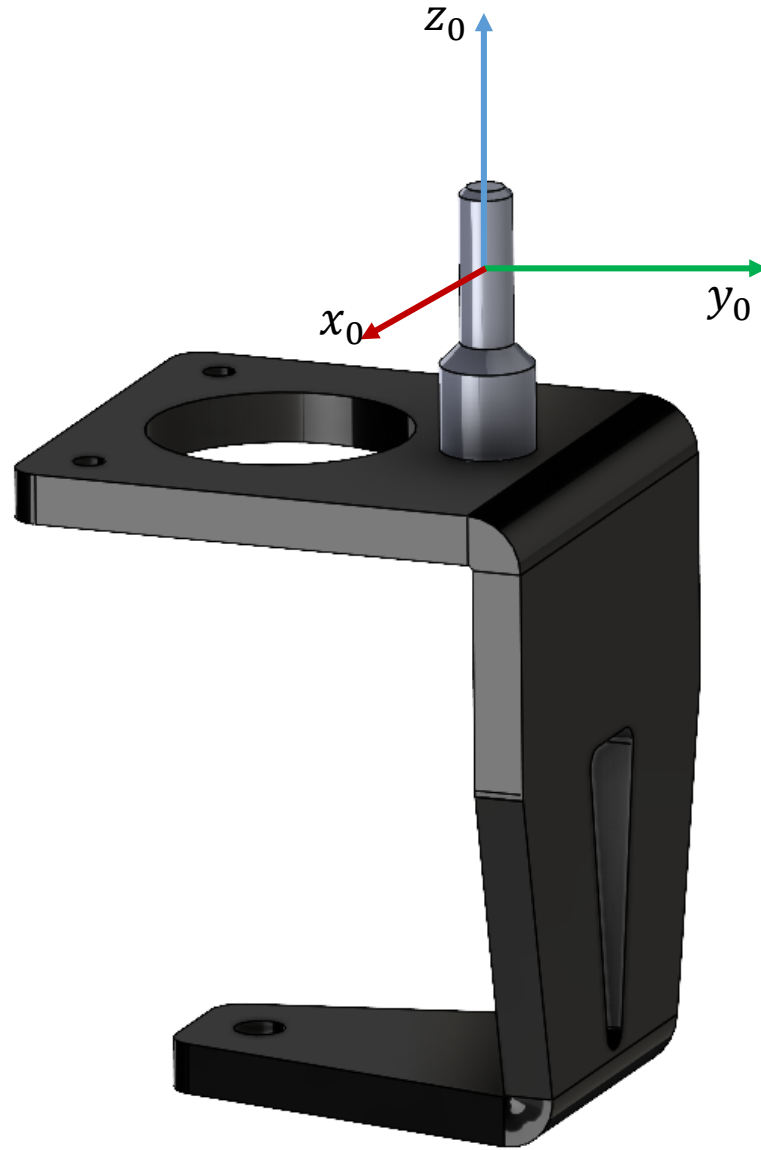


Kinova

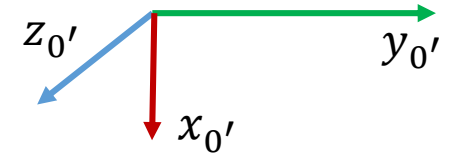
Modèle dynamique

Base



Denavit-Hartenberg

$$R_{y_0, \pi/2}$$



Solide 1



$$I(G_1, S_1) = \begin{bmatrix} I_{xx_1} & 0 & 0 \\ 0 & I_{yy_1} & 0 \\ 0 & 0 & I_{zz_1} \end{bmatrix}_{(\vec{x}_1, \vec{y}_1, \vec{z}_1)}$$

$$\begin{aligned} I_{xx_1} &= 15449.15 \text{ kg} \cdot \text{mm}^2 \\ I_{yy_1} &= 328261.04 \text{ kg} \cdot \text{mm}^2 \\ I_{zz_1} &= 329660.90 \text{ kg} \cdot \text{mm}^2 \end{aligned}$$

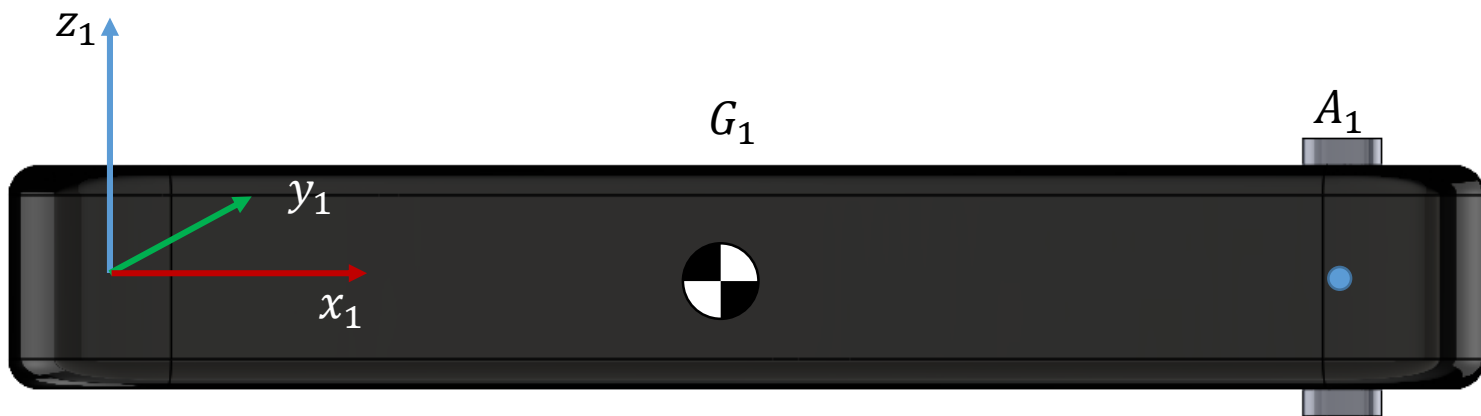
$$\begin{aligned} \overrightarrow{O_1 G_1} &= b_1 \vec{x}_1 \\ \overrightarrow{O_1 A_1} &= l_1 \vec{x}_1 \end{aligned}$$

$$b_1 = 61,11 \text{ mm}$$

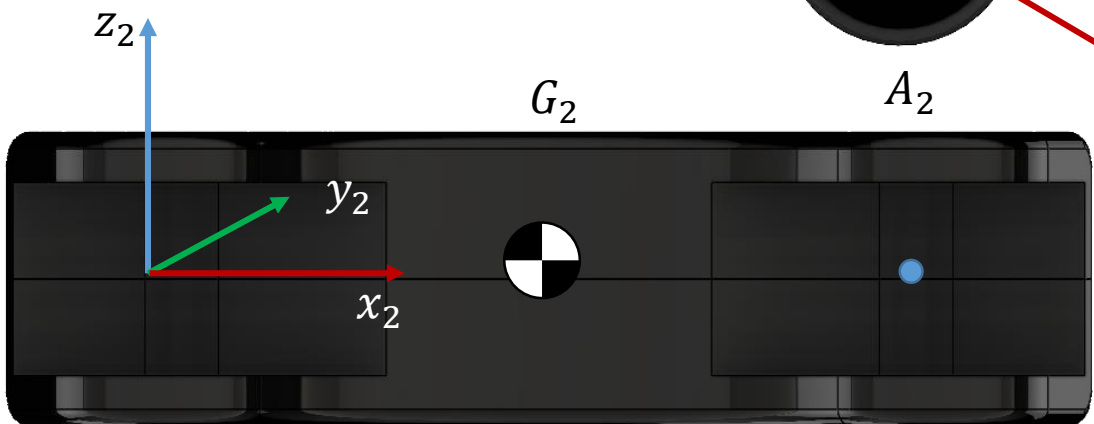
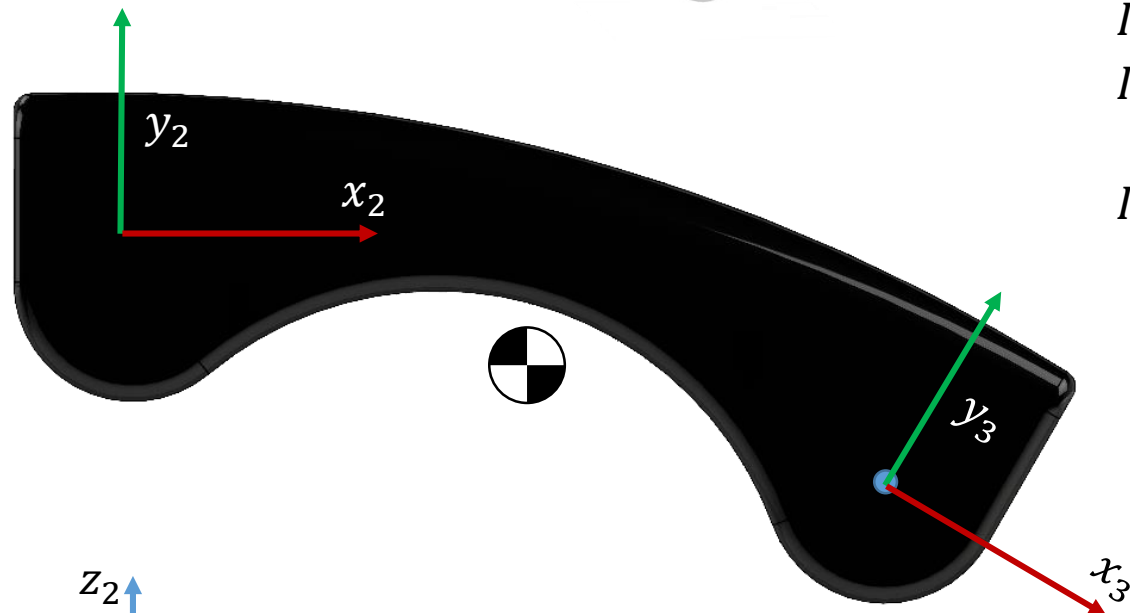
$$l_1 = 120 \text{ mm}$$

$$m_1 = 0,172 \text{ kg}$$

$$V_1 = 76225.68 \text{ mm}^3$$



Solide 2



$$I(G_2, S_2) = \begin{bmatrix} I_{xx_2} & I_{xy_2} & 0 \\ I_{xy_2} & I_{yy_2} & 0 \\ 0 & 0 & I_{zz_2} \end{bmatrix}_{(\vec{x}_2, \vec{y}_2, \vec{z}_2)}$$

$$I_{xx_2} = 4.434e - 05 \text{ kg.m}^2$$

$$I_{yy_2} = 2.0119e - 04 \text{ kg.m}^2$$

$$I_{zz_2} = 2.0547e - 04 \text{ kg.m}^2$$

$$I_{xy_2} = -4.528e - 05 \text{ kg.m}^2$$

$$\overrightarrow{O_2 G_2} = a_2 \vec{x}_2 + b_2 \vec{y}_2$$

$$\overrightarrow{O_2 A_2} = l_{21} \vec{x}_2 + l_{22} \vec{y}_2$$

$$a_2 = 0.0476925 \text{ m}$$

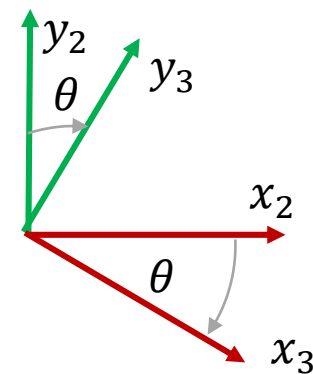
$$b_2 = 0.00114713 \text{ m}$$

$$l_{21} = 0.08842 \text{ m}$$

$$l_{22} = 0.02369 \text{ m}$$

$$m_2 = 0.164 \text{ kg}$$

$$V_2 = 7.613e - 05 \text{ m}^3$$



Solide 3



$$I(G_3, S_3) = \begin{bmatrix} I_{xx_3} & 0 & 0 \\ 0 & I_{yy_3} & 0 \\ 0 & 0 & I_{zz_3} \end{bmatrix}_{(\vec{x}_3, \vec{y}_3, \vec{z}_3)}$$

$$\overrightarrow{O_3 G_3} = b_3 \vec{x}_3$$

$$\overrightarrow{O_3 A_3} = l_3 \vec{x}_3$$

$$I_{xx_3} = 15449.15 \text{ kg} \cdot \text{mm}^2$$

$$I_{yy_3} = 328261.04 \text{ kg} \cdot \text{mm}^2$$

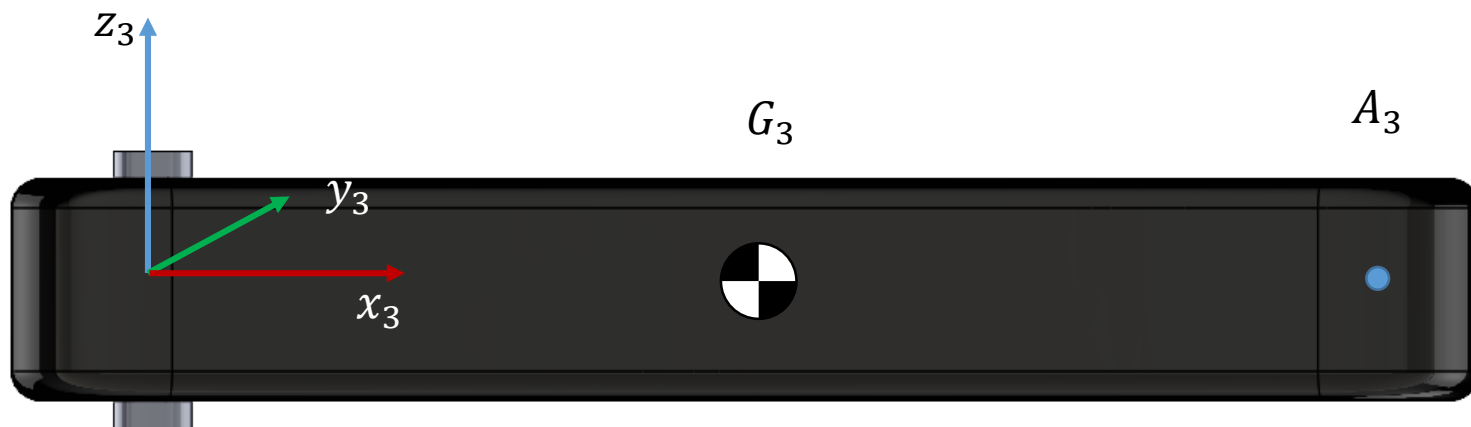
$$I_{zz_3} = 329660.90 \text{ kg} \cdot \text{mm}^2$$

$$b_3 = 0,06111 \text{ m}$$

$$l_3 = 0,120 \text{ m}$$

$$m_3 = 0,172 \text{ kg}$$

$$V_3 = 76225.68 \text{ mm}^3$$



Solide 4



$$I(G_4, S_4) = \begin{bmatrix} I_{xx_4} & 0 & I_{xz_4} \\ 0 & I_{yy_4} & 0 \\ I_{xz_4} & 0 & I_{zz_4} \end{bmatrix}_{(\vec{x}_4, \vec{y}_4, \vec{z}_4)}$$

$$\begin{aligned} \overrightarrow{O_4 G_4} &= a_4 \vec{x}_4 + c_4 \vec{z}_4 \\ \overrightarrow{O_4 A_4} &= l_{14} \vec{x}_4 + l_{34} \vec{z}_4 \end{aligned}$$

$$I_{xx_4} = 0.00078841 \text{ kg.m}^2$$

$$I_{yy_4} = 0.00084184 \text{ kg.m}^2$$

$$I_{zz_4} = 0.00025806 \text{ kg.m}^2$$

$$I_{xz_4} = 0.00002960 \text{ kg.m}^2$$

$$a_4 = 0.03208716 \text{ m}$$

$$c_4 = 0.07885968 \text{ m}$$

$$l_{14} =$$

$$l_{34} =$$

$$m_4 = 0,338 \text{ kg}$$

$$V_4 = 0.00013636 \text{ m}^3$$

Cas pivot $\begin{aligned} l_{14} &= 0,01354 \text{ m} \\ l_{34} &= 0,14202 \text{ m} \end{aligned}$

Cas liaison pignon-
crémaillère.

Faisable dans biorbd ?

Solide 5



$$I(G_5, S_5) = \begin{bmatrix} I_{xx_5} & I_{xy_5} & I_{xz_5} \\ I_{xy_5} & I_{yy_5} & I_{yz_5} \\ I_{xz_5} & I_{yz_5} & I_{zz_5} \end{bmatrix}_{(\vec{x}_5, \vec{y}_5, \vec{z}_5)}$$

$$\begin{aligned} \overrightarrow{O_5 G_5} &= a_5 \vec{x}_5 + b_5 \vec{y}_5 + c_5 \vec{z}_5 \\ \overrightarrow{O_5 A_5} &= l_{15} \vec{x}_5 + l_{35} \vec{z}_5 \end{aligned}$$

$$I_{xx_5} = 0.00012693 \text{ kg.m}^2$$

$$a_5 = 0,09771349 \text{ m}$$

$$I_{yy_5} = 0.00699861 \text{ kg.m}^2$$

$$b_5 = 0,01067939 \text{ m}$$

$$I_{zz_5} = 0.00700635 \text{ kg.m}^2$$

$$c_5 = 0,00003686 \text{ m}$$

$$I_{xy_5} = -0.00001377 \text{ kg.m}^2$$

$$l_{15} = 0,25326 \text{ m}$$

$$I_{yz_5} = -0.00000036 \text{ kg.m}^2$$

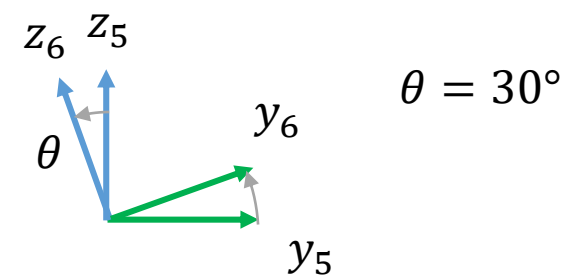
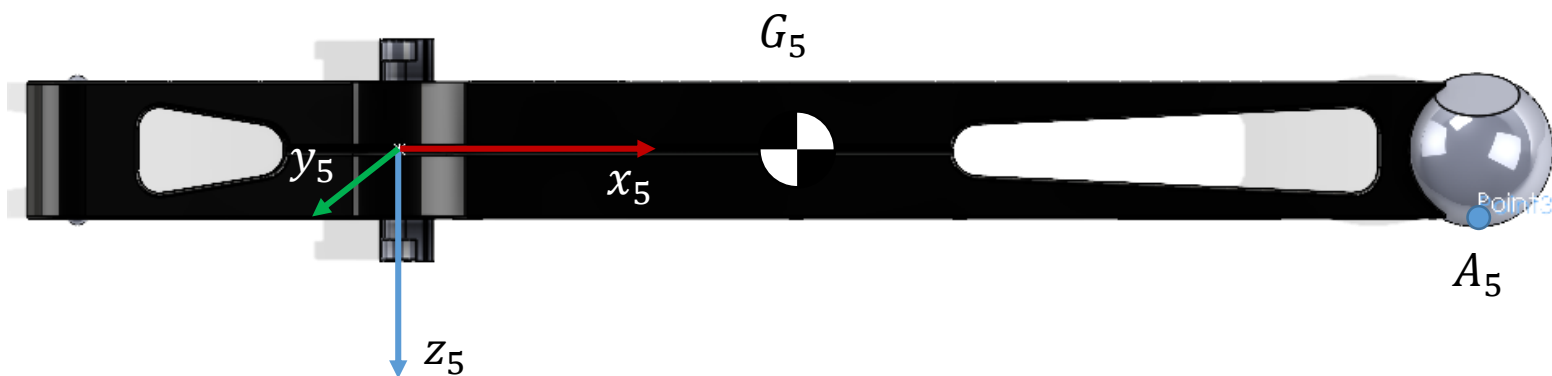
$$l_{35} = 0,01602 \text{ m}$$

$$I_{xz_5} = -0.00000427 \text{ kg.m}^2$$

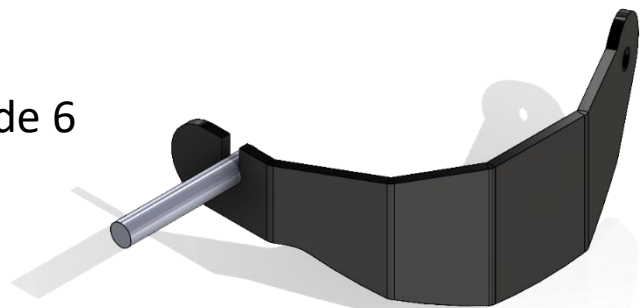
$$m_5 = 0,392 \text{ kg} + 0,11919 \text{ kg}$$

$$m_5 = 0,51119 \text{ kg}$$

$$V_5 = 0,000149287 \text{ m}^3$$



Solide 6



$$I(G_6, S_6) = \begin{bmatrix} I_{xx_6} & I_{xy_6} & I_{xz_6} \\ I_{xy_6} & I_{yy_6} & I_{yz_6} \\ I_{xz_6} & I_{yz_6} & I_{zz_6} \end{bmatrix}_{(\vec{x}_6, \vec{y}_6, \vec{z}_6)}$$

$$\begin{aligned} \overrightarrow{O_6 G_6} &= a_6 \vec{x}_6 + b_6 \vec{y}_6 + c_6 \vec{z}_6 \\ \overrightarrow{O_6 A_6} &= l_{16} \vec{x}_6 + l_{36} \vec{z}_6 \end{aligned}$$

$$I_{xx_6} = 0.00012751 \text{ kg.m}^2$$

$$I_{yy_6} = 0.00015371 \text{ kg.m}^2$$

$$I_{zz_6} = 0.00004567 \text{ kg.m}^2$$

$$I_{xy_6} = 0.00000695 \text{ kg.m}^2$$

$$I_{yz_6} = 0.00000686 \text{ kg.m}^2$$

$$I_{xz_6} = 0.00004329 \text{ kg.m}^2$$

$$a_6 = 0.03291972 \text{ m}$$

$$b_6 = 0.00776230 \text{ m}$$

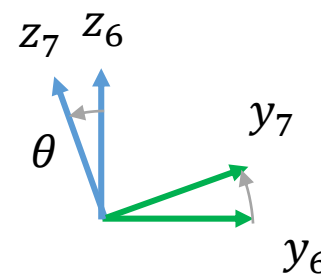
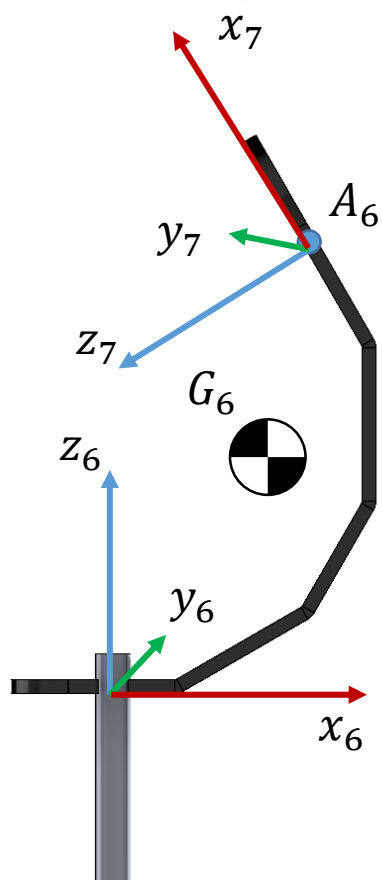
$$c_6 = 0.03895646 \text{ m}$$

$$l_{16} = 0.03352 \text{ m}$$

$$l_{36} = 0.10130 \text{ m}$$

$$m_6 = 0.08658000 \text{ kg}$$

$$V_6 = 0.00001665 \text{ m}^3$$



$$\begin{aligned} \theta &= -120^\circ \\ \text{ou} \\ \theta &= 240^\circ \end{aligned}$$

Solide 7



$$I(G_7, S_7) = \begin{bmatrix} I_{xx_7} & I_{xy_7} & I_{xz_7} \\ I_{xy_7} & I_{yy_7} & I_{yz_7} \\ I_{xz_7} & I_{yz_7} & I_{zz_7} \end{bmatrix}_{(\vec{x}_5, \vec{y}_5, \vec{z}_5)}$$

$$\begin{aligned} \overrightarrow{O_7 G_7} &= a_7 \vec{x}_7 + b_7 \vec{y}_7 + c_7 \vec{z}_7 \\ \overrightarrow{O_7 A_7} &= l_{17} \vec{x}_7 + l_{37} \vec{z}_7 \end{aligned}$$

$$I_{xx_7} = 0.00255786 \text{ kg.m}^2$$

$$I_{yy_7} = 0.00098183 \text{ kg.m}^2$$

$$I_{zz_7} = 0.00240229 \text{ kg.m}^2$$

$$I_{xy_7} = 0.00000966 \text{ kg.m}^2$$

$$I_{yz_7} = -0.00089959 \text{ kg.m}^2$$

$$I_{xz_7} = -0.00019222 \text{ kg.m}^2$$

$$a_7 = 0,02748935 \text{ m}$$

$$b_7 = -0.03834733 \text{ m}$$

$$c_7 = 0.05151232 \text{ m}$$

$$l_{17} = ?$$

$$l_{37} = ?$$

$$m_7 = 0,35022 \text{ kg}$$

$$V_7 = 200437.864 \text{ mm}^3$$

Notes de calcul

$$\text{Masse}(\text{Sphere} + \text{solide 6} + \text{solide 7 part 1}) = 274 \text{ g}$$

$$V(\text{Sphere} + \text{solide 6} + \text{solide 7 part 1}) = 40167.19 \text{ mm}^3$$

$$V(\text{solide 6}) = 16647.92 \text{ mm}^3$$

$$V(\text{solide 7 part 1}) = 13031.10 \text{ mm}^3$$

$$V(\text{Sphere}) = 22859.34 \text{ mm}^3$$

$$\text{frac}V(\text{Sphere}) = 22859.34 / (16647.92 + 13031.10 + 22859.34) = 0.435$$

$$\text{frac}V(\text{solide 6}) = 16647.92 / (16647.92 + 13031.10 + 22859.34) = 0.435$$

$$M(\text{Sphere}) = 0,435 * 274 = 119.19 \text{ g}$$

$$M(\text{Solide 6}) = 0.316 * 274 = 86.58 \text{ g}$$

$$M(\text{solide 7 part 1}) = (1 - 0.316 - 0,435) * 274 = 68.22 \text{ g}$$