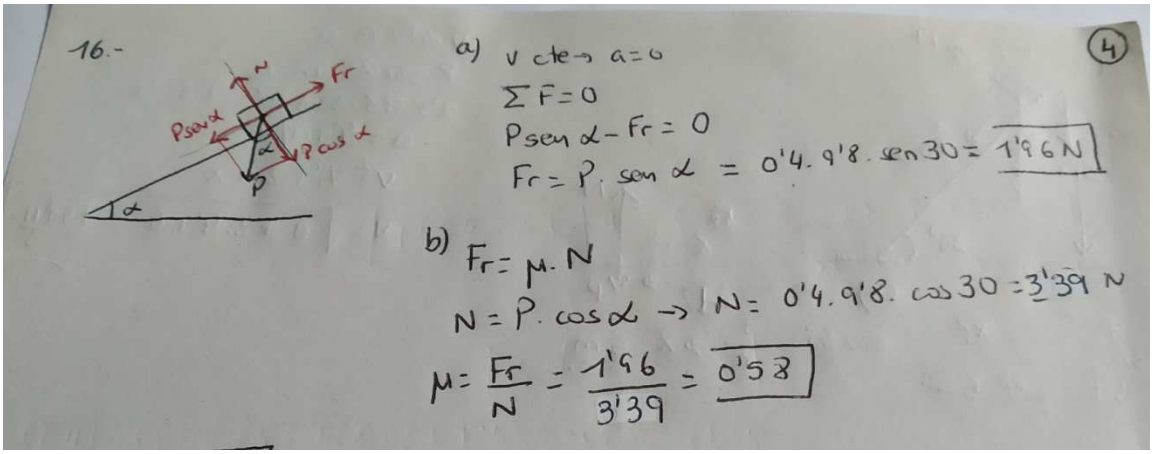
EXERCICIOS DINÁMICA

(DO 16 AO 21)



16.-

a) v cte → a = 0

$\Sigma F = 0$

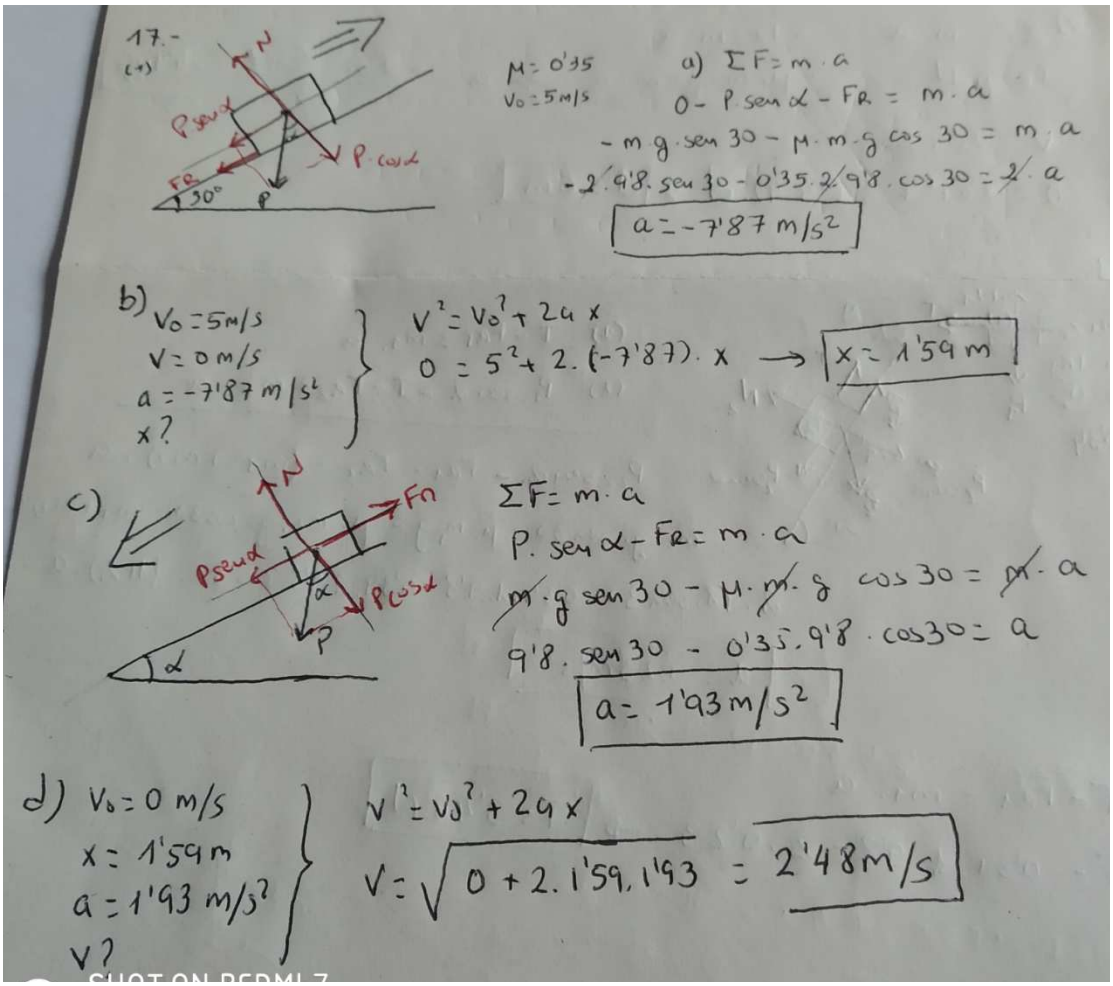
$P \operatorname{sen}\alpha - Fr = 0$

$Fr = P \cdot \operatorname{sen}\alpha = 0'4 \cdot 9'8 \cdot \operatorname{sen}30 = \boxed{1'96\ N}$

b) $Fr = \mu \cdot N$

$N = P \cdot \cos\alpha \rightarrow N = 0'4 \cdot 9'8 \cdot \cos 30 = 3'39\ N$

$\mu = \frac{Fr}{N} = \frac{1'96}{3'39} = \boxed{0'58}$



17.-

(+)

$\mu = 0'35$

$V_0 = 5\ m/s$

a) $\Sigma F = m \cdot a$

$0 - P \operatorname{sen}\alpha - Fr = m \cdot a$

$-m \cdot g \cdot \operatorname{sen}30 - \mu \cdot m \cdot g \cos 30 = m \cdot a$

$-9'8 \cdot \operatorname{sen}30 - 0'35 \cdot 9'8 \cdot \cos 30 = a$

$\boxed{a = -7'87\ m/s^2}$

b) $V_0 = 5\ m/s$, $V = 0\ m/s$, $a = -7'87\ m/s^2$, x?

$V^2 = V_0^2 + 2ax$

$0 = 5^2 + 2 \cdot (-7'87) \cdot x \rightarrow \boxed{x = 1'59\ m}$

c)

$\Sigma F = m \cdot a$

$P \cdot \operatorname{sen}\alpha - Fr = m \cdot a$

$m \cdot g \operatorname{sen}30 - \mu \cdot m \cdot g \cos 30 = m \cdot a$

$9'8 \cdot \operatorname{sen}30 - 0'35 \cdot 9'8 \cdot \cos 30 = a$

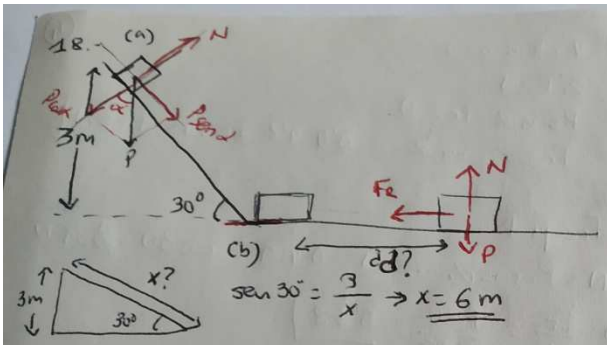
$\boxed{a = 1'93\ m/s^2}$

d) $V_0 = 0\ m/s$, $x = 1'59\ m$, $a = 1'93\ m/s^2$, V?

$V^2 = V_0^2 + 2ax$

$V = \sqrt{0 + 2 \cdot 1'59 \cdot 1'93} = \boxed{2'48\ m/s}$

18.



$\text{sen } 30° = \frac{3}{x} \rightarrow x = 6\,m$

a) $\Sigma F = m \cdot a$

$P \cdot \text{sen}\,\alpha = m \cdot a$

$25 \cdot 9'8 \cdot \text{sen } 30° = 25 \cdot a$

$a = 4'9\,m/s^2$

$v^2 = v_0^2 + 2ax$

$v = \sqrt{0 + 2 \cdot 4'9 \cdot 6} = 7'67\,\frac{m}{s}$

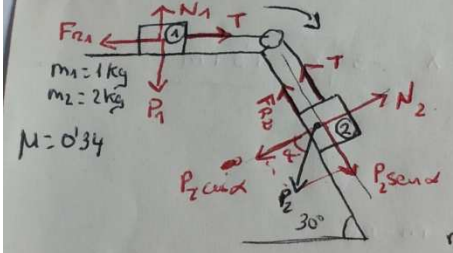
b) $\Sigma F = m \cdot a \qquad -F_R = m \cdot a$

$F_R = \mu \cdot N \qquad -\mu \cdot m \cdot g = m \cdot a \rightarrow a = \frac{-0'5 \cdot 25 \cdot 9'8}{25} = -4'9\,m/s^2$

$v^2 = v_0^2 + 2ax$

$0 = 7'67^2 + 2 \cdot (-4'9) \cdot d \rightarrow \boxed{d = 6\,m}$

19.



(1) $T - F_{R1} = m_1 \cdot a$

(2) $P_2 \cdot \text{sen}\,\alpha - T - F_{R2} = m_2 \cdot a$

$P_2 \cdot \text{sen}\,\alpha - F_{R1} - F_{R2} = (m_1 + m_2) \cdot a$

$m_2 \cdot g \cdot \text{sen } 30 - \mu \cdot m_1 g - \mu \cdot m_2 \cdot g \cdot \cos 30 = (m_1 + m_2)a$

$2 \cdot 9'8 \cdot \text{sen } 30 - 0'34 \cdot 1 \cdot 9'8 - 0'34 \cdot 2 \cdot 9'8 \cdot \cos 30 = (1+2) \cdot a$

$\boxed{a = 0'23\,m/s^2}$

$T - F_{R1} = m_1 \cdot a$

$T - 0'34 \cdot 1 \cdot 9'8 = 1 \cdot 0'23 \rightarrow \boxed{T = 3'46\,N}$

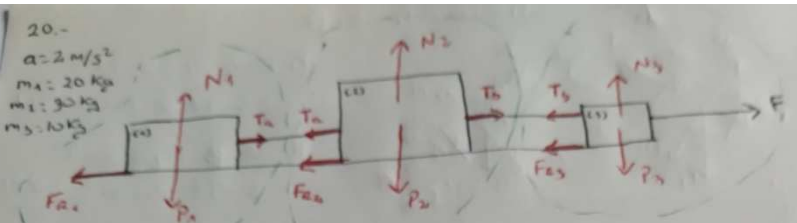
20.-

$a = 2\ m/s^2$

$m_1 = 20\ kg$

$m_2 = 30\ kg$

$m_3 = 10\ kg$



$T_a - F_{R1} = m_1 \cdot a$ $\quad T_b - T_a - F_{R2} = m_2 \cdot a$ $\quad F - T_b - F_{R3} = m_3 \cdot a$

$F_R = \mu \cdot N = \mu \cdot P = \mu \cdot m \cdot g$

~~$T_a - F_{R1} = m_1 \cdot a$~~

~~$T_b - T_a - F_{R2} = m_2 \cdot a$~~

~~$F - T_b - F_{R3} = m_3 \cdot a$~~

$F - F_{R1} - F_{R2} - F_{R3} = (m_1 + m_2 + m_3) \cdot a$

$F - \mu \cdot m_1 \cdot g - \mu \cdot m_2 \cdot g - \mu \cdot m_3 \cdot g = (m_1 + m_2 + m_3) \cdot a$

$F - \mu \cdot g (m_1 + m_2 + m_3) = (m_1 + m_2 + m_3) \cdot a$

$F - 0'2 \cdot 9'8 (20 + 30 + 10) = (20 + 30 + 10) \cdot 2$

$\boxed{F = 237'6\ N}$

$T_a - F_{R1} = m_1 \cdot a \rightarrow T_a - \mu \cdot m_1 \cdot g = m_1 \cdot a$

$T_a - 0'2 \cdot 20 \cdot 9'8 = 20 \cdot 2$

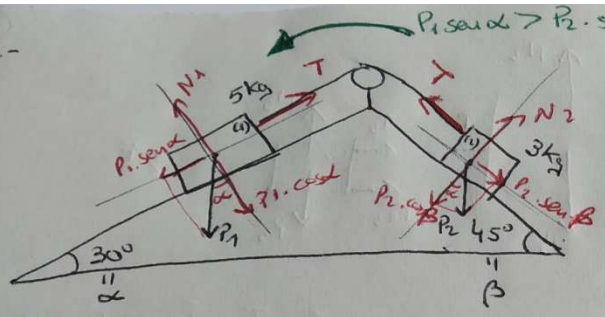
$\boxed{T_a = 79'2\ N}$

$F - T_b - F_{R3} = m_3 \cdot a \rightarrow F - T_b - \mu \cdot m_3 \cdot g = m_3 \cdot a$

$237'6 - T_b - 0'2 \cdot 10 \cdot 9'8 = 10 \cdot 2$ $\quad \boxed{T_b = 198\ N}$

21.-

$P_1 \cdot \operatorname{sen}\alpha > P_2 \cdot \operatorname{sen}\beta$



$P_1 \cdot \operatorname{sen}\alpha = m_1 \cdot g \cdot \operatorname{sen} 30 =$

$= 5 \cdot 9'8 \cdot \operatorname{sen} 30 = 24'5\ N$

$P_2 \cdot \operatorname{sen}\beta = m_2 \cdot g \cdot \operatorname{sen} 45$

$= 3 \cdot 9'8 \cdot \operatorname{sen} 45 = 20'8\ N$

(1) $P_1 \cdot \operatorname{sen}\alpha - T = m_1 \cdot a$

(2) ~~T~~ $- P_2 \cdot \operatorname{sen}\beta = m_2 \cdot a$

$P_1 \cdot \operatorname{sen}\alpha - P_2 \cdot \operatorname{sen}\beta = (m_1 + m_2) \cdot a$

$24'5 - 20'8 = (5 + 3) \cdot a \rightarrow \boxed{a = 0'46\ m/s^2}$

$P_1 \cdot \operatorname{sen}\alpha - T = m_1 \cdot a$

$24'5 - T = 5 \cdot 0'46 \rightarrow \boxed{T = 22'2\ N}$