Name _____

Friction always points parallel to the surface and in the direction opposite the motion (if kinetic), and opposite the net applied force (if static)

Static Friction: $f_s \leq \mu_s N, \quad f_{s\ \max} = \mu_s N$

Kinetic Friction: $f_k = \mu_k N$

μ_s (μ_k) is coefficient of static (kinetic) friction, N is Normal Force

Coefficients of friction depend on the 2 surfaces and must be looked up in a table

1. What does it mean if the coefficient of kinetic friction between your shoes and the ground is **large**? **A**: It is slippery (easy to slide), **B**: It is sticky (hard to slide)

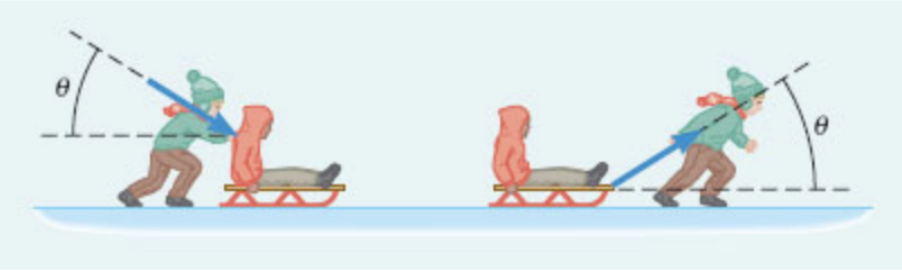
2. A book with a mass of $5kg$ is at rest on a flat table. The coefficient of static friction between the book and the table is 0.4 and the coefficient of kinetic friction is 0.2.

   (a) If you apply a horizontal force of 10N to the book, will it move? **A**:Yes, **B**:No

   (b) What is the minimum force you would need to apply to get the book to move?

   (c) Suppose you apply a force to get the book moving at 0.3m/s and then you let it go. How far will it move before it stops? Hint: First find the acceleration of the block when only friction acts.

3. Now suppose you want to hold the book vertically on a wall with the same coefficients of friction as the table above. What is the minimum force you would need to apply to keep the book in place?



4. If you have a choice to push or pull someone on a sled at a constant velocity when friction is present and the angle of your pushing or pulling force is the same, which one would require less force? Why? **A**: Push, **B**: Push, **C**: Same Force

   Suppose the mass of the kid and sled is $60kg$ and the coefficient of kinetic friction between the sled and snow is 0.2, and the angle $\theta = 30°$. Calculate the force required to keep the sled moving at a constant velocity in the pushing and pulling cases.