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PHYS 211X
Lab 4: Simple Machine, 2/21/2023, Partners: Maite Valentin-Lugo, Seth Waln

Part 1

2.

Part 2

Weight of the mass being lifted: <u>4.9 N</u>

	D_m	D_{fp}	$\vec{F}$
Long Lever	0.05 m	0.270 m	0.31 N
Medium Lever	0.05 m	0.145 m	1.10 N
Short Lever	0.05 m	0.050 m	3.90 N

Table 1: Lever Data

8.

	W (J)
Long Lever	0.084 J
Medium Lever	0.16 J
Short Lever	0.20 J

Table 2: Lever Analysis

9. Mechanical advantage: $MA = \frac{F_i}{F_o}$

The theoretical MA for the long lever is $\frac{D_{fp}}{D_m} = \frac{0.270}{0.05} = \boxed{5.4}$

Long Lever:

$$F_i = 0.018N$$
$$F_o = 4.9N$$
$$MA = \frac{4.9}{0.31}$$
$$= \boxed{15.8}$$

10. The longer the lever, the less force is needed to move the mass.

11. From our observations, the longer the lever, the less work is needed. This is probably false and due to our incosistencies in measuring the force.

12. Work done by the mass $= 4.9N \cdot 0.05m = 0.245J$.

13. Technically I did, but more likely (and why people use them) is that my measurements and use of force became more efficient as it was able to be done with less strain difficulty at longer lengths of the lever.

Part 3.

Weight of the cart: <u>11.94 N</u> Verticle Distance traveled: <u>0.7 m</u>

	Lowest Steepness	Medium Steepness	Largest Steepness
y_0	0.025 m	same m	same m
y_f	0.095 m	same m	same m
Δy	0.07 m	same	same
x_0	0.75 m	0.545 m	0.325 m
x_f	2.22 m	1.65 m	1.22 m
Δx	1.47 m	1.105 m	0.895 m
$\vec{F}$	0.2237 N	0.84 N	1.135 N

Table 3: Inclined Plane Data

14.

	W_{fp} (J)	W_g (J)
Lowest Steepness	0.33 J	0.09 J
Medium Steepness	0.93 J	same
Highest Steepness	1.02 J	same

Table 4: Inclined Plane Analysis

15. Lowest:

$$MA = \frac{11.94}{0.2237}$$
$$= \boxed{53.4}$$

Medium:

$$MA = \frac{11.94}{0.84}$$
$$= \boxed{14.21}$$

Largest:

$$MA = \frac{11.94}{1.135}$$
$$= \boxed{10.52}$$

16. As the slope increases from being horizontal, the force needed to move the cart is increased and the mechanical advantage is decreased.

17. The same as before; increasing the slope increases the work needed to be done, although this is probably due to errors in unaccounted for forces.

18.