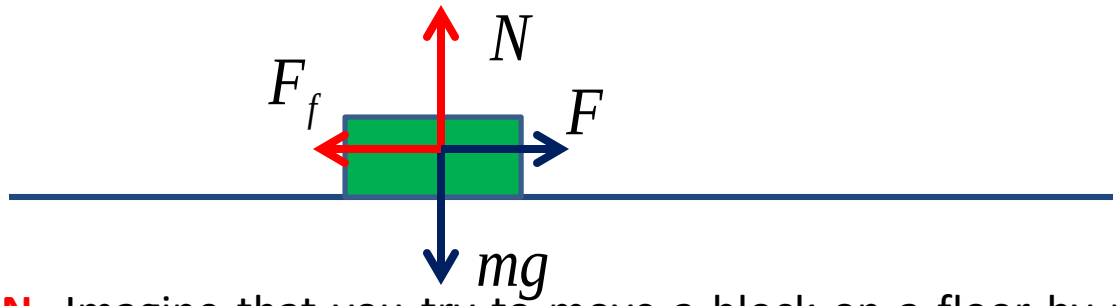
Friction Force



- **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 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*:*

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

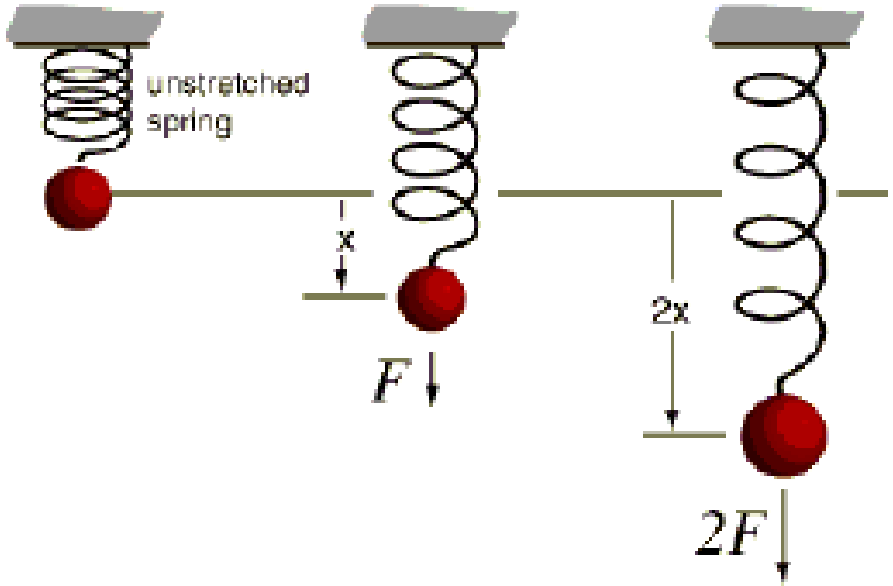
μ_k is called kinetic friction coefficient (μ_k<μ_s).

Hooke's Law

When a spring is stretched or compressed, the *restoring force* ***F*** is proportional to its *deformation,* ***x***:

$$F = -kx$$

Here ***k*** is called spring constant. "-" sign shows that this force opposes deformation.



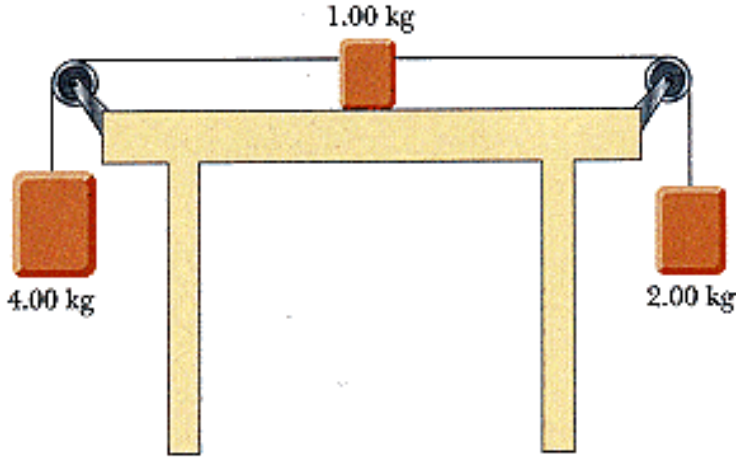
Homework

Problem 1.

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

Problem 2

For the system shown in the picture, find the minimal coefficient of static friction at which the blocks are NOT moving.



Problem 3

When a mass is suspended by a spring, the spring is extended by 5 cm. Now imagine that you are pulling the same spring with the same mass up, with acceleration $4 m/s^2$. What will be an extension of the spring?