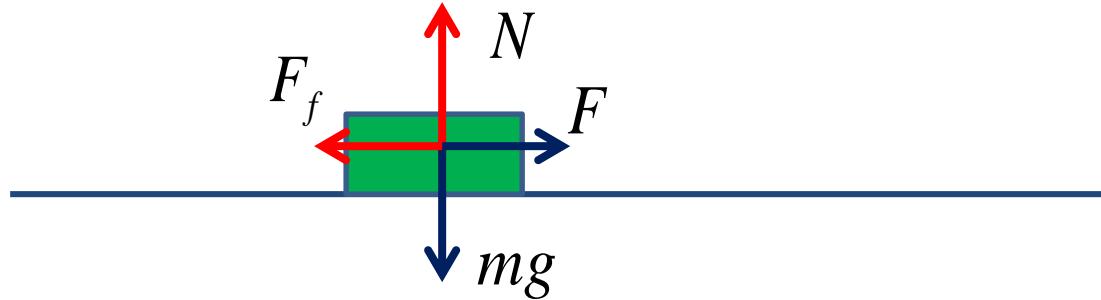


Friction Force



- **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 oppose 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, $\mu_s < 1$).

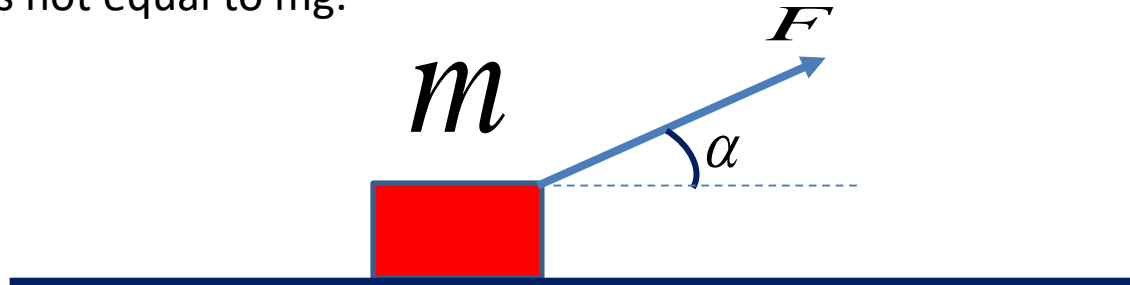
- **KINETIC FRICTION** Once the block starts moving, the friction force will stay nearly constant, and equal to $\mu_k N$ (μ_k is called kinetic friction coefficient, it is smaller than μ_s):

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

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 $v=100\text{km/hr}$.

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