Problem :

Modern US cars have anti-locking brakes. These brake mechanisms prevent the wheels from locking up, if you have to "slam on" the brakes.

Will you stop more quickly if you lock wheels and skid to a stop, or if you come to a rolling stop with the anti-locking brakes?

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Solution :

Consider a stationary refrigerator.

It takes more effort to ***start*** it moving across the floor, than it does to ***maintain*** its motion.

The force (f) you have to apply in either case is directly proportional to the normal force of the refrigerator (in this case… just its weight, N, for a horizontal push)… $f = \mu \bullet N$.

The proportionality constant, μ, is called the *coefficient of friction*.

The amount of friction impeding your effort when the refrigerator is ***moving***, is less than the amount of friction you experience when the refrigerator is initially ***stationary***. We say that the coefficient of kinetic friction is less than the coefficient of static friction…. $\mu_K < \mu_S$.

When the wheels of a car (or anything else) are moving, the speed of the part of the wheel which is in contact with the ground, is identically zero (no matter how fast the car is going)!!! If that were not so, then the wheel would be sliding across the ground, rather than rolling.

Therefore, the *static* friction coefficient applies to a *rolling* car; and there is correspondingly, ***more*** friction between the tires and the ground if the car is *rolling*, than if it is *skidding*.

This means that the car will come to a stop more quickly, if it is rolled to a stop (μ_S), than if it is skidded to a stop (μ_K)… That's a good thing, if you have to slam on the brakes!