SPH3U: Friction Lab

1. First measure the mass of your wooden board, by suspending it from your spring scale and measuring the spring force holding it up.

Draw a FBD	Fx Spring Force (N)	Fg (N)	Mass (kg)
F_x ↑ ↓ F_g	1.50 N	1.50 N	$m = \dfrac{F_g}{g}$ $= \dfrac{1.5}{9.8}$ $= 0.153 \text{ kg}$

2. Now you will measure different forces of friction, to find the coefficients of friction (μ) for different objects. Remember:

   F_{Smax}: Maximum static friction. This is the maximum force <u>before</u> it starts moving.

   F_K: Kinetic friction. This is the force to keep it moving at a <u>constant speed</u>.

   Write the equations to get μ_S and μ_K from F_{Smax} and F_K:

   $$\mu_S = \frac{F_{SMax}}{F_N}$$
   $$\mu_K = \frac{F_K}{F_N}$$

Board on table:

Added Mass (kg)	Total Mass (kg)	F_N (N)	F_{Smax} (N)	F_K (N)	μ_S	μ_K
0.5 kg	0.653 kg	6.3994 N	1.0 N	0.9 N	0.156	~~0.175~~ 0.141
1.0 kg	1.153 kg	11.2994 N	2.0 N	1.8 N	0.177	0.159
1.5 kg	1.653 kg	16.1994 N	2.7 N	2.6 N	~~0.167~~	0.160
Coefficients of friction for board on table:					0.167	0.153

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Board on carpet:

Added Mass (kg)	Total Mass (kg)	F_N (N)	F_{Smax} (N)	F_K (N)	μ_S	μ_K
0.5	0.653	6.3994	2.2	1.9	0.344	0.297
1.0	1.153	11.2994	3.7	3.3	0.327	0.292
1.5	1.653	16.1994	5.2	4.8	0.321	0.296
Coefficients of friction for board on carpet:					0.331	0.295

Board on wood:

Added Mass (kg)	Total Mass (kg)	F_N (N)	F_{Smax} (N)	F_K (N)	μ_S	μ_K
0.5	0.653	6.3994	2.6	2.6	0.406	0.406
1.0	1.153	11.2994	5.4	5.4	0.478	0.478
Coefficients of friction for board on wood:					0.442	0.442

3. Are the coefficients of friction the same for all three surfaces?

No! Wood had the most friction, table had the least.

Did the coefficients of friction change with different amounts of mass?

No! (A bit, but they were pretty consistent).

Was the coefficient of static friction the same as the coefficient of kinetic friction for any materials?

Wood seemed to have the same values, but it was very difficult to measure (very jerky).