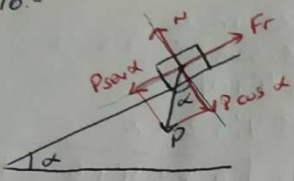


EXERCÍCIOS DINÂMICA

(DO 16 AO 21)

16.-



a) $v \text{ cte} \rightarrow a = 0$

$\Sigma F = 0$

$P \sin \alpha - F_r = 0$

$F_r = P \cdot \sin \alpha = 0'4 \cdot 9'8 \cdot \sin 30 = \boxed{1'96 \text{ N}}$

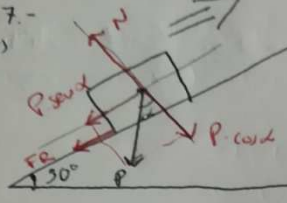
b) $F_r = \mu \cdot N$

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

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

17.-

(+)



$M = 0'35$

$v_0 = 5 \text{ m/s}$

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

$0 - P \sin \alpha - F_r = m \cdot a$

$- m \cdot g \cdot \sin 30 - \mu \cdot m \cdot g \cdot \cos 30 = m \cdot a$

$- 2 \cdot 9'8 \cdot \sin 30 - 0'35 \cdot 2 \cdot 9'8 \cdot \cos 30 = 2 \cdot a$

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

b) $v_0 = 5 \text{ m/s}$

$v = 0 \text{ m/s}$

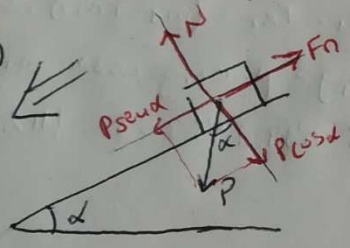
$a = -7'87 \text{ m/s}^2$

$x?$

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

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

c)



$\Sigma F = m \cdot a$

$P \sin \alpha - F_r = m \cdot a$

$m \cdot g \sin 30 - \mu \cdot m \cdot g \cos 30 = m \cdot a$

$9'8 \cdot \sin 30 - 0'35 \cdot 9'8 \cdot \cos 30 = a$

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

d) $v_0 = 0 \text{ m/s}$

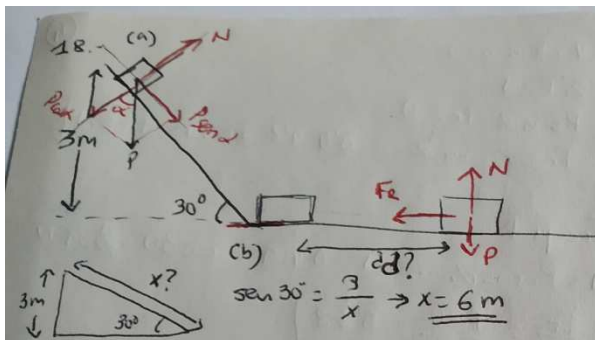
$x = 1'59 \text{ m}$

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

$v?$

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

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



$$\begin{aligned} a) \Sigma F &= m \cdot a \\ P \sin \alpha &= m \cdot a \\ 2'5 \cdot 9'8 \cdot \sin 30^\circ &= 2'5 \cdot a \\ a &= 4'9 \text{ m/s}^2 \\ v^2 &= v_0^2 + 2 a x \\ v &= \sqrt{0 + 2 \cdot 4'9 \cdot 6} = 7'67 \frac{\text{m}}{\text{s}} \end{aligned}$$

$$\begin{aligned} b) \Sigma F &= m \cdot a & - F_e &= m \cdot a \\ F_e &= \mu \cdot N & - \mu \cdot m \cdot g &= m \cdot a \rightarrow a = \frac{-0'5 \cdot 2'5 \cdot 9'8}{2'5} = -4'9 \text{ m/s}^2 \\ v^2 &= v_0^2 + 2 a x \\ 0 &= 7'67^2 + 2 \cdot (-4'9) \cdot d \rightarrow \boxed{d = 6 \text{ m}} \end{aligned}$$

19.

Diagram for problem 19 showing two blocks connected by a string over a pulley. Block 1 is on a horizontal surface, and Block 2 is on a 30-degree incline. Forces N_1 , T , F_{R1} , P_1 , N_2 , T , F_{R2} , $P_2 \sin \alpha$, and $P_2 \cos \alpha$ are shown.

$m_1 = 1 \text{ kg}$
 $m_2 = 2 \text{ kg}$
 $\mu = 0'34$

$$\begin{aligned} (1) \quad T - F_{R1} &= m_1 \cdot a \\ (2) \quad P_2 \sin \alpha - T - F_{R2} &= m_2 \cdot a \\ \hline P_2 \sin \alpha - F_{R1} - F_{R2} &= (m_1 + m_2) \cdot a \\ m_2 \cdot g \cdot \sin 30 - \mu \cdot m_1 \cdot g - \mu \cdot m_2 \cdot g \cdot \cos 30 &= (m_1 + m_2) \cdot a \\ 2 \cdot 9'8 \cdot \sin 30 - 0'34 \cdot 1 \cdot 9'8 - 0'34 \cdot 2 \cdot 9'8 \cdot \cos 30 &= (1 + 2) \cdot a \\ \boxed{a = 0'23 \text{ m/s}^2} \end{aligned}$$

$$\begin{aligned} T - F_{R1} &= m_1 \cdot a \\ T - 0'34 \cdot 1 \cdot 9'8 &= 1 \cdot 0'23 \rightarrow \boxed{T = 3'46 \text{ N}} \end{aligned}$$

20.-
 $a = 2 \text{ m/s}^2$
 $m_1 = 20 \text{ kg}$
 $m_2 = 30 \text{ kg}$
 $m_3 = 10 \text{ kg}$

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

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

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

$F - f_{R1} - f_{R2} - f_{R3} = (m_1 + m_2 + m_3) \cdot a$
 $F - \mu \cdot m_1 \cdot g - \mu \cdot m_2 \cdot g - \mu \cdot m_3 \cdot g = (m_1 + m_2 + m_3) \cdot a$
 $F - \mu \cdot g (m_1 + m_2 + m_3) = (m_1 + m_2 + m_3) \cdot a$
 $F - 0'2 \cdot 9'8 (20 + 30 + 10) = (20 + 30 + 10) \cdot 2$

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

$T_a - f_{R1} = m_1 \cdot a \rightarrow T_a - \mu \cdot m_1 \cdot g = m_1 \cdot a$
 $T_a - 0'2 \cdot 20 \cdot 9'8 = 20 \cdot 2$

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

$F - T_b - f_{R3} = m_3 \cdot a \rightarrow F - T_b - \mu \cdot m_3 \cdot g = m_3 \cdot a$
 $237'6 - T_b - 0'2 \cdot 10 \cdot 9'8 = 10 \cdot 2$

$T_b = 198 \text{ N}$

SHOT ON REDMI 7 AI DUAL CAMERA

21.-

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

$P_1 \cdot \text{sen } \alpha = m_1 \cdot g \cdot \text{sen } 30 =$
 $= 5 \cdot 9'8 \cdot \text{sen } 30 = 24'5 \text{ N}$

$P_2 \cdot \text{sen } \beta = m_2 \cdot g \cdot \text{sen } 45$
 $= 3 \cdot 9'8 \cdot \text{sen } 45 = 20'8 \text{ N}$

$(1) \quad P_1 \cdot \text{sen } \alpha - T = m_1 \cdot a$
 $(2) \quad T - P_2 \cdot \text{sen } \beta = m_2 \cdot a$

$P_1 \cdot \text{sen } \alpha - P_2 \cdot \text{sen } \beta = (m_1 + m_2) \cdot a$
 $24'5 - 20'8 = (5 + 3) \cdot a \rightarrow a = 0'46 \text{ m/s}^2$

$P_1 \cdot \text{sen } \alpha - T = m_1 \cdot a$
 $24'5 - T = 5 \cdot 0'46 \rightarrow T = 22'2 \text{ N}$