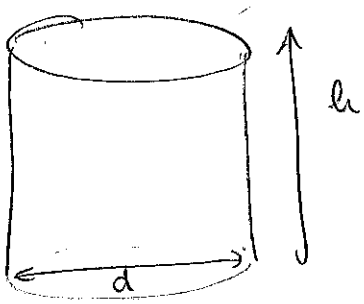
# Calcul de volume : estimation des erreurs

$$V = V(d, h) = \frac{\pi d^2 h}{4}$$




$d = 2.5 \pm 0.01$ cm

$h = 1.3 \pm 0.01$ cm

Question : $V = V_0 \pm \Delta V$ ?

- $V_0$ :

$$V_0 = V(d_0, h_0) = \frac{\pi d_0^2 h_0}{4} = \pi \frac{(2.5\,\text{cm})^2 \cdot 1.3\,\text{cm}}{4}$$

$$\simeq 6.38\ \text{cm}^3$$

- $\Delta V$ :

$$\Delta V = \left|\frac{\partial V}{\partial d}\right|_0 \Delta d + \left|\frac{\partial V}{\partial h}\right|_0 \Delta h$$

$$= \left|\frac{\pi 2 d_0 h_0}{4}\right| \Delta d + \left|\frac{\pi d_0^2}{4}\right| \Delta h = \frac{\pi d_0 h_0}{2} \Delta d + \frac{\pi d_0^2}{4} \Delta h$$

$$= \frac{\pi \cdot 2.5\,\text{cm} \cdot 1.3\,\text{cm}}{2} 0.01\,\text{cm} + \frac{\pi (2.5\,\text{cm})^2}{4} 0.01\,\text{cm}$$

$$\simeq 0.05\ \text{cm}^3 + 0.05\ \text{cm}^3 \simeq 0.10\ \text{cm}^3$$

$$V = (6.38 \pm 0.10)\ \text{cm}^3$$

- Incertitude relative :

$$\frac{\Delta V}{|V_0|} = \frac{0.10\ \text{cm}^3}{6.38\ \text{cm}^3} = \frac{0.10}{6.38} \simeq 0.015 = 1.5\,\%$$