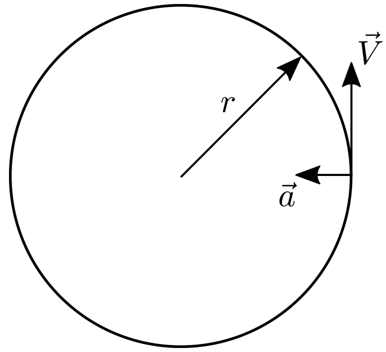

FIG. 1:

Consider the circular motion around the radius r in Fig. 1. We measured time it takes to do 10 revolutions - t_{10}, s. Find period (T, s), frequency (f, Hz), angular frequency (ω, Hz), circular velocity $(V_\tau, m/s)$ and centripetal force (F_c, N).

$$T = \frac{t_{10}}{10} \tag{1}$$

$$f = \frac{1}{T} \tag{2}$$

$$\omega = 2\pi f = \frac{2\pi}{T} \tag{3}$$

$$V_\tau = \omega r \tag{4}$$

$$F_c = \frac{mV^2}{r} = ma \tag{5}$$

Note, velocity is always directed along the circle and acceleration is always directed towards the center.

Now, consider the satellite moving around the Earth on the orbit of the height $h = 1000\,km = 10^6\,m$. Gravitational constant ($G = 6.67 \cdot 10^{-11}, \frac{m^3}{kg \cdot s^2}$), mass of the Earth ($M = 6 \cdot 10^{24}, kg$) and radius of the Earth ($r = 6.4 \cdot 10^6, m$) are given. Find the speed with which satellite rotates around Earth.

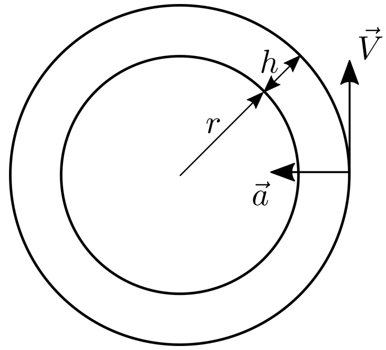

FIG. 2:

$$F_g = G\frac{mM}{(r+h)^2} = ma = m\frac{V^2}{r+h} \tag{6}$$

$$V = \sqrt{G\frac{M}{r+h}} = \sqrt{6.67 \cdot 10^{-11} * \frac{6 \cdot 10^{24}}{7.4 \cdot 10^6}} = 7.4 \cdot 10^3 [m/s] = 7.4 [km/s] \tag{7}$$

For the part 1 your measurements won't be given back to you after you are done, so write down everything you measure as you go and later include this in your lab report. Every step there is a new measurement.

For the part 2, I expect 2 tables similar to Table I. One for 8 different moving masses with constant radius and the other for 8 different radiuses with constant mass. Additionally, insert a plot of m vs V for the first table and r vs ω for the second.

r, m	m, kg	t_{10}, s	T, s	f, Hz	ω, Hz	$V, m/s$	# of washers	F_c, N

TABLE I: Sample table