Friction Lab - Worksheet

Name_____
Lab Partner(s)_____
_____

Hypotheses:

F_k and maxF_s are greater for heavier objects.
Kinetic friction force is the same when the surface area is increased.
Kinetic friction force is the same when an object is pulled at different speeds.
Friction force is greater on rougher surfaces.

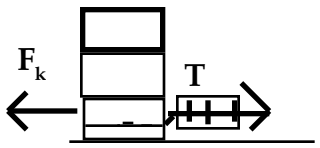
Materials:

3 blocks, a large spring scale, string strong enough to pull the blocks.

Procedure:

1. Weigh the blocks. Lay one block flat and pull it across the selected surface (_____?) at a constant speed. Record the constant force required. Place a second block on top of the first and repeat. Finally, add the third block and repeat. Use the same speed. (Notice that the kinetic friction force, F_k, equals the pulling force (T, tension in the scale) because the block is being pulled at a constant velocity or with zero acceleration. Also, the upward normal force of the floor, N, equals the weight (w) of the block(s).

$N = w$ (N)	F_k = T (N)



2. Calculate the surface area(A) of the flat face and one edge face. Pull this one block at a constant speed (a) laying it on its edge face and (b) laying it flat. Record the forces required to pull the block in each case. Pull at the same speed.

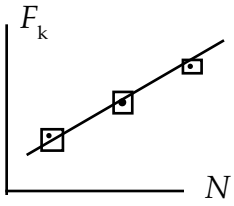
A (cm^2)	F_k (N)

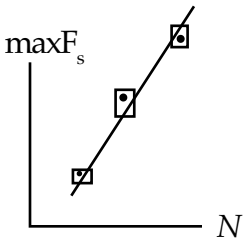
3. Pull one block at three different constant speeds (v): very slow, slow, and medium. Record the necessary force in each case.

v	F_k(N)
v. slow	
slow	
med	

4. Repeat Step 1 with a smaller tension force (T), trying to pull the blocks without actually moving them until finally the block(s) moves. Record the increasing F_s values. Graph F_k vs Normal force and maxF_s vs Normal force. Box in the data points, draw a **"best fit" line** and **show the right triangle and slope calculations** used for each graph. **Title** your graph without using "vs". **Label the axes** with variable letters and include the **units in parentheses**. Axes should have "nice" multiple values. Record the **kinetic and static coefficients of friction in decimal form** for your surface in the table at the bottom right. Then add your lab partners' results.

N (N)	F_s (N)	F_s (N)	F_s (N)	maxF_s (N)
	.			





Questions:

1. Is kinetic friction force (a) proportional to the normal force, (b) does F_k increase with increasing surface area, and (c) does F_k decrease with increasing speed?

2. If the maximum static friction force occurs just as the block slips and we define max$F_s = \mu_s N$, what is the static coefficient of friction, μ_s, for one block on your selected surface? ___ for 2 blocks? ___ for 3 blocks?___

surface	μ_k	μ_s
Your Surface		