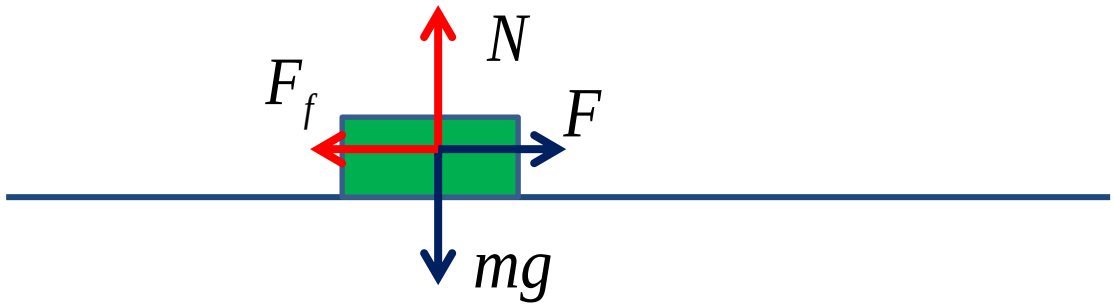
Friction Force



- **STATIC FRICTION** Imagine that you try to move a block on a floor by pushing it with force F. The block does not move because of static friction with the floor. That force opposes motion, and will be equal to -F to make sure that the block is at rest. However, it cannot be bigger than certain maximum value:

$$F_f^{(static)} < \mu_s N$$

Here *N* is the Reaction Force, and μ_s is called static friction coefficient (normally, μ_s <1).

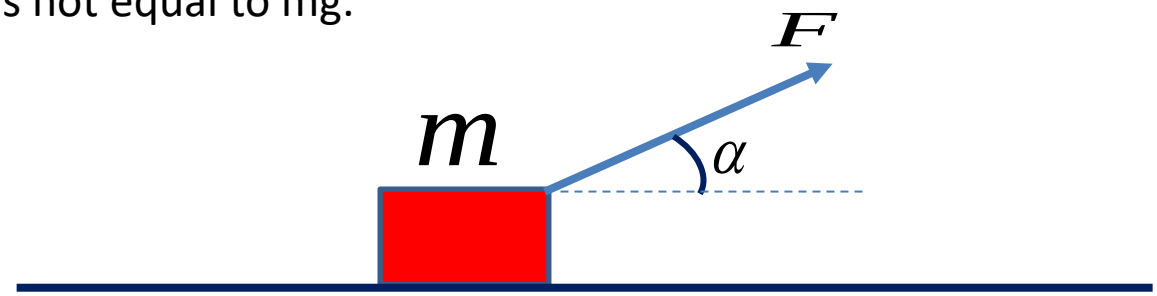
- **KINETIC FRICTION** Once the block starts moving, the friction force will stay nearly constant, and equal to $\mu_k N$ (μ_s is called kinetic friction coefficient, it is smaller than μ_s):

$$F_f^{(kinetic)} = \mu_k N$$

Homework

Problem 1.

Construct Free Body Diagram, and find the acceleration of the block of mass m. Assume kinetic friction coefficient μ between the block and the surface. Hint: note that reaction force N is not equal to mg.



Problem 2

Let the friction coefficient (both static and kinetic) between car tires and the road surface be μ. Find the minimal time that the car would need to reach speed v, starting from rest. Get the general formula, and compute this time for $\mu=0.7$ (dry road), and $\mu=0.4$ (wet road), if v=100km/hr.

Assume a four-wheel-drive car (all wheels are rotated by the motor and pushing the car forward).