

Force of Friction

Goal:

- to determine the force of friction acting on an object
- to be familiar with the coefficient of friction

What is friction?

A force that always opposes motion caused by the contact of two surfaces.

Is friction good or bad?

Good : allows motion (start + stop)

Bad : causes heat = loss of energy

What factors affect friction?

- types of surfaces (μ) coefficient of friction
- weight of object (F_N)

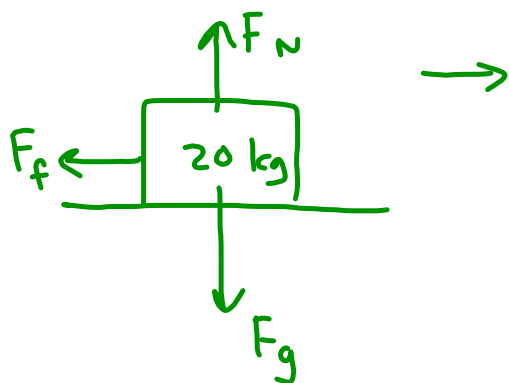
Force of Friction

$$F_f = \mu F_N$$

Table for coefficient of friction

Materials	μ_s	μ_k
Steel on steel	0.74	0.57
Aluminum on steel	0.61	0.47
Copper on steel	0.53	0.36
Rubber on concrete (dry)	1.0	0.8
Rubber on concrete (wet)	0.3	0.25
Wood on wood	0.25-0.5	0.2
Glass on glass	0.94	0.4
Teflon on Teflon	0.04	0.04
Teflon on steel	0.04	0.04
Waxed wood on wet snow	0.14	0.1
Waxed wood on dry snow	0.10	0.04
Metal on metal (lubricated)	0.15	0.06
Ice on ice	0.1	0.03
<u>Synovial joints in humans</u>	0.01	0.003
Very rough surfaces		1.5

A 20 kg box is being pushed along the floor. The coefficient of kinetic friction is 0.3. Determine the force of friction.



$$\begin{aligned} F_f &= \mu F_N \\ &= \mu m g \\ &= 0.3 (20 \text{ kg})(9.8 \text{ N/kg}) \\ &= 58.8 \text{ N} \\ &= 59 \text{ N} \end{aligned}$$