Force Needed to Start and Maintain Motion of a Sliding Object

Name _____ ___**o**

Purpose: To find the relationship between the amount of force needed to start an object sliding across a surface and the weight of the object. To find the relationship between the amount of force needed to keep the object sliding at a constant velocity across the surface and the weight of the object.

PART A: Setup

1. Find the mass of the wood block (kg) and RECORD it.
2. Place the wood block at one end of the center section of the lab table with the hook facing the center of the table. The larger area of the wood side should contact the table.
3. Place 2000 g of slotted mass on the center of the block.
4. Run a string from the hook on the block to the hook on the force sensor.
5. Open the Data Studio file named "Force on wood block - DS".

PART B: Procedure

6. You will do four sets of trials. Each set will consist of three trials.
7. Set 1 will use the block with 2000 g added mass (m ~ 2.125 kg).
8. Set 2 will use the block with 1500 g added mass (m ~ 1.625 kg).
9. Set 3 will use the block with 1000 g added mass (m ~ 1.125 kg).

Do the following steps (10-29) in order for each trial:

10. RECORD the total mass in kg of the block and all passengers.
11. Click "Experiment", "Delete ALL Data Runs", "OK".
12. Wipe the track down before each set of runs.
13. Move the sensor toward the block until there is slack in the string.
14. Press the "TARE' button on the side of the force sensor. IMPORTANT! Make sure you do this before every run.
15. Release the string and take up most of the slack in the string but to not allow it to become taut.
16. Slide the block back and forth a few inches before each run to ensure uniform starting conditions.
17. Click "Start". Pull smoothly on the sensor to apply tension to the string and continue increasing the tension to try to make a constant slope on the force graph.
18. Continue pulling until the force breaks the wood loose.
19. When this happens, continue to pull now to keep the block moving at a constant speed (and force).
20. Do this until you have a couple seconds of constant speed motion.
21. Click "Stop" on Data Studio.
22. Using your smart cursor, find the peak force just as the block broke loose and RECORD it.
23. Now go to the region of constant velocity and force.
24. Highlight the points where the graph is flat.
25. Click on the arrow to the right of the stats "Σ" and select "Mean". A check mark should appear. No other terms should have a check.
26. RECORD the mean, which is the average Force in N while the string was taut. Keep all SF for now.
27. Click away from the curve to make the yellow highlight disappear. If you do this after every run, you probably do not have to turn the mean off.
28. RECORD the mean, which is the average Force in N while the block was moving at constant velocity. Keep four SF for now.

PART C: Calculations

29. Fill in the required values and perform the calculations in the Results table.

"Force on Wood Block" Lab

Name _____ ___o

Data:

mass of wood block (kg)

Set 1 – block + 2000g

Trial	m_{total} (kg)	F_{max} (N)	F_{slide} (N)
1			
2	"		
3	"		
average	"		

Set 2 – block + 1500g

Trial	m_{total} (kg)	F_{max} (N)	F_{slide} (N)
1			
2	"		
3	"		
average	"		

Set 3 – block + 1000g

Trial	m_{total} (kg)	F_{max} (N)	F_{slide} (N)
1			
2	"		
3	"		
average	"		

Results:

$F_g = m\ (9.8\ m/s^2)$

Set	F_g (N)	$F_{max\ ave}$ (N)	$F_{slide\ ave}$ (N)	F_{max} / F_g (none)	F_{slide} / F_g (none)
1					
2					
3					

Conclusions: What relationship(s) seem to exist?