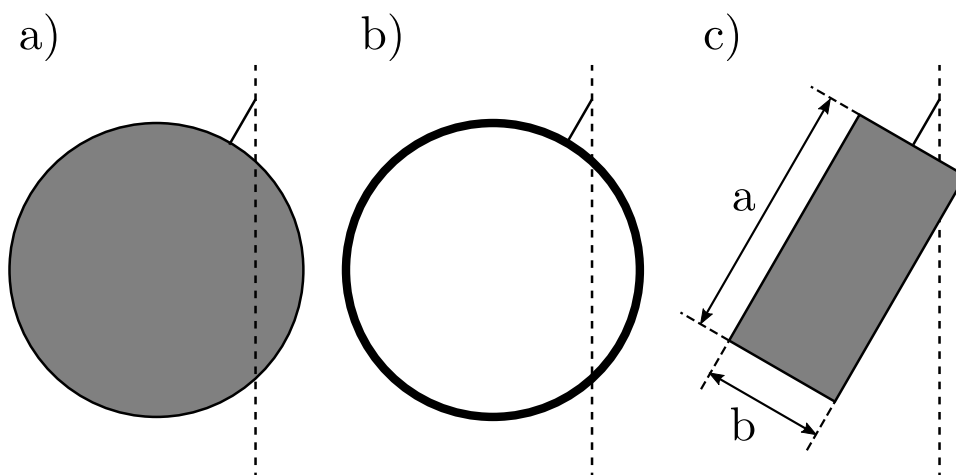# Pendulums

September 2023

Tasks

1. During lecture we didn't analyse units in equation of dynamics in rotation in plane eg. $\Gamma = I\epsilon$. Derive units of each element in this equation.

2. Using Wikipedia's page: List of moments of inertia, derive the value of periods of following pendulums (each time the centre of mass is at the distance $L = 1\,\mathrm{m}$ from the centre of rotation and mass $M = 1\,\mathrm{kg}$):

   a) pendulum with disk with radius $R = 0.9\,\mathrm{m}$;

   b) pendulum with circular loop with radius $R = 0.9\,\mathrm{m}$;

   c) pendulum with rectangular plate with diameters $a = 1\,\mathrm{m}$, $b = 0.5\,\mathrm{m}$;

a)   b)   c)

3. [HARD Problem] go back to the beginning... and derive again the formula for motion of a pendulum but this time don't assume small angles. Calculate the period of such pendulum with $L = 1\,\mathrm{m}$ and plot it's dependency of initial angle. You can neglect moment of inertia.