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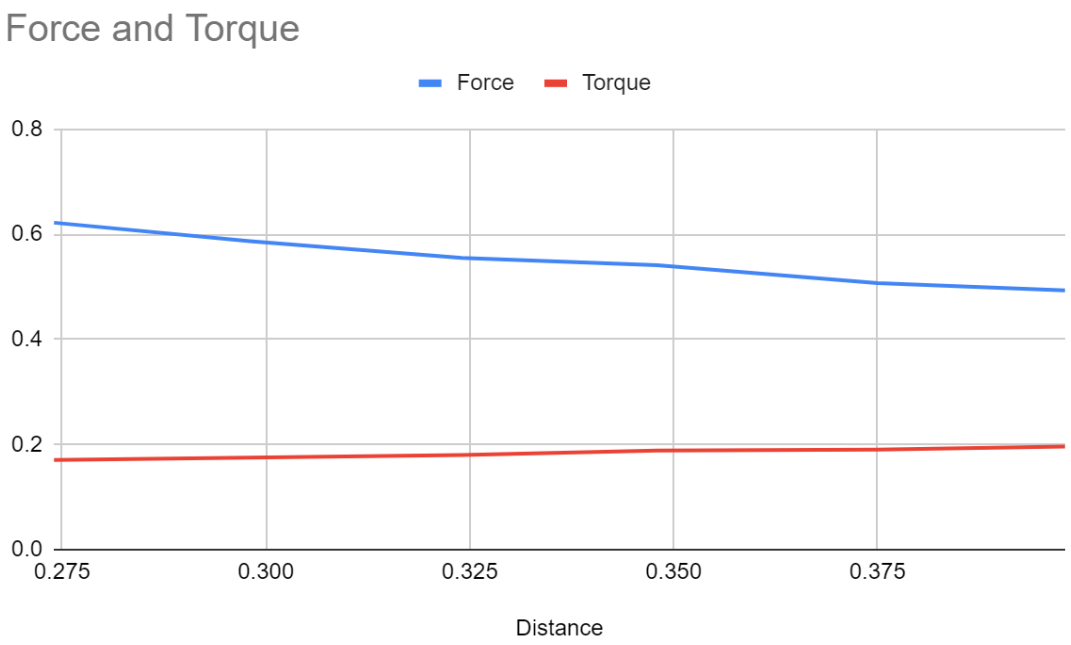
PHYS 211X
Lab 8: Torque, Angular Acceleration, and Moment of Inertia, 3/28/2023, Partners: Maite Valentin-Lugo, Seth Waln

1., 2.

	Distance	Force	Torque
d1	0.398	0.493	0.196214
d2	0.375	0.507	0.190125
d3	0.348	0.541	0.188268
d4	0.324	0.555	0.17982
d5	0.298	0.587	0.174926
d6	0.274	0.622	0.170428

3.



4.

	Disk	ball	Ring
Diameter (m)	0.0960	0.0987	0.0990
Mass (kg)	0.5275	0.7462	0.2109

5.

	Inertia
Ring	0.0005167
Ball	0.0007292
Disc	0.0006076

6. Ring - Seth

   Ball - Maite, Kaleb

7. The ball won the race.

8. Yes, I believe the low surface contact between the ball and the ramp led to lower energy loss to friction, it also had a higher mass but a similar radius to the others, meaning its initial potential energy was higher, and it had

the highest theoretical inertia.

9.

	Ring	Disk	Sphere
Initial position (when velocity is zero)	0	0	0
Position at measurement of final velocity	2	2	2
Height difference at measurement of final velocity	0.125	0.125	0.125
Final Velocity	1.172	1.181	1.366
Final Angular velocity	0.0422	0.0406	0.0361

12.

$$\begin{aligned} K_i + U_i &= K_f + U_f \\ \frac{1}{2}I\omega_i^2 + mgh_i &= \frac{1}{2}I\omega_f^2 + mgh_f \\ \frac{1}{2}I(0) + mgh_i &= \frac{1}{2}I\omega_f^2 + mgh_f \\ -\frac{1}{2}I\omega_f^2 &= mgh_f - mgh_i \\ I &= \frac{2mg(\Delta h)}{\omega_f^2} \end{aligned}$$

13.

Computed in excel $\Longrightarrow$

	Inertia
Ring	289.65
Ball	782.35
Disc	1400.71

14. Terribly. The calculated moments of inertia were about 7 orders of magnitude smaller, for the case of the ball, it was $\frac{1400.71}{0.00073} = 1{,}918{,}781$ times larger in the experimental case. I have no idea what we did in our calculations for this to happen, but it is astronomically wrong.

15. I'm almost certain our equations were not set up correctly. On top of that, the obvious things like friction, vibration, and inaccuracy in where we dropped the objects, are all also factors in the uncertainty.

16. Center - Kaleb

18. If the wheels are lighter, it'll take less energy to move them, meaning you have to spend less energy accelerating/decelerating.

19. The slower the discus spins, the less rotational acceleration will occur, which will pull the discus back and forth, reducing its overall horizontal speed.

20. I don't know what a moment of inertia stick is, we didn't engage with them.