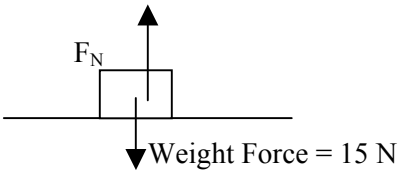
N/S/D

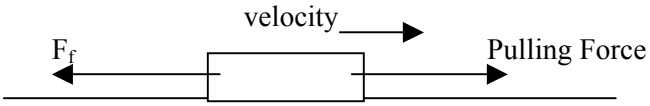
Physics Lab: The Friction Force - Part I

1. **Goal:** To find the coefficient of friction, "μ", for various combinations of surfaces.
2. Write the equation for the strength of the friction force here: _____
3. This seems simple enough at first glance. Just measure F_f, then measure F_N, and then divide to find "μ". **Unfortunately we have no direct way to measure F_f or F_N.** So what can we do?
4. Look at the diagram at right.
   Since the weight force is 15 N, how strong is the normal force?



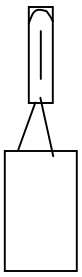
5. So even though we can't directly measure the normal force, if something is on a flat surface we can measure the total weight force on it and that will be the same as F_N.

6. But what about the friction force?
   Look at the diagram at right.
   Newton's 1st Law says that, as long as the block is moving at a **constant velocity**, the friction force F_f will equal the pulling force.

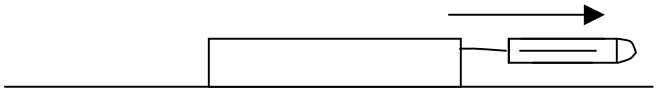


7. So even though we can't directly measure the friction force, if we pull something so that it moves at constant velocity, then we can measure our pulling force and that will be the same as F_f.

8. **Practice:** You hang a weight block (*with three weights*) from a force meter like this and it reads say 9.0 N for example.



You then drag the weight block horizontally at constant velocity across a tabletop using a force meter like this:



Now the meter reads say 7.2 N. What is the value of μ, the coefficient of friction? _____

<u>Finding Coefficients of Friction</u>

Materials: Loop of string Force meter

1. Use the above method to find the μ, the coefficient of sliding friction, between your *weight block* (*with three weights*) and the lab tabletop. Indicate all your data, **labeled** as necessary. Also write your calculations and result.
2. Now find μ_s, the coefficient of **static** friction. This is the coefficient for the friction force when the weight block is **not** moving. To do this pull very gently on the weight block – not strong enough to move it. Now increase the pulling force ***very gradually*** until the weight block starts to move. I mean very, *very,* ***VERY*** gradually. It should take 10 or 20 seconds from when you start increasing the force to when the weight block starts to move. See how large you can make the reading before the weight block "slips."
3. Use this "maximum value" on the force meter as your F_{sf} (Force of static friction). Calculate μ_s, the coefficient of static friction. The formula is the same as the one for sliding friction. Show all your work.
4. Go to the table with the sandpaper. Use the above method to find the μ, the coefficient of sliding friction, for sandpaper (*taped to the desk*). Include all your data labeled as necessary. Also write your calculations and result.