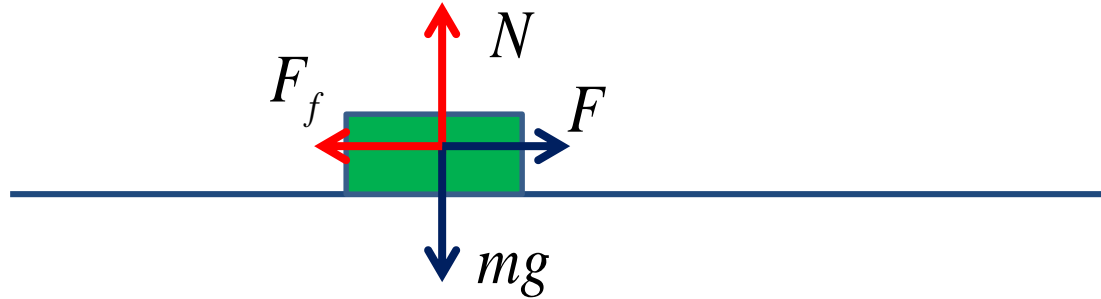


# Friction Force



- **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  $\mu_s$  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

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

Here  $\mu_k$  is called kinetic friction coefficient, which is slightly less than the static one.

# Homework

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:

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