T_D + T_U)$

$= \frac{1}{2}\sqrt{3} (8,7 + 35)$ N

$= \boxed{38 \text{ N}}$

c. $\Sigma F_x = \frac{mv^2}{R}$

$v = \sqrt{\frac{\Sigma F_x \cdot R}{m}}$

$= \sqrt{\frac{38 \cdot 1,47}{1,34}}$ m/s

$= \boxed{6,5 \text{ m/s}}$

d. Toward the center of rotation