



FRICTION

When we stop pedalling a bicycle, it gradually slows down and finally comes to a stop



FRIC~~TION~~

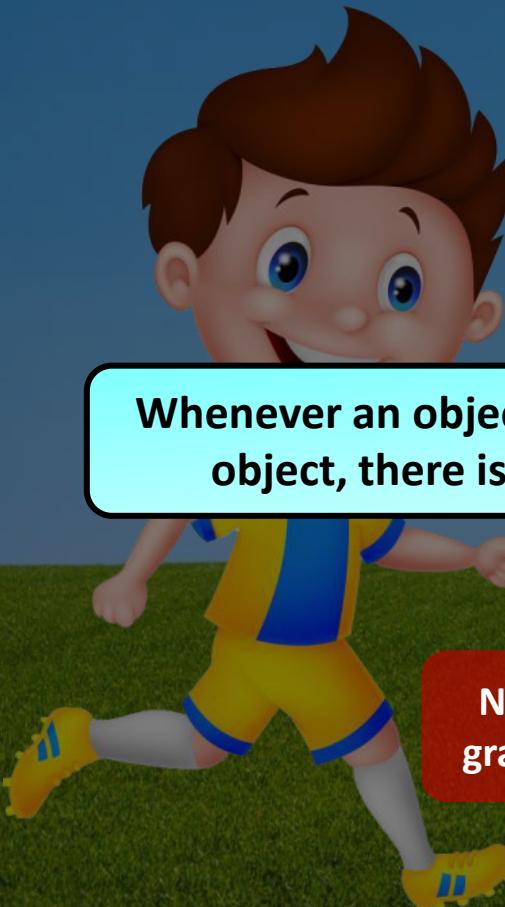


CONTACT FORCE

The force responsible for changing the state of motion of

Whenever an object moves, or tends to move, over the surface of another object, there is a force acting between the two surfaces in contact.

No force appears to be acting on the ball, yet the speed gradually decreases and it comes to rest after some time.

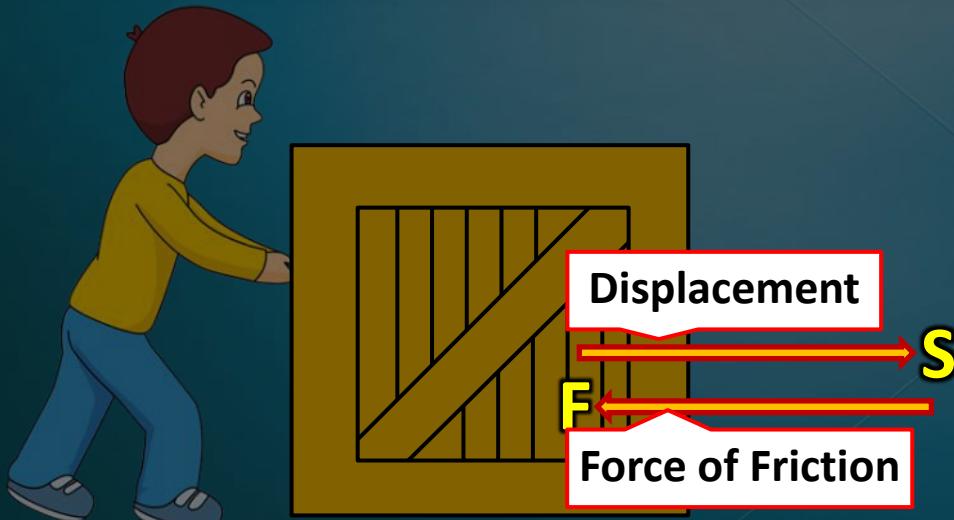


FRICITION



FORCE OF FRICTION

The force of friction always acts on all the moving objects and its direction is always opposite to the direction of motion

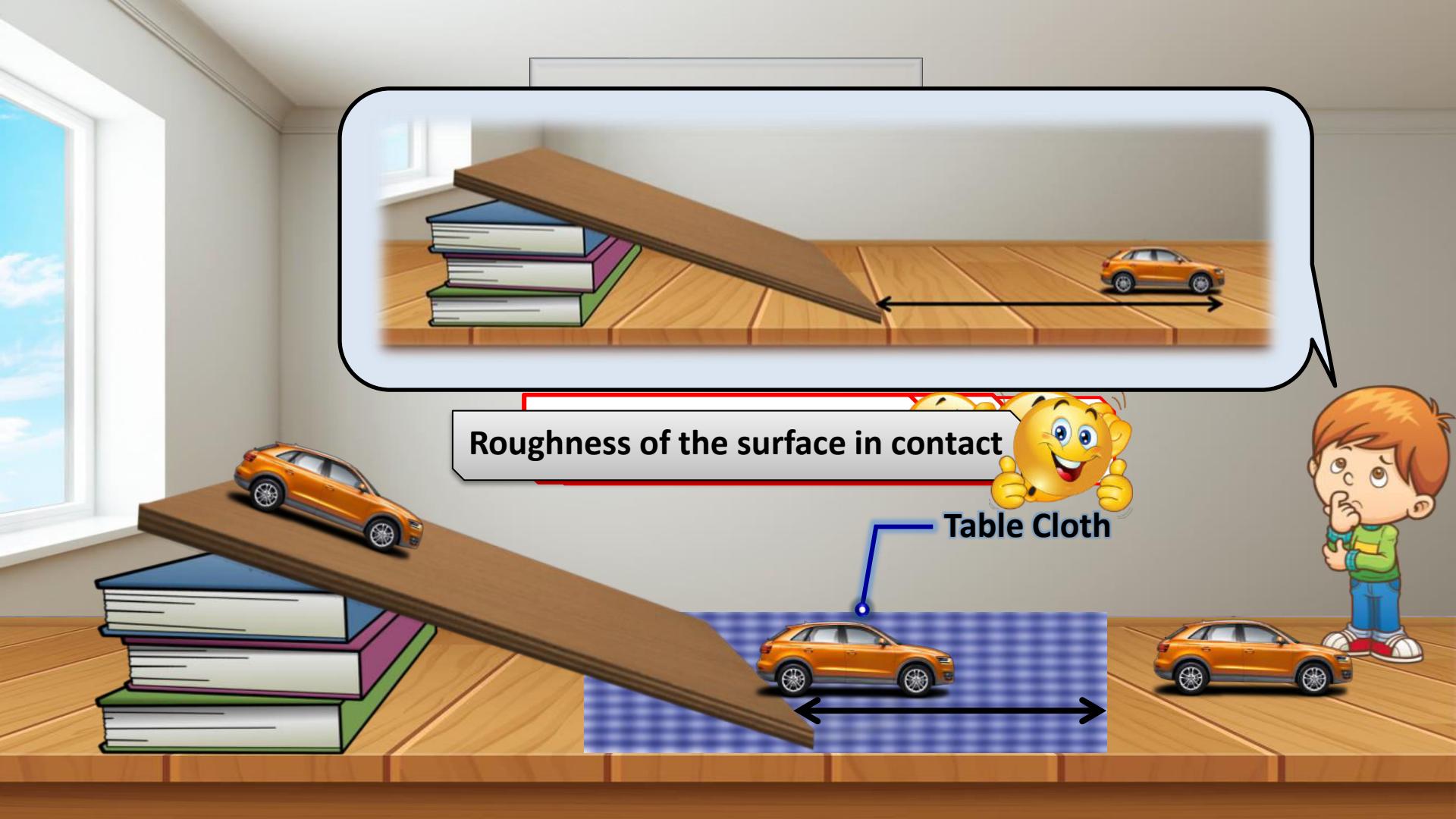


CAUSE OF FRICTION

Due to force of friction of the wooden surface, the car comes to rest

Inclined Plane





Roughness of the surface in contact



Table Cloth

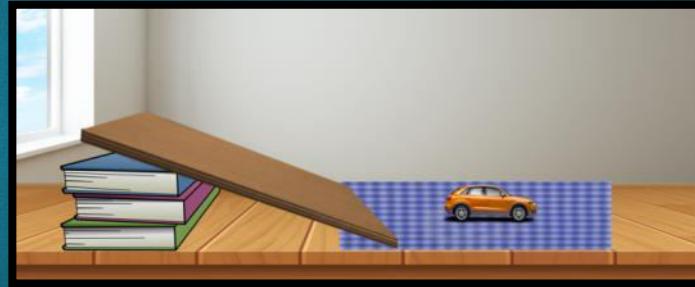
CAUSE OF FRICTION

Force of friction depends on the nature of the two surfaces in contact.



Roughness
Decreases

Force of Friction
Decreases



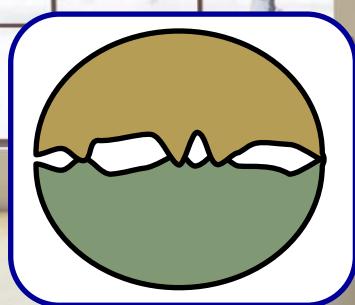
Roughness
Increases

Force of Friction
Increases

All surfaces have some roughness on them.

CAUSE OF FRICTION

When two surfaces are put in contact, the irregularities (ups/downs) of one surface get somewhat interlocked with the irregularities of the other surface



Still the block comes to rest

Smooth surface





**Force is applied, but that
force is not able to set
the body in motion.**

Let Us Understand Why....

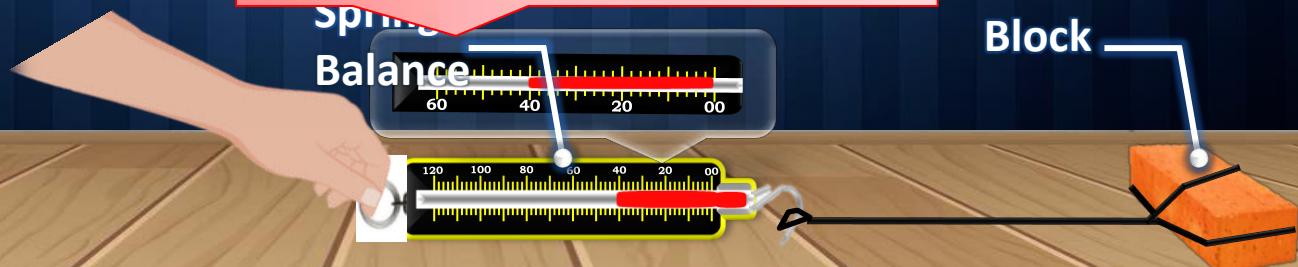
ACTIVITY

What do you observe ?



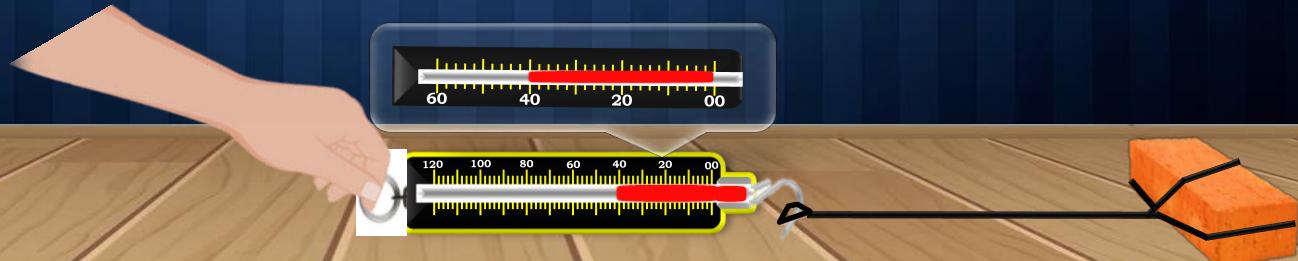
When you Apply Some Force..

The reading of the Spring Balance changes, but the block does not move



ACTIVITY

This Reading gives the measure of the Force of Friction between the Block and the Wooden Surface



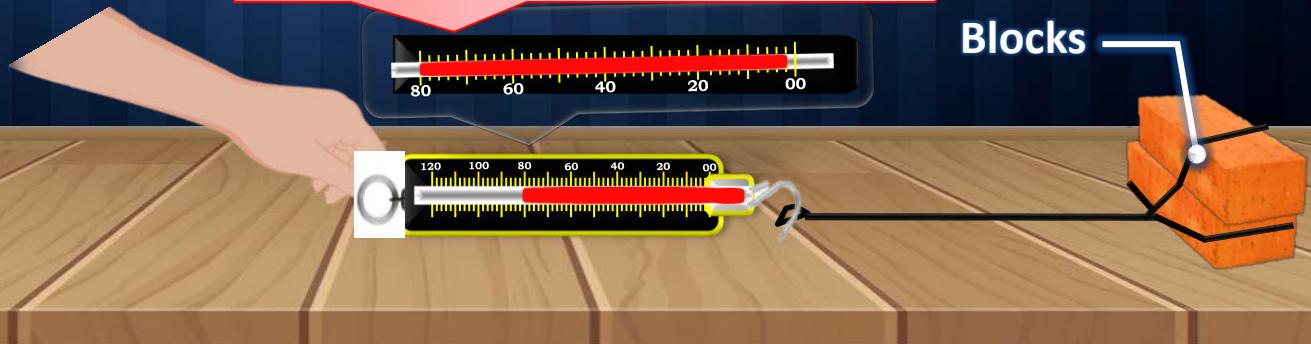
ACTIVITY

What do you observe ?



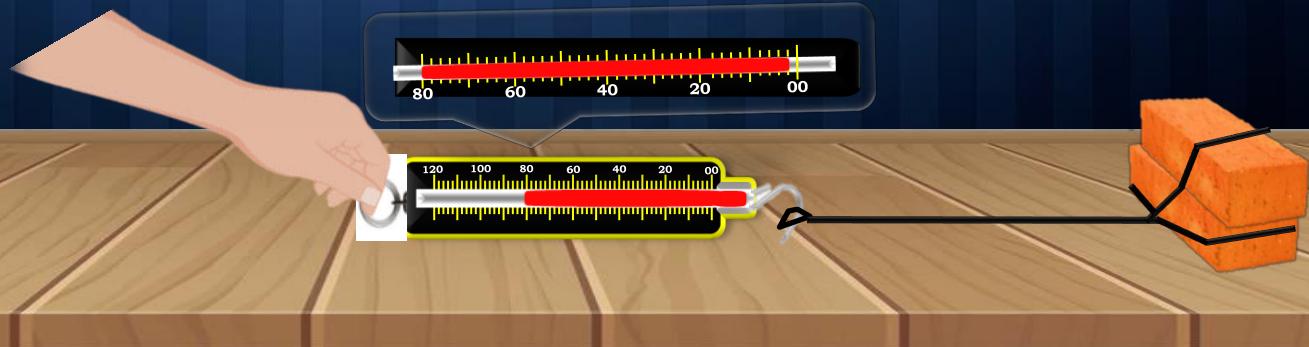
When you Apply Some Force..

The reading of the Spring Balance changes, but the block does not move



ACTIVITY

This Reading gives the measure of the Force of Friction between the Blocks and the Wooden Surface



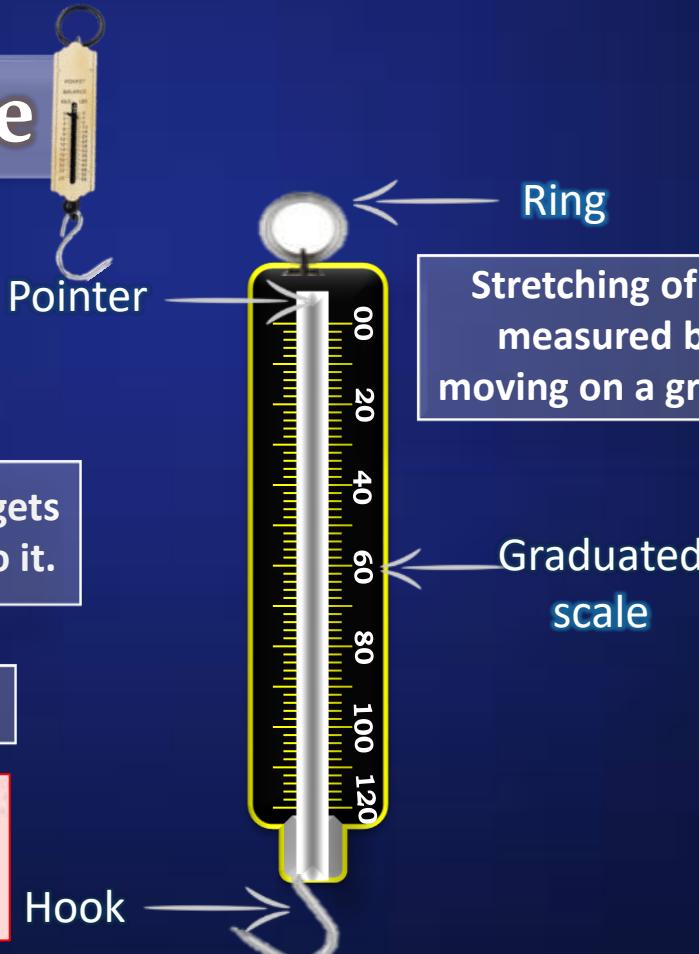
Spring Balance

Spring balance is a simple device that can be used for measuring the force acting on an object.

It consists of a coiled spring which gets stretched when a force is applied to it.

The S.I. unit of force is 1 newton (1N).

The force is said to be 1N if it produces an acceleration of 1m/s^2 in a body of mass 1kg.



Spring balance

FACTORS AFFECTING FRICTION

1. Nature of the two surfaces in contact.

2. Force pressing the two surfaces together.

Types of FRICTION

Static friction

Static friction

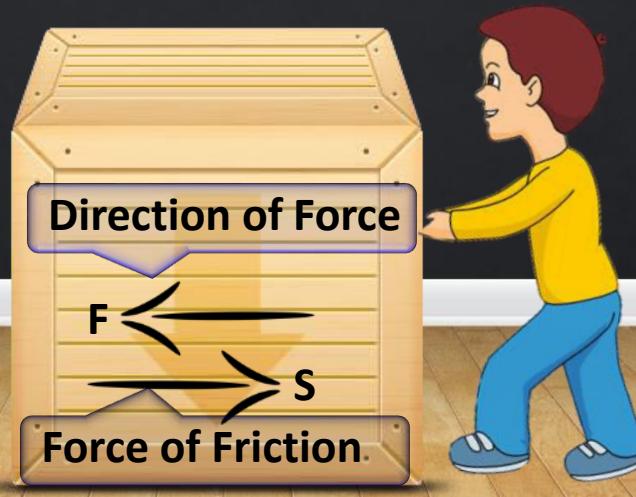
When an external force acts on the box, the force of friction acting is known as static friction.

This force is not sufficient to overcome the Friction

What does it happen???



This static friction balance the force which we exert on the box and the box remains at rest.



Static friction

This static friction balance the force

The box moves than the box and the
box remains at rest

When applied force is increased
to $2F$, static friction also
increases to $2F$.

This force is also not
sufficient to overcome the

**Force of static friction increases
of the applied force.**

What happens???

Static friction is a self-adjusting force.

Direction of Force

$2F \leftarrow$

$\rightarrow 2F$

Force of Friction

Types of **FRIC^{TION}**

Static friction

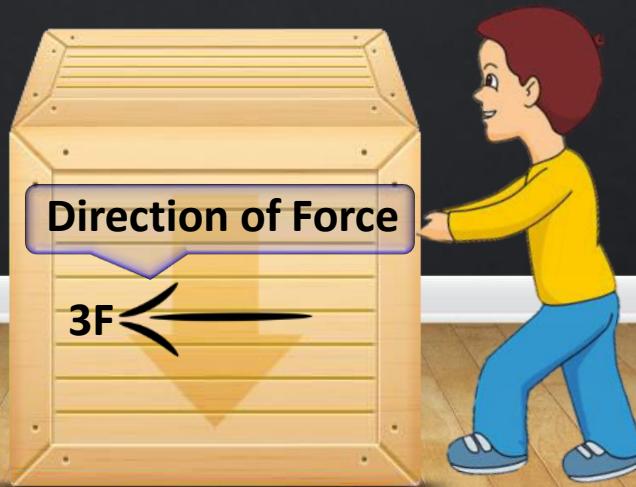
Sliding friction

The force required to overcome friction at the instant an object starts moving from rest is a measure of static friction.

Sliding friction

This force of friction is known as sliding friction (kinetic friction)

This force is sufficient to
What do we find?
overcome the Friction



Types of **FRICITION**

Static friction

The force required to overcome friction at the instant an object starts moving from rest is a measure of static friction.

Sliding friction

The force required to keep the object moving with the same speed is a measure of sliding.

Static and sliding friction

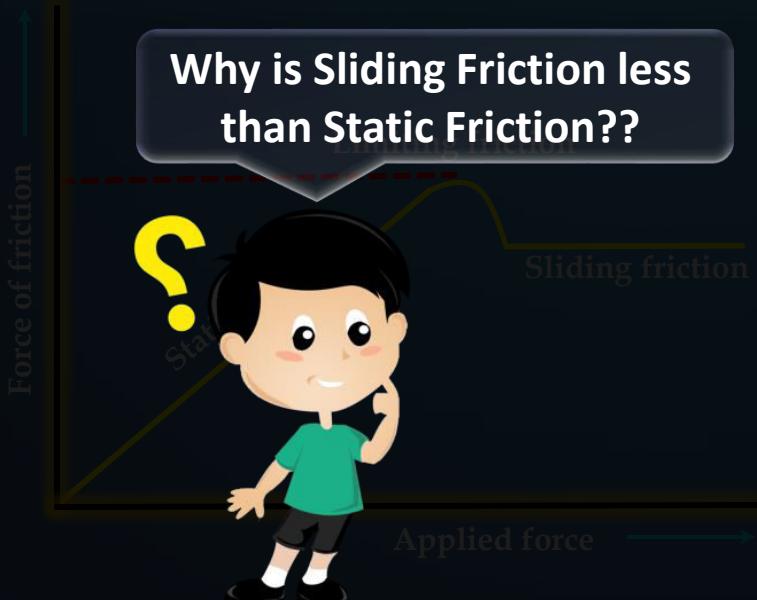
When some weight is added
to the pan

Block

This force is sufficient to
overcome the Friction

Graph for friction

Sliding Friction is always a little less than the Limiting Friction as well as Static Friction



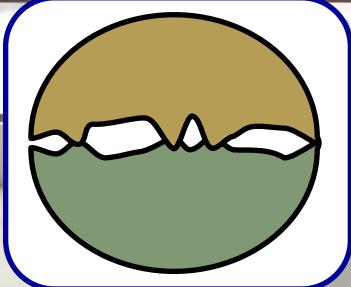
Static friction is equal and opposite to the applied force.

It can increases only unto a certain upper limit (limiting friction).

The force of limiting friction depends on the nature of the surfaces in contact

The block doesn't move

This is because of the interlocking
between the irregularities



Once the motion starts, the 'contact points' on one surface do not get enough time to lock into the 'contact points' of the other surface.
unlocked, the block starts moving



Types of FRICTION

Static friction

The force required to overcome friction at the instant an object starts moving from rest is a measure of static friction.

Sliding friction

The force required to keep the object moving with the same speed is a measure of sliding.

Rolling friction

Rolling friction

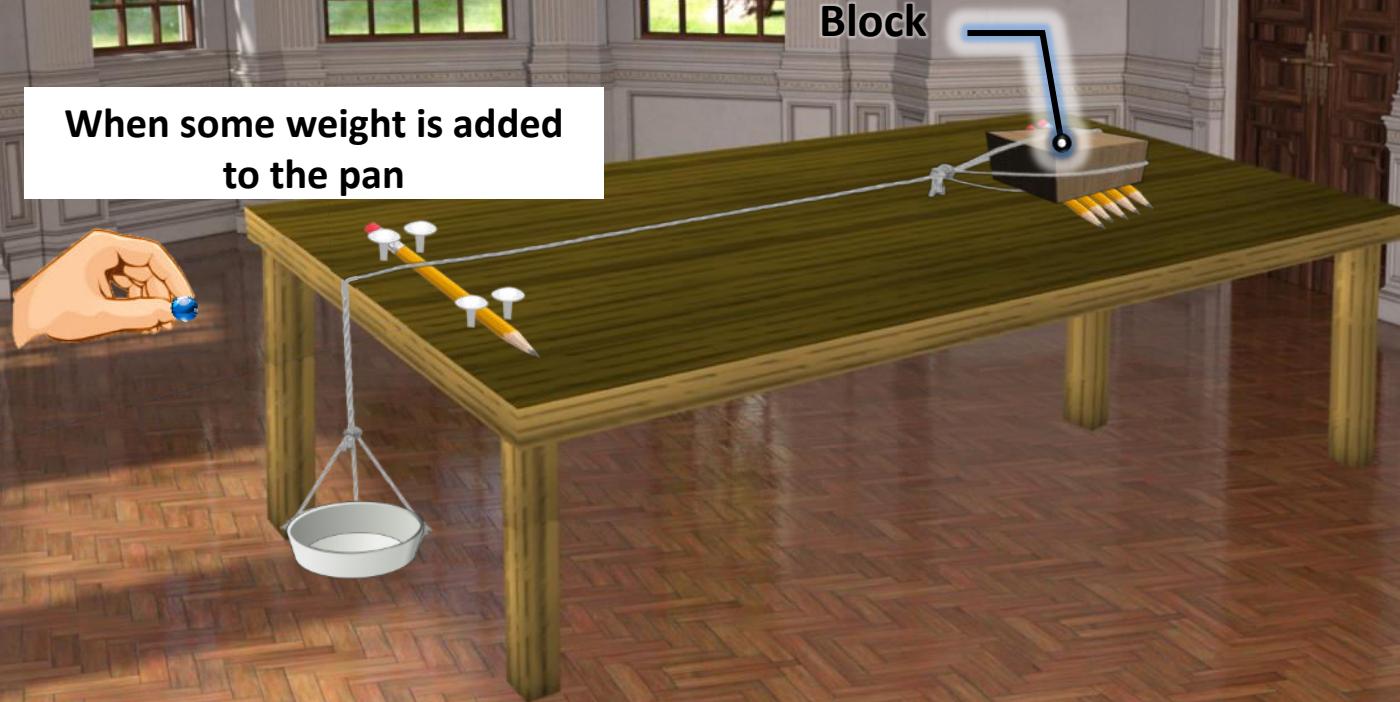
Why do the bag have wheels??

It makes it easy for the person to pull the bag, thus reducing friction.

Such a friction is called as rolling friction

ACTIVITY TO UNDERSTAND ROLLING FRICTION

When some weight is added
to the pan



Types of FRICTION

Static friction

The force required to overcome friction at the instant an object starts moving from rest is a measure of static friction.

It exists between two surfaces in contact, between which there is no relative motion.

Sliding friction

The force required to keep the object moving with the same speed is a measure of sliding.

It exists between two objects, when one of them is sliding over the surface of the other.

Rolling friction

The force of friction that comes into play when one body rolls over the surface of another body

Static friction



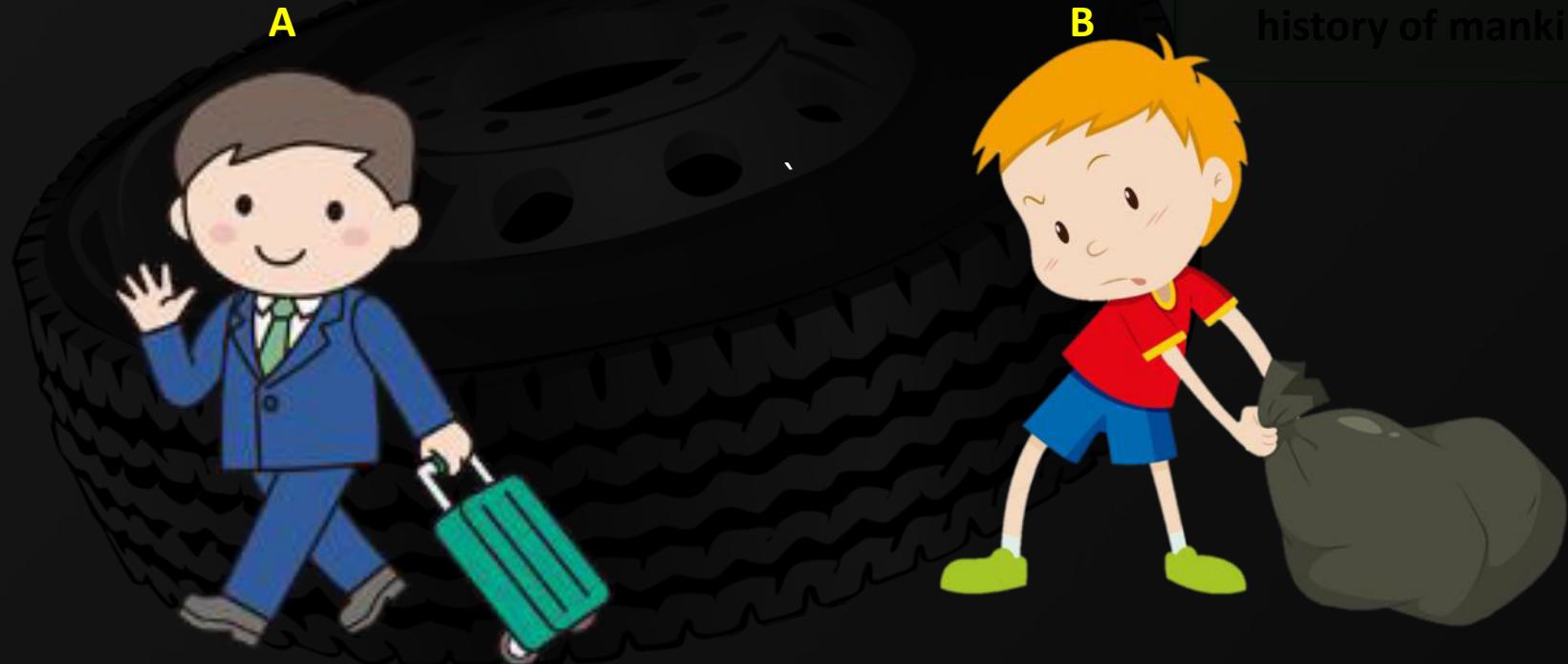
Sliding friction



Rolling friction

Wheel-A Revolutionary Invention

Where do you think the force of friction to pull the bag will be less??



The wheel has been considered one of the greatest inventions in the history of mankind.

Thank You