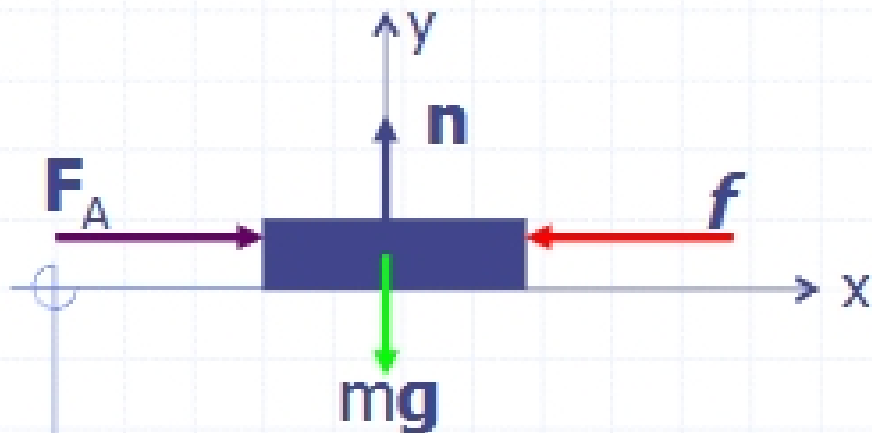


# Chapter 6: Frictional Forces

- Two types:

- *static* – applies to stationary objects
- *kinetic* – applies to sliding (moving) objects

- Like the normal force, the Frictional Force is a contact force, but acts parallel to the interface of two objects



Apply Newton's 2<sup>nd</sup> Law

$$\sum F_y = N - mg = ma_y = 0$$

$$N = mg$$

$$\sum F_x = F_A - f = ma_x$$

- If applied force is small, book does not move (*static*),  $a_x = 0$ , then  $f = f_s$

$$F_A = f_s$$

- Increase applied force, book still does not move
- Increase  $F_A$  more, now book moves,  $a_x \neq 0$

$$F_A - f_s = ma_x \Rightarrow F_A = f_s + ma_x > f_s$$

□ There is some maximum *static* frictional force,  $f_s^{\max}$ . Once the applied force exceeds it, the book moves

$$f_s^{\max} = \mu_s N$$

Magnitudes  
not vectors

- $\mu_s$  is the coefficient of *static* friction, it is a dimensionless number, different for each surface-object pair (wood-wood, wood-metal); also depends on surface preparation
- $\mu_s$  does not depend on the mass or surface area of the object
- Has value:  $0 < \mu_s < 1.5$
- If no applied vertical force

$$f_s^{\max} = \mu_s mg$$