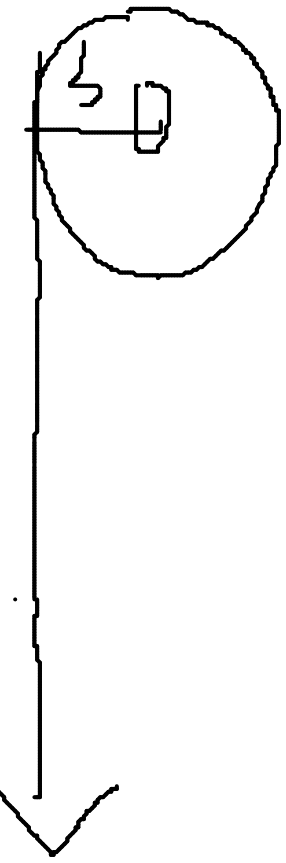
$r = 7,5\,cm$

$m = 83\,kg$

$M = ?$

$r = 7,5\,cm = 0,075\,m$



$F_p = mg = 83\,kg \cdot 9,8\,\frac{N}{kg} = 813\,N$

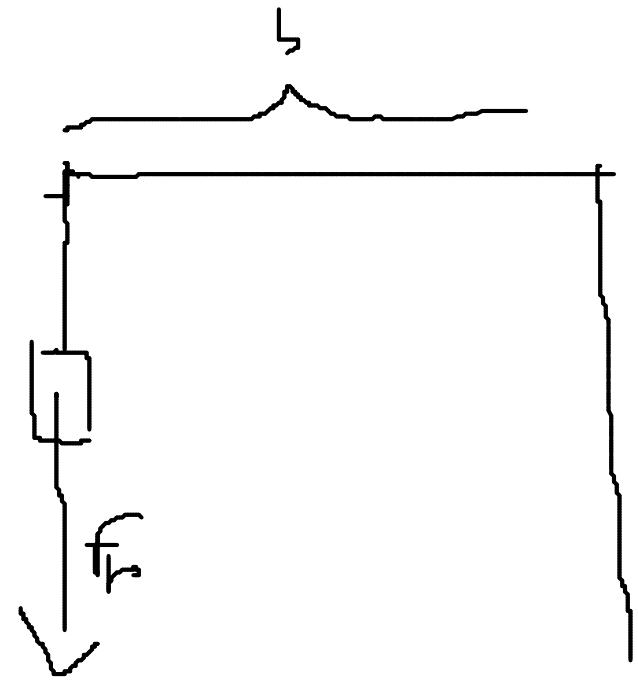
$M = F \cdot b = 813\,N \cdot 0,075\,m = 61\,N \cdot m$

$b = 23\,m$

$m_c = 50\,kg$

$m_z = 340\,kg$

$F_{p,n} = ?$



$$F_c = mg = 50\,kg \cdot 9{,}8\,\frac{N}{kg} = 490\,N$$

$$F_z = mg = 340\,kg \cdot 9{,}8\,\frac{N}{kg} = 3332\,N$$

$$F_{p_n} = 490\,N + 3332\,N = 3{,}8 \cdot 10^3\,N$$

$$M = F \cdot b = 3{,}8 \cdot 10^3\,N \cdot 23\,m = 8{,}7 \cdot 10^5\,N \cdot m$$

$$M_2 = 72 \cdot 10^3 \ N \cdot m$$

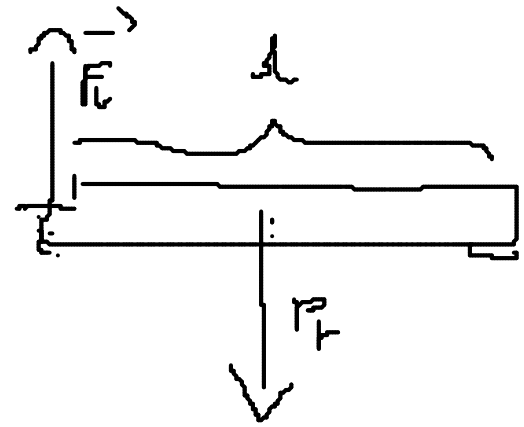
$$b_2 = ?$$

$$b_2 = \frac{M_2}{F} = \frac{72 \cdot 10^3 \ N \cdot m}{3{,}8 \cdot 10^3 \ N} \approx 19 \ m$$

$d = 80\ cm$

$m = 31\ kg$

$F_p = ?$

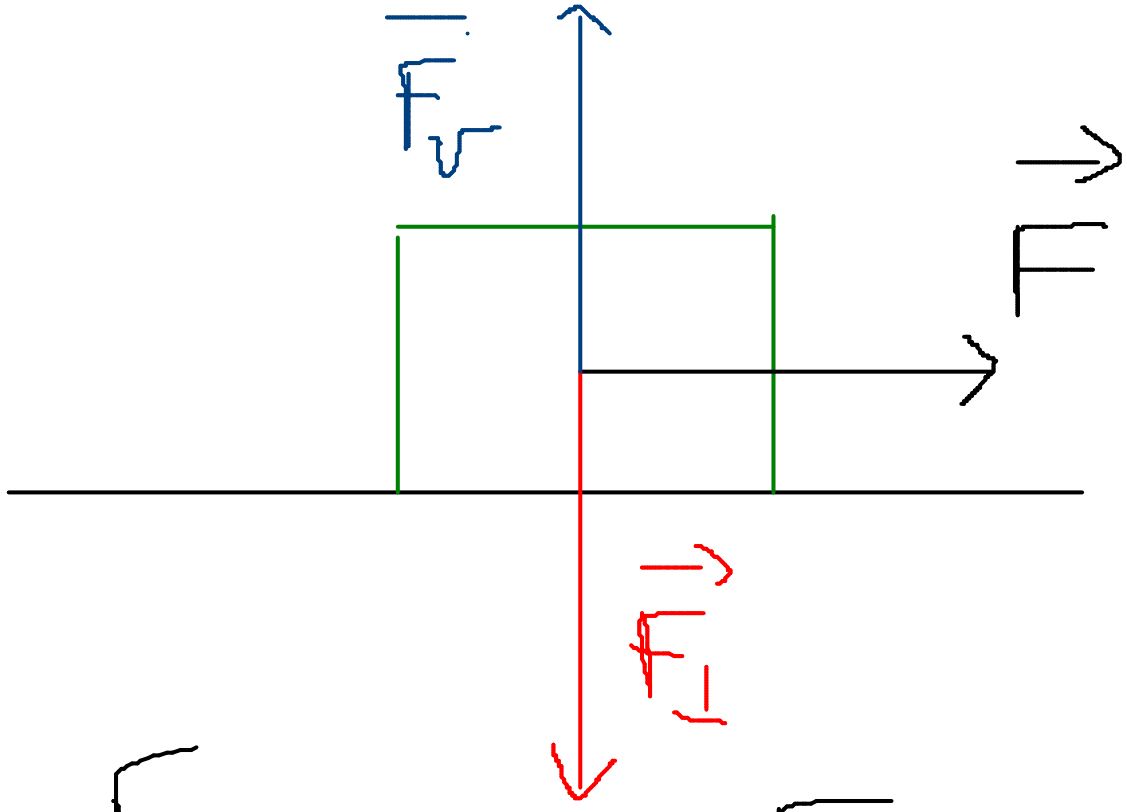


$F_p = mg = 31\ kg \cdot 9{,}8 \frac{N}{kg} \approx 300\ N$

$b_1 = \frac{80\ cm}{2} = 40\ cm = 0{,}4\ m$

$M = F \cdot b_1 = 300\ N \cdot 0{,}4\ m = 120\ N \cdot m$

$F_L = \frac{M}{d} = \frac{120\ N \cdot m}{0{,}8\ m} = 150\ N$



$$f_{max} = \mu_s F_\perp$$

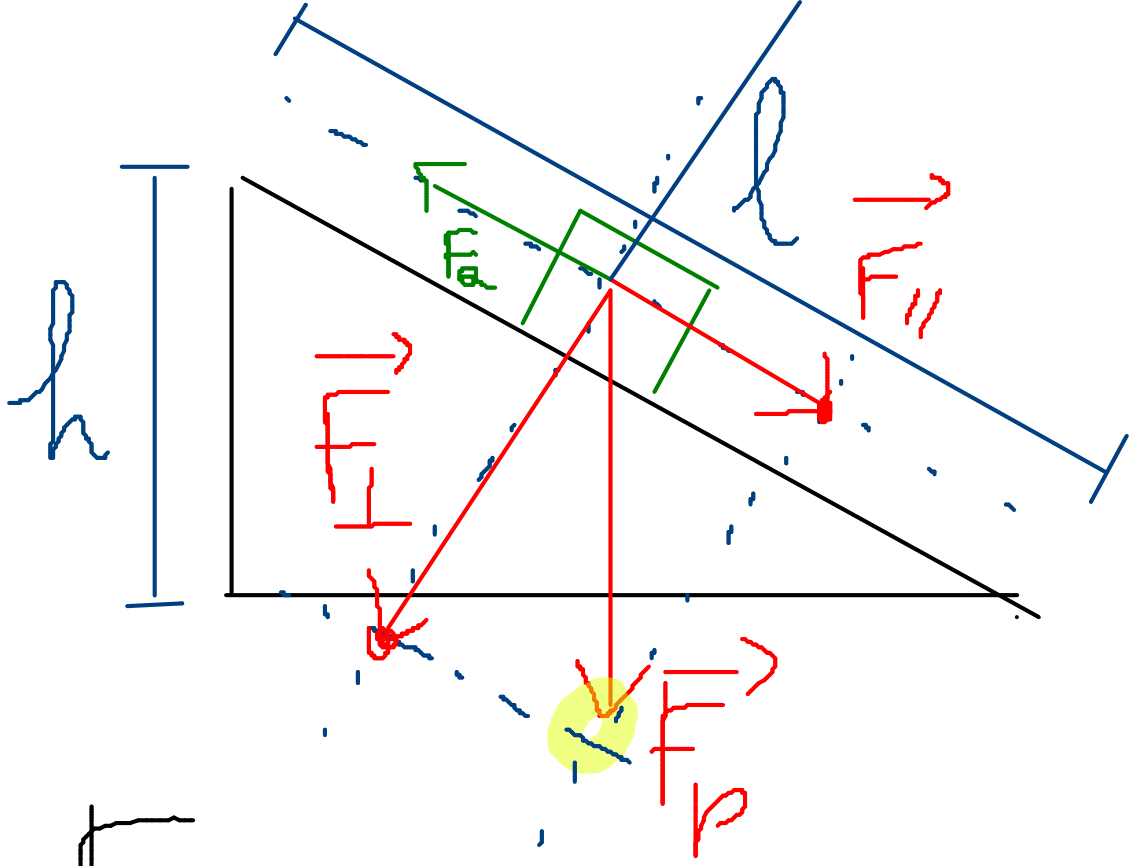
$$f_\perp = f_p = mg$$

$$\mu_s = 0{,}70$$

$$m = 80\,kg$$

$$F = ?$$

$$F \geq F_{max} = \mu_s m g$$



$$\mu_s = 0{,}85$$

$$l = 10\,m$$

$$l = 100\,m$$

$$F_{max} = \mu_s F_\perp$$

$$m = 5{,}0\,kg$$

$$\frac{F_{//}}{h} = \frac{F_p}{l} \Longrightarrow$$

$$F_{//} = F_r \frac{h}{l}$$

$$F_{\perp} = \sqrt{F_p^2 - F_{//}^2} = \sqrt{F_p^2 - \left(F_p \frac{l}{l}\right)^2}$$

$$= \sqrt{F_p^2 \left(1 - \left(\frac{l}{l}\right)^2\right)} = F_p \sqrt{1 - \left(\frac{l}{l}\right)^2}$$

$$F_{max} = \mu_s F_{\perp} = \mu_s F_p \sqrt{1 - \left(\frac{l}{l}\right)^2}$$

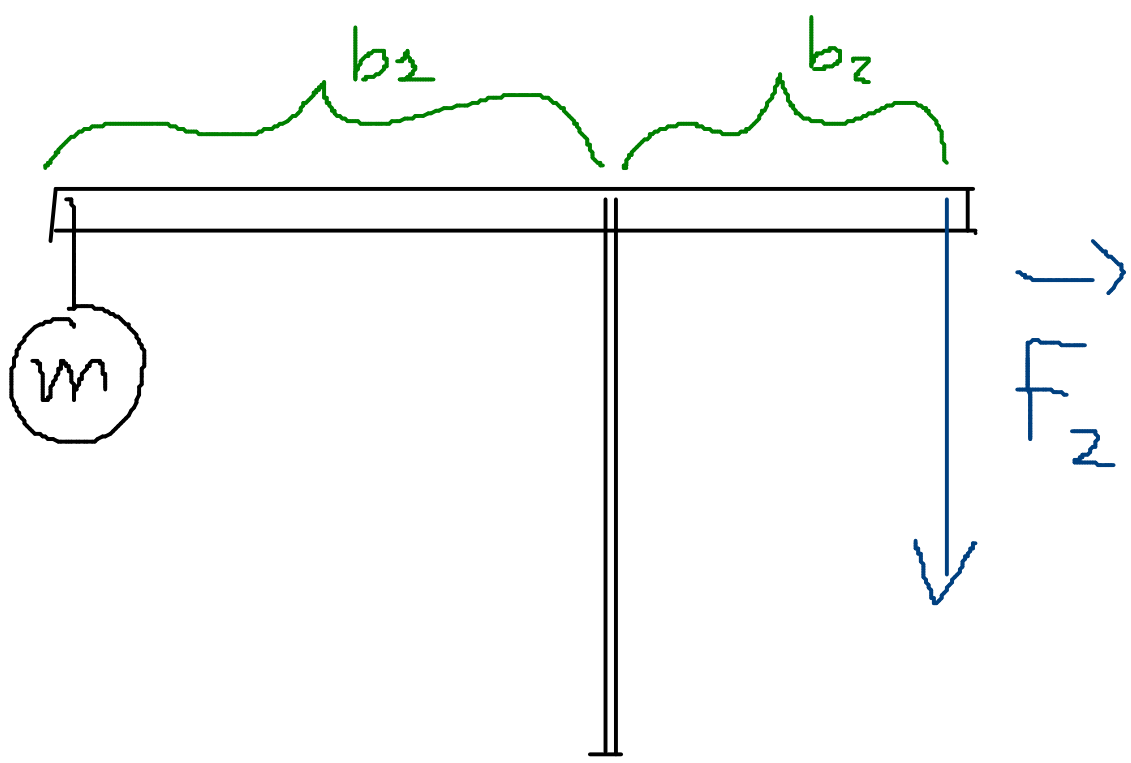
$$\frac{F_{max}}{F_1} = \frac{\mu_s F_p \sqrt{1-\left(\frac{h}{\ell}\right)^2}}{F_p \frac{h}{\ell}} = \mu_s \frac{\ell}{h}\sqrt{1-\left(\frac{h}{\ell}\right)^2}$$

$$= \mu_s \frac{\sqrt{\ell^2-h^2}}{h} = 0{,}85 \frac{\sqrt{160^2-10^2}\ m}{10\ m}$$

$$= 0{,}85 \frac{\sqrt{9900}}{10} = 8{,}4$$

$$l\sqrt{1-\left(\frac{l}{l}\right)^2} = \sqrt{l^2\left(1-\frac{l^2}{l^2}\right)}$$

$$= \sqrt{l^2 - l^2\frac{l^2}{l^2}} = \sqrt{l^2 - l^2}$$



$$F_2 = 150\ N$$

$$m = ?$$

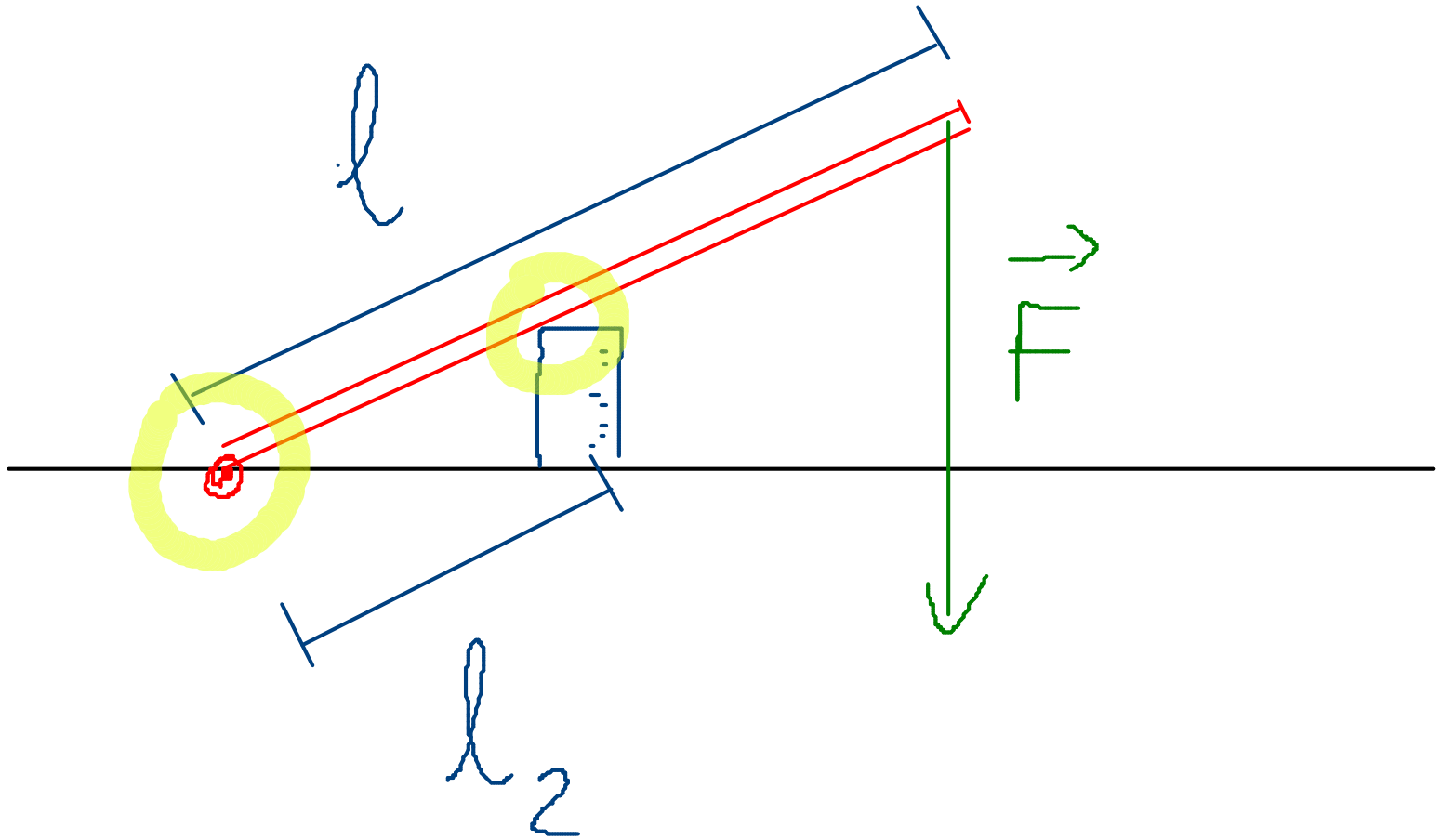
$$b_1 = 20\ cm$$

$$b_2 = 80\ cm$$

$$M_1 = M_2$$

$$mg\, b_1 = b_2 F_2 \Rightarrow m = \frac{b_2}{b_1}\frac{F_2}{g}$$

$$\frac{F_1}{F_2} = \frac{b_2}{b_1}$$



$F = 30\,N$

$l = 40\,cm$

$F_2 = 70\,N$

$F\,l = F_2 \cdot l_2$

$l_2 = ?$