

Weight + Friction

Weight  $\rightarrow$  force of gravity

$$\vec{F}_g = m\vec{g} \quad (g = 9.81 \text{ m/s}^2)$$

Friction  $\rightarrow$  static + kinetic

$\rightarrow$  depends on  $F_N$  and  $\mu$

(related to weight)      (related to the surfaces)

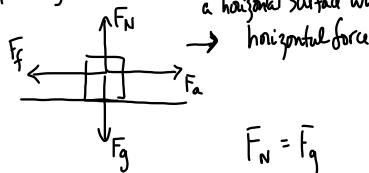
$$F_f = \mu F_N \quad \leftarrow \text{gives the magnitude (direction always opposes the motion)}$$

$F_N$  is the normal force

- it is always perpendicular to the surface as it is the force of the surface on the object.
- if everything is horizontal (i.e. the surface and the applied force) then  $F_N$  is equal to  $F_g$ .

FBD  $\rightarrow$  Free Body Diagrams

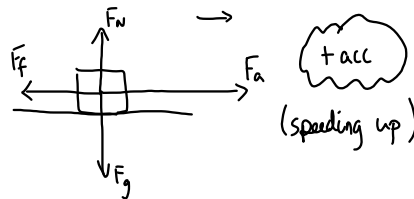
Consider pushing a crate along a horizontal surface with a constant velocity:



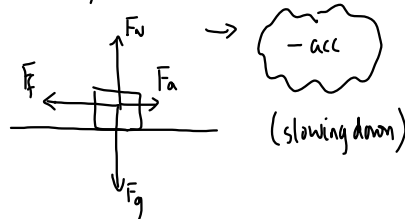
$$F_N = F_g$$

$$F_a = F_f$$

What if  $F_a > F_f$ ?



What if  $F_a < F_f$ ?



① PP/144

② Assignment p151/26-35