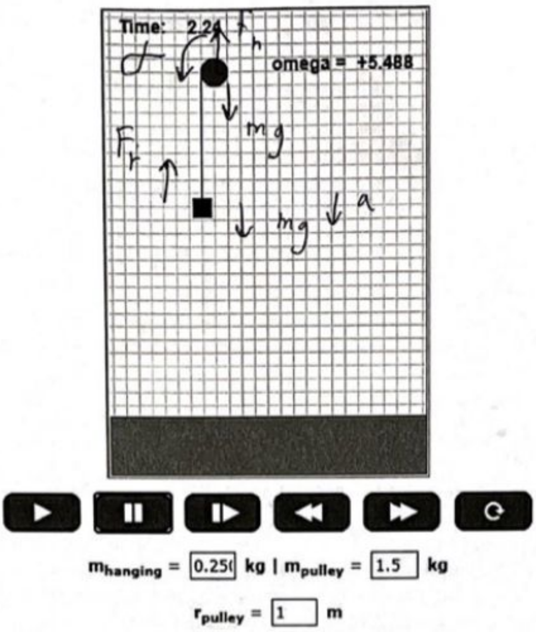

Figure 1: Side view of the pulley system that consists of a block hanging from a long (massless) string that is wrapped around a uniform pulley wheel of known mass and radius. Time is measured in seconds and angular speed ω in rad/sec. Each square on the grid is 1 m in length and height. Set the pulley (disk) mass to 1.5 kg. The coordinates (in meters) of any point on the grid screen can be found by clicking on the point.

2. Set the mass of the pulley (M) to 1.5 kg and its radius (R) to 1.0 m. You will keep these values fixed throughout the lab. Attach a 250 g "hanging mass" to the end of the pulley's string. Release the system from rest and wait at least 15 m before stopping it. Record the elapsed time and corresponding final angular velocity of the pulley wheel. Then use the expression $\omega(t) = \omega_o + \alpha t$ to determine the angular acceleration of the pulley.

$\omega =$ 10.241 rad/s, $\alpha =$ 2.45 rad/s^2.

3. Repeat the experiment until you have data for six different hanging mass values ranging from 250 g to 500 g. Organize your data in the table below. Make sure to add the appropriate units in the heading of each column. Determine the angular acceleration α for each experimental run. Calculate the applied tension force (Eq. 5) that creates the torque, and use Eq. 2 to calculate the magnitude of the applied torque You will use this data later to experimentally determine the moment of inertia of your pulley wheel.

Hanging Mass	Time s	ω rad/s	α rad/s^2	Tension N	$\lvert\vec{\tau}\rvert$ N·m
250	4.18	10.471	2.45	1.837	1.837
300	3.9	10.92	2.8	2.1	2.1
350	3.7	11.537	3.12	2.338	2.738
400	3.54	12.067	3.41	2.556	2.556
450	3.4	12.495	3.675	2.756	2.756
500	3.3	12.936	3.92	2.94	2.94

4. Show a sample calculation for each column in the table above.

250g ; $t = 4.18$; $\omega = 10.421$

$10.421 = 0 + \alpha\, 4.18$

$\alpha = 2.45$

$T = m(g - \alpha R)$

$T = 0.25(9.8 - 2.45\,(1\text{m}))$

$= 1.837$

$\tau = Fl\sin\theta$

$\tau = 1.837(1)\sin 90^\circ = 1.837$