LISTA Ø3 — RESOLUÇÃO

1) a) $S = S_0 + \cancel{V_0 t}^{\,0} + \frac{1}{2} a t^2$ $V_0 = 0$

$\Delta S = S - S_0 = 2,5\,cm = 0,025\,m$

$\Delta S = \frac{1}{2} a \Delta t^2$ $\Delta t = t = 25\,ms = 0,025\,s$

$$a = \frac{2\Delta S}{\Delta t^2} = \frac{2(0,025\,m)}{(0,025\,s)^2} \Rightarrow a = 80\,m/s^2$$

b) $V = \underbrace{\cancel{V_0}}_{0} + at \Rightarrow V = (80\,m/s^2)(0,025\,s)$

$$V = 2\,m/s$$

c) $V^2 = V_0^2 + 2a\Delta S \Rightarrow 0 = (2\,m/s)^2 - 2(9,8\,m/s^2) H_{MAX}$

$\Delta S = H_{MAX}$

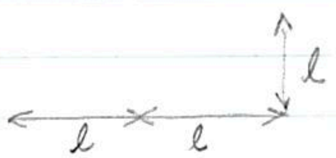
$$H_{MAX} = \frac{(2\,m/s)^2}{2(9,8\,m/s^2)}$$

$$H_{MAX} \cong 0,2\,m$$

2) PERNA → COMPRIMENTO ℓ $\therefore\ \ell \rightarrow \frac{T}{2}$

T' → TEMPO PARA 2 PASSOS

N: PASSOS / TEMPO $= \ell/(T/2) \propto \ell/T'$ $V_C = N\ell \propto \frac{\ell}{\sqrt{\ell}} \propto \sqrt{\ell}$

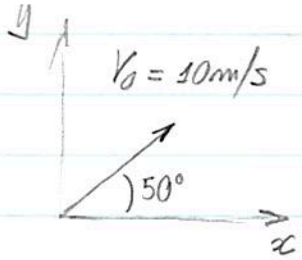


$T' \propto \sqrt{\ell}$ $V_C \propto \sqrt{\ell}$

SE COMPARAMOS 2 PESSOAS $\ell \Rightarrow L$ $L = \frac{1,8}{1,5}$

$$\frac{V_2}{V_1} = \frac{\sqrt{\ell_2}}{\sqrt{\ell_1}} \Rightarrow \frac{V_2}{V_1} \sim 1,095$$

3)



ALCANCE: $g = 9,8\, m/s^2$

$R = 2 V_{0x} t_H$

$R = \dfrac{2 V_0 \cos 50° V_0 \operatorname{sen} 50°}{g}$

$R = \dfrac{V_0^2 \operatorname{sen} 100°}{g}$

$R \cong 10,05\, m$

x) $V_{0x} = V_0 \cos 50°$

$x = V_{0x} t$

y) $V_{0y} = V_0 \operatorname{sen} 50°$

$y = y_0 + V_{0y} t - \frac{1}{2} g t^2$

$V_y = V_{0y} - g t$

$V_y = 0 \qquad t_H = \dfrac{V_0 \operatorname{sen} 50°}{g}$

$H = \dfrac{V_0^2 \operatorname{sen}^2 \theta}{2g} \cong 2,99\, m$

$V_{0x} = 6,43\, m/s$

CICLISTA $\Rightarrow$ 5 m/s

4) $F = 600\, N \qquad A_1 = 50\, cm^2 = 50 \times 10^{-4}\, m^2$

$A_2 = 0,5\, cm^2 = 0,5 \times 10^{-4}\, m^2$

$T_1 = \dfrac{600 N}{50 \times 10^{-4} m^2} = 1,2 \times 10^5 \dfrac{N}{m^2}$

$T_2 = \dfrac{600 N}{0,5 \times 10^{-4} m^2} = 1,2 \times 10^7 \dfrac{N}{m^2}$

5) MÓDULO DE YOUNG $\Rightarrow Y = \dfrac{\text{TENSÃO}}{\text{DEFORMAÇÃO}} = \dfrac{F/A}{\Delta l / l}$

$A = \pi (0,04)^2\, m^2$

$A \cong 0,005\, m^2$

$\left.\begin{array}{l} \Delta l = 0,05\, m \\ l = 0,2\, m \end{array}\right\} \dfrac{\Delta l}{l} = 0,25 \qquad F_1 = 25 N \quad F_2 = 500 N$

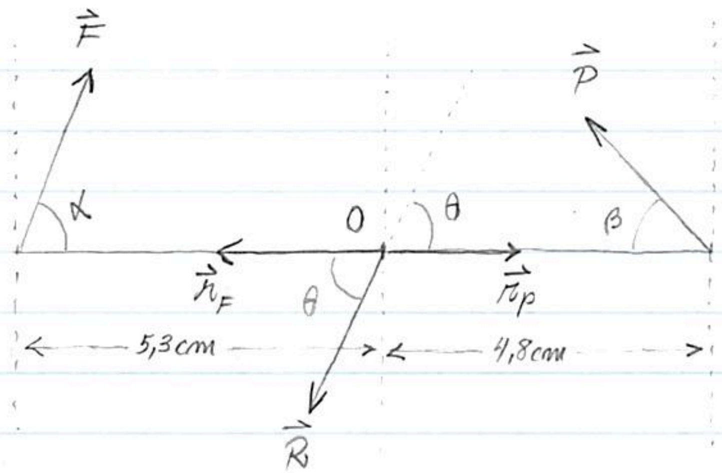
1) $Y_1 = \dfrac{(25)/(0,005)}{0,25}$

$Y_1 = 2 \times 10^4 \dfrac{N}{m^2}$

2) $Y_2 = \dfrac{(500)/(0,005)}{0,25}$

$Y_2 = 4 \times 10^5 \dfrac{N}{m^2}$

6)



$\alpha = 80°$
$\beta = 45°$
$|\vec{P}| = 446\,N$

EQUILÍBRIO TRANSLACIONAL:

EM Y $\quad F\,sen\alpha - R\,sen\theta + P\,sen\beta = 0 \quad (1)$

EM X $\quad F\cos\alpha - R\cos\theta - P\cos\beta = 0 \quad (2)$

EQUILÍBRIO ROTACIONAL:

$$\vec{r}_F \times \vec{F} + \vec{r}_p \times \vec{P} = 0 \qquad \text{(EM RELAÇÃO A O)}$$

$$(4{,}8)\,P\,sen\beta - (5{,}3)\,F\,sen\alpha = 0$$

$$F = \frac{(4{,}8)\,P\,sen\beta}{(5{,}3)\,sen\alpha} = \frac{(4{,}8)(446)\,sen\,45°}{(5{,}3)\,sen\,80°}$$

$\therefore$

$$F \cong 290\,N \qquad (3)$$

DE (1) e (2) TEMOS:

$$R\,sen\theta = F\,sen\alpha + P\,sen\beta \qquad (4)$$
$$R\cos\theta = F\cos\alpha - P\cos\beta \qquad (5)$$

$\therefore$

$$R\,sen\theta = (290)\,sen\,80° + (446)\,sen\,45°$$
$$R\cos\theta = (290)\cos 80° - (446)\cos 45°$$
$$R\,sen\theta \cong 601$$
$$R\cos\theta \cong -265$$

QUADRANDO E SOMANDO:

$$R^2 = 431426$$

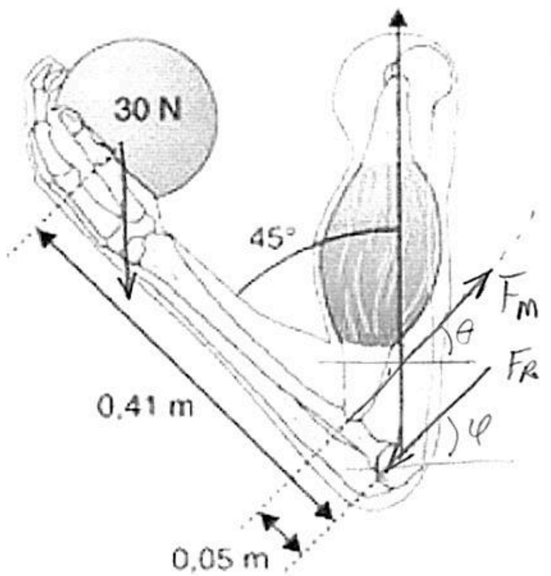
$$R \cong 657\,N$$

IGNORANDO $P\cos\beta$ EM (2)

$$R^2 \cong 363737$$

$$R \cong 603\,N$$

7)

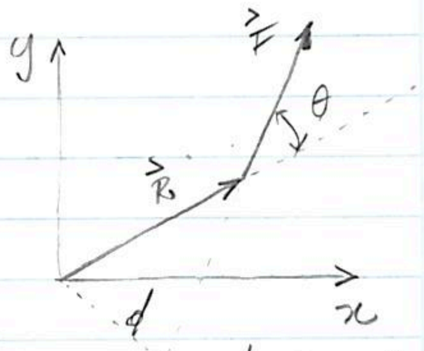


MOMENTO OU TORQUE:

$$\vec{\tau} = \vec{M} = \vec{R} \times \vec{F}$$

INTENSIDADE

$$M = RF\,\text{sen}\,\theta$$



$d = R\,\text{sen}\,\theta$

a) CONDIÇÕES DE EQUILÍBRIO

Em x $\quad F_M \cos\theta = F_R \cos\varphi$

Em y $\quad F_M \sin\theta = F_R \sin\varphi + 30\,N$

TORQUE $\quad (0{,}05)\,F_M \sin\theta = (0{,}41)(30)$; com $\theta = 45°$

$$F_M \cong 347{,}9\ N$$

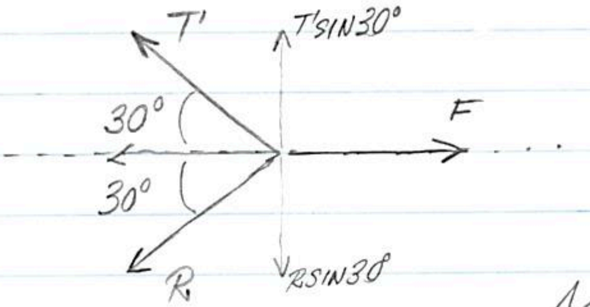
b)
$$F_R \cos\varphi = (347{,}9)\cos 45° \cong 246\,N$$
$$F_R \sin\varphi = (347{,}9)\sin 45° - 30 \cong 216\,N$$

QUADRANDO E SOMANDO:

$$F_R = \sqrt{(246)^2 + (216)^2}$$

$$F_R \cong 327{,}4\ N$$

8)



NO EQUILÍBRIO

$F = T\cos 30° + R_1 \cos 30°$

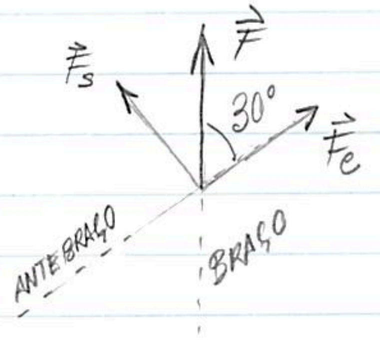
AGORA $R_1 = mg = (3,6)(9,81)\,N$

$T\sin 30° = R_1 \sin 30° \Longrightarrow R_1 = T$

$\therefore \quad F = 2R\cos 30°$

$F = 61,17\,N$

9)



$|\vec{F}| = 70\,N$

a) $F_e = 70\cos 30° \cong 60,6\,N$

b) $F_s = 70\sin 30° = 35\,N$

10) UTILIZANDO A TABELA 3.1 (MATERIAL DE APOIO)

$M = 70\,kg$ MASSA DE CADA PARTE

$H = 1,80\,m$

COXAS $= 0,215 \times 70 = 15,05$

PERNAS $= 0,096 \times 70 = 6,72$

PÉS $= 0,034 \times 70 = 2,38$

COORDENADAS ILÍACO-FEMORAIS

$y_0 = (0,0504)(1,80) = 0,09072\,m$ $\quad y_{cm} = 0,46\,m$

$z_0 = (0,5213)(1,80) = 0,93834\,m$ $\quad z_{cm} = 0,94\,m$

COORDENADAS HORIZONTAIS:

COXAS: $y_1 = y_0 + (0,5213 - 0,4248)(1,80) = 0,26442$

PERNAS: $y_2 = y_0 + (0,5213 - 0,1819)(1,80) = 0,70164$

PÉS: $y_3 = y_0 + (0,513 - 0,0178)(1,80) = 0,99702$

$y_{cm} = (0,26442)(15,05) + (0,70164)(6,72) + (0,99702)(2,38) / (24,15) = 0,46\,m$