FRICTION

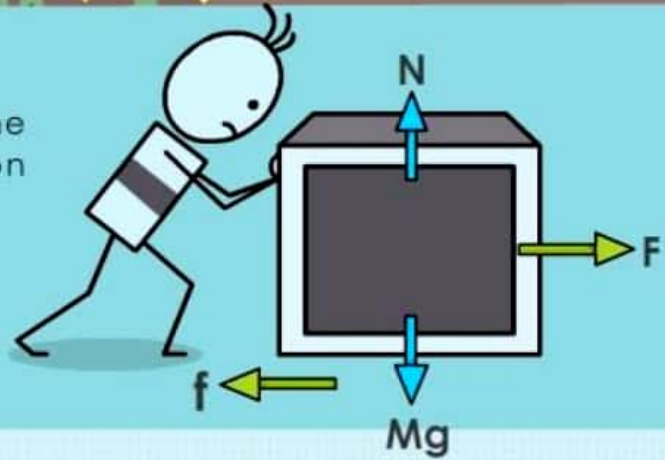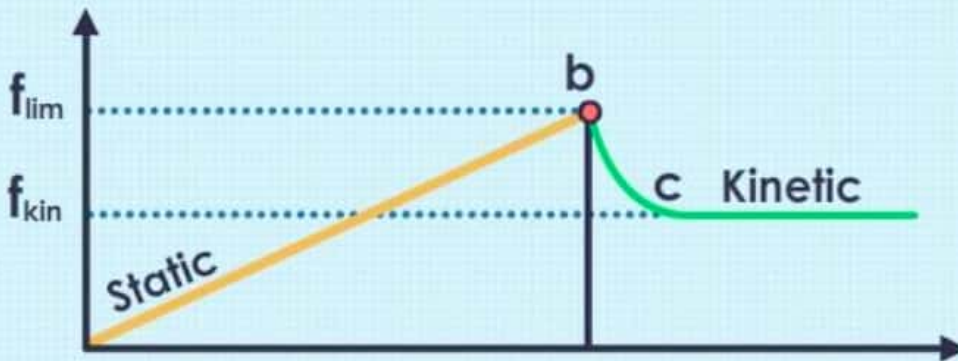## FRICTION

Friction is a contact force that opposes the relative motion or tendency of relative motion between two bodies.

$$f = \mu N = \mu mg$$

TYPES OF FRICTION FORCES

1.STATIC FRICTIONAL FORCE

The opposing force due to which there is no relative motion between the bodies in contact is called static friction force. It's a self-adjusting force.
Coefficient of static friction is μ_s.

2.LIMITING FRICTIONAL FORCE

The maximum frictional force that acts when the body is about to move is called limiting frictional force.

3.KINETIC FRICTIONAL FORCE

The frictional force between the surfaces in contact when relative motion starts between them is called Kinetic Frictional Force. Coefficient of kinetic friction is μ_k.
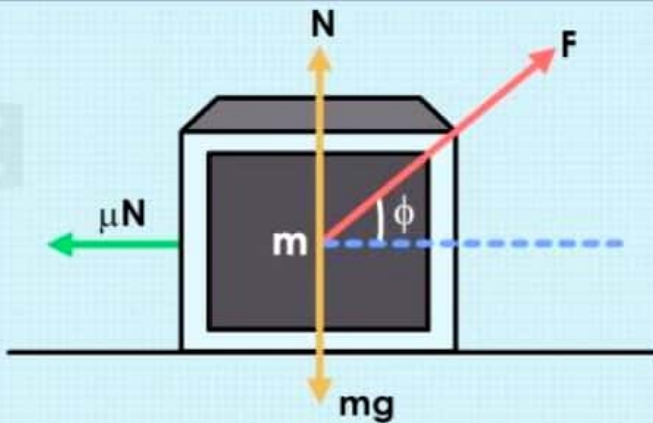
$$\mu_k < \mu_s$$

FRICTION

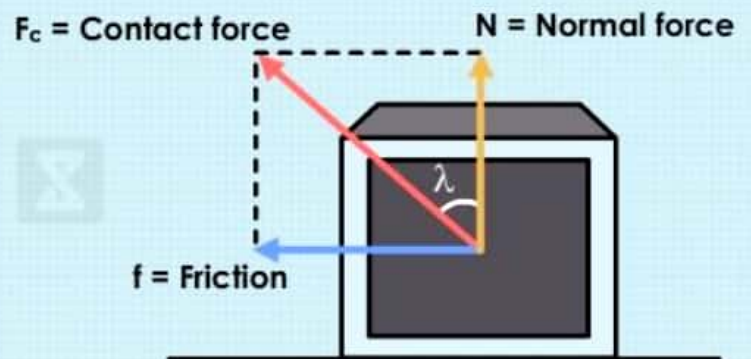## MINIMUM FORCE REQUIRED TO MOVE THE BODY
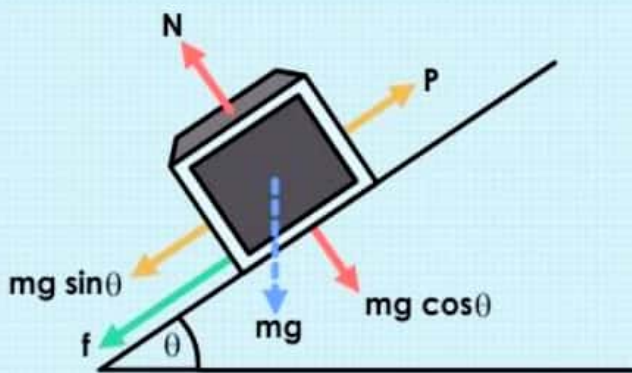
$$F_{min} = \frac{\mu mg}{1 + \mu^2}$$

N = Normal force

FRICTION AS A COMPONENT OF CONTACT FORCE

$$F_{c\,max} = \sqrt{\mu^2 N^2 + N^2} \quad \{\because f_{max} = \mu N\}$$

$$F_{c\,max} = N\sqrt{\mu^2 + 1}$$

F_c = Contact force

N = Normal force

f = Friction

MOTION ON A ROUGH INCLINED PLANE

mg sin θ

mg cos θ

Balancing Vertical Forces

$$N = mg\cos\theta$$

Balancing Horizontal Forces

$$f = \mu N = \mu\, mg\cos\theta$$

When sliding with acceleration 'a'

$$mg\sin\theta - \mu mg\cos\theta = ma$$

ANGLE OF REPOSE

The angle of repose is the maximum angle that a surface can be tilted from the horizontal, such that an object on it is just able to stay on the surface without moving.

or $$\tan\theta_c = \mu$$

where θ_c is called angle of repose.

mg sin θ

mg cos θ