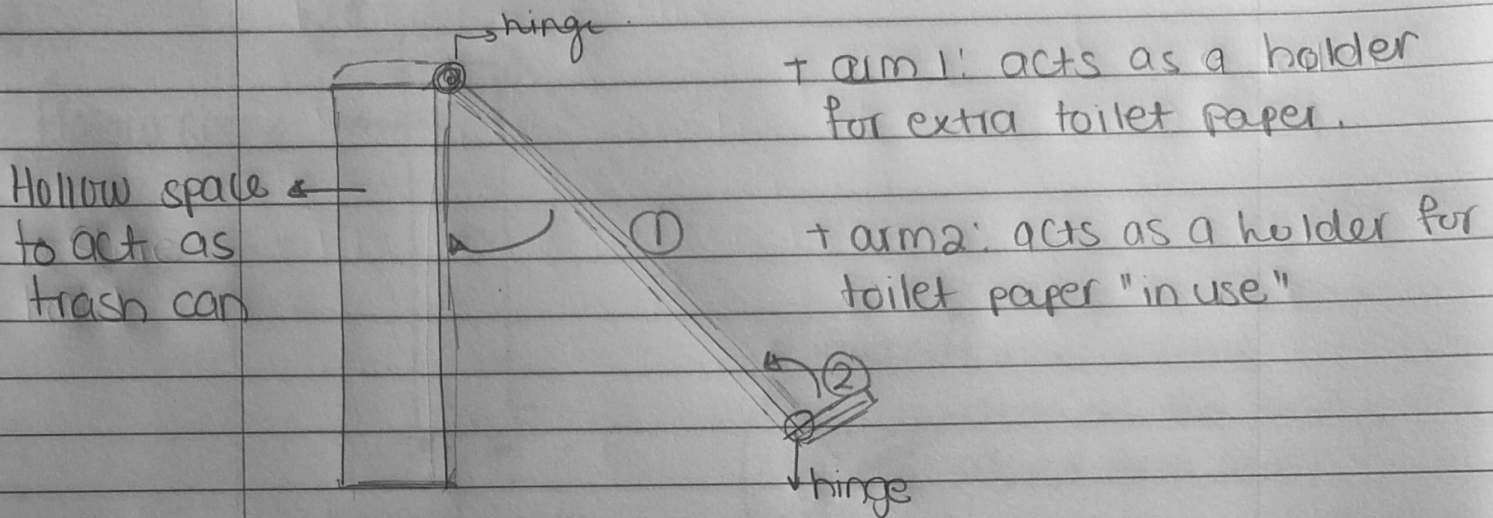


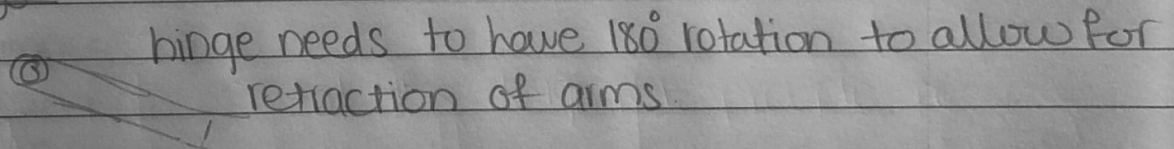
Concept 1

The toilet paper holder for

Side view



hinge



+ assuming

$$\left. \begin{array}{l} m = 10 \text{ lbs} \\ g = 9.8 \text{ m/s}^2 \end{array} \right\} F = mg = (10 \text{ lbs})(9.8 \text{ m/s}^2) = 198 \text{ N}$$

$$L = 15 \text{ in} \Rightarrow \tau = F \cdot L \rightarrow \text{length of retractable arm}$$

Torque of ↙

retractable
arms

$$\tau = F \cdot L = (198 \text{ N})(15 \text{ in}) \left(\frac{1 \text{ in}}{0.025 \text{ m}} \right)$$

$$\tau = 91470 \text{ N} \cdot \text{in}$$