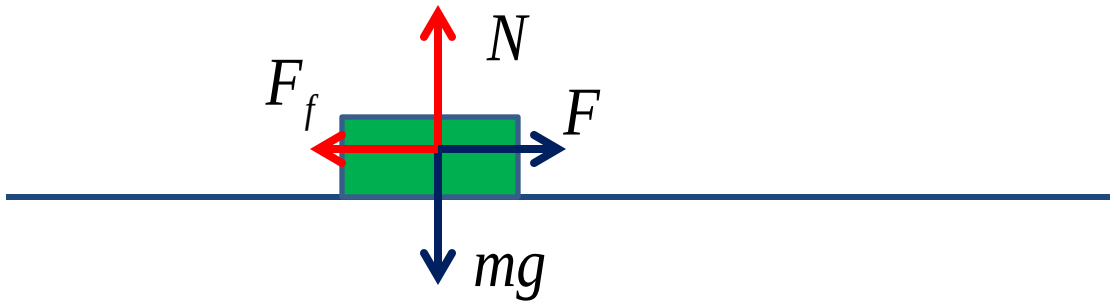
Friction Force



- **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, μ_s <1).

- **KINETIC FRICTION** Once the block starts moving, the friction force will stay nearly constant, and equal to

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

Here μ_k is called kinetic friction coefficient, which is slightly less than the static one.

Homework

Problem 1

Let the coefficient of kinetic friction between car tires and the road surface be $\mu=0.3$ (typical for a wet road). When the car moves at speed v= 30 m/s, the driver suddenly applies breaks. Find the time it takes for the car to stop.

To solve the problem, follow these steps:

- Assume car's mass is m. Construct free body diagram. Is this a case of static or kinetic friction?
- Using the free body diagram, find the car's acceleration (it is negative).
- Knowing the acceleration and initial speed, find the time needed to stop.

Problem 2

Construct Free Body Diagram, and find the acceleration of the block of mass m. Assume kinetic friction coefficient $\mu=0.5$ between the block and the surface. Hint: note that reaction force N is not equal to mg.