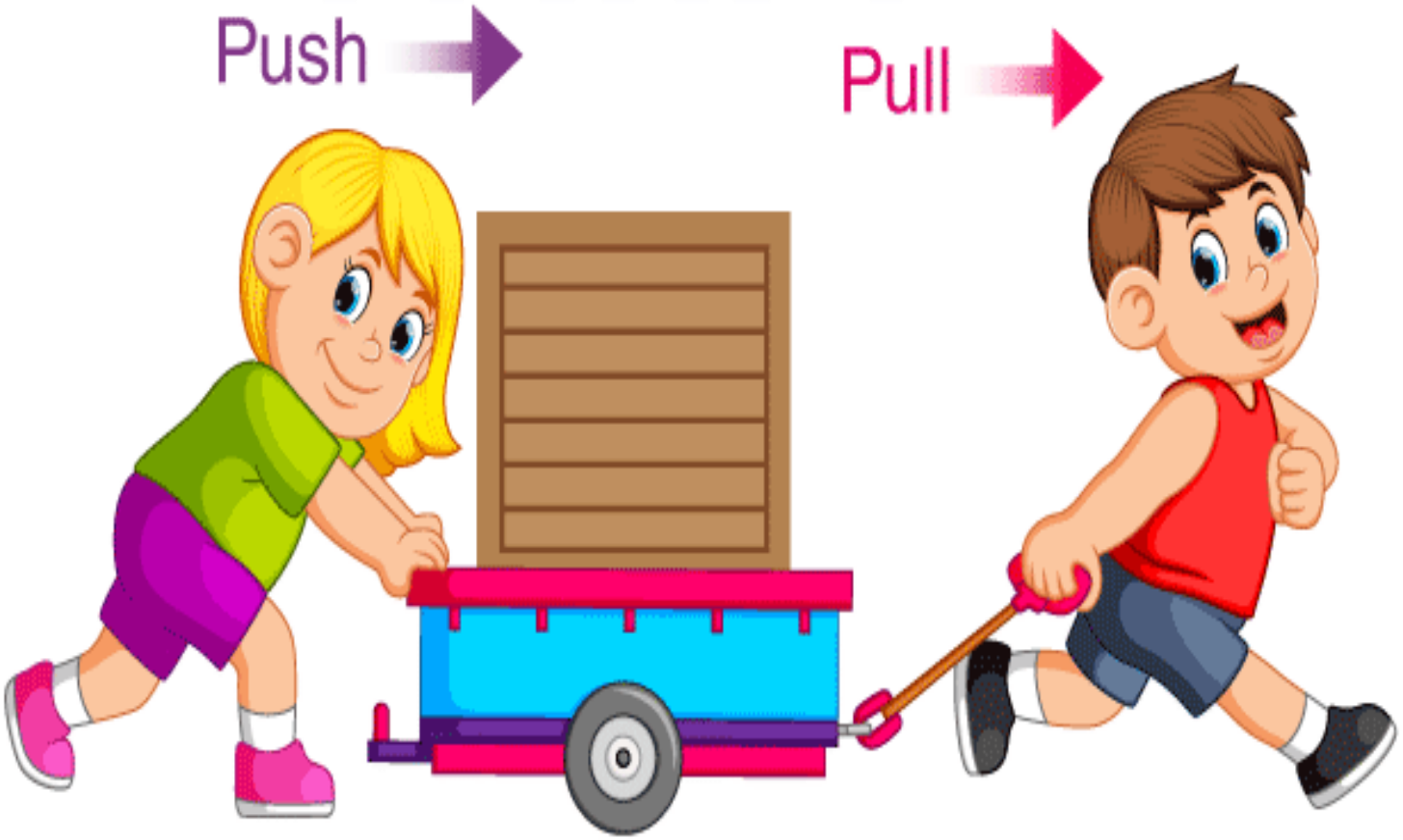
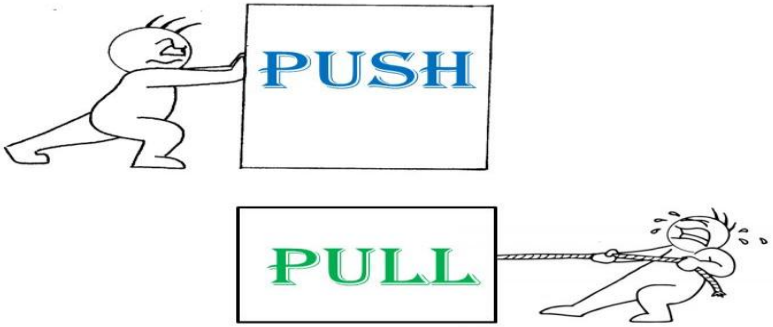
FORCE



Can you ride the bicycle without push the pedal.?

Can you open the door without exert the force (push/pull)?

Can you move the ball without kick.?



Can you do any work without applied force.?

Force = A push or a pull

ACTIVITY-1

Identify the following tasks (actions) as Push or Pull or Both.

Sl. No.	ACTION	PICTURE	PULL/PUSH/BOTH
1	Digging a bore well.		
2	Sipping juice with a straw.		
3	A magnet attracting iron nails.		
4	Fruits falling from a tree.		
5	Hoisting a flag.		

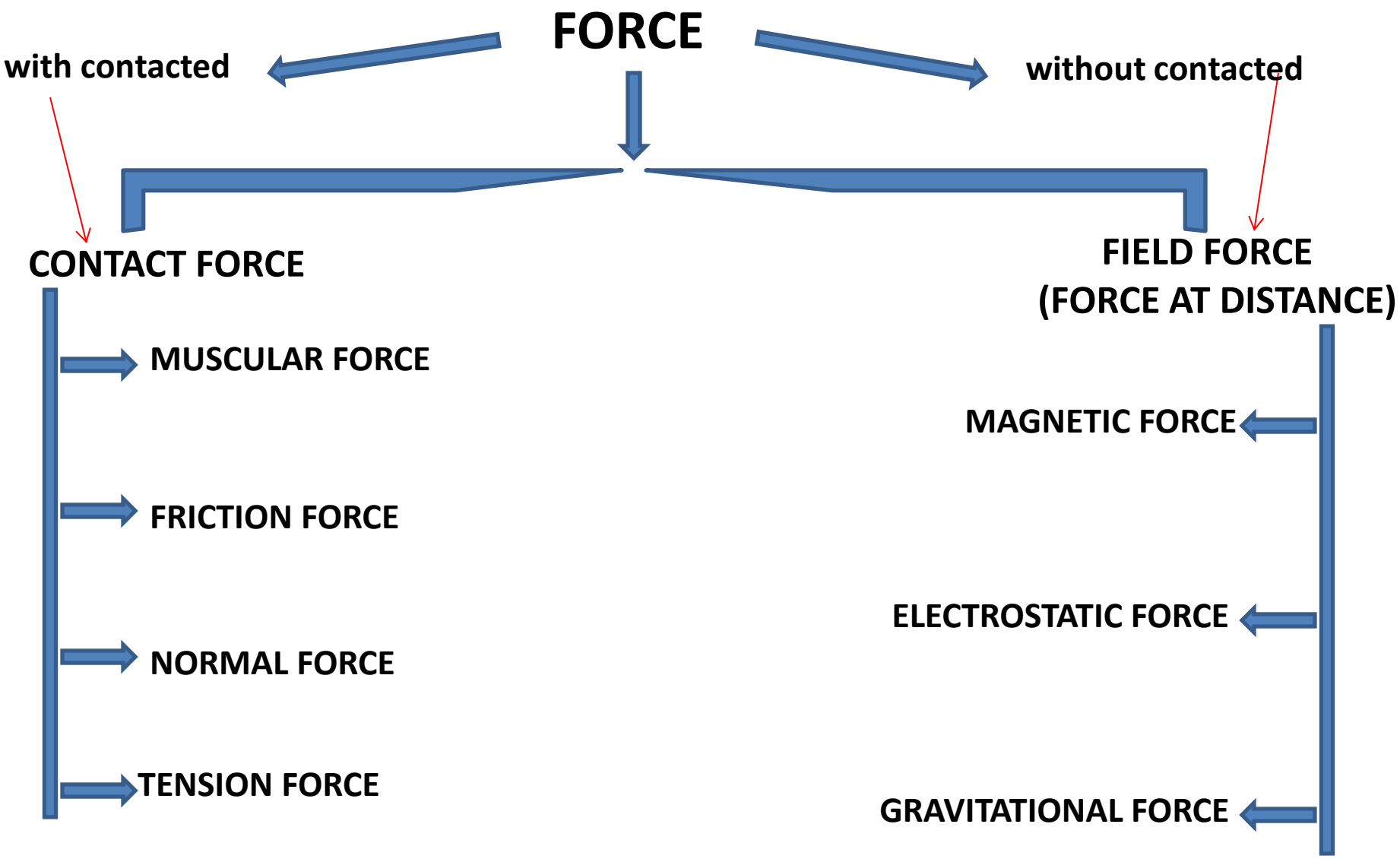
FORCES

A force is a push or pull.

What can a force do?

1. Change the position of an obje
2. Change the speed of an object
3. Change the direction of a moving object
4. Change shape of an object.

TYPES OF FORCE



Contact Forces

A force when there is a physical contact between two interacting objects is known as CONTACT FORCE.

Muscular force

The force which we exert by using our body muscles is known as MUSCULAR FORCE.

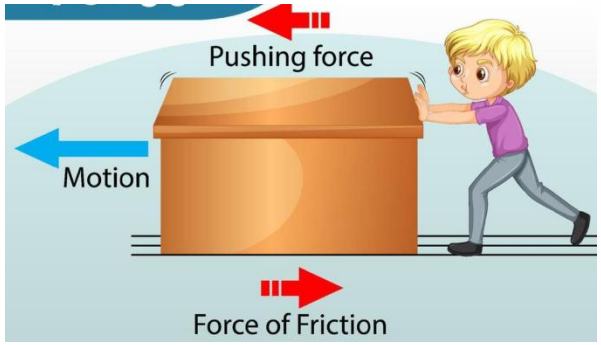
Ex: 1. write on the board
2. lift the bag or luggage
3. ride the bicycle
4. cutting the vegetables
5. catch the ball
6. play the games…etc

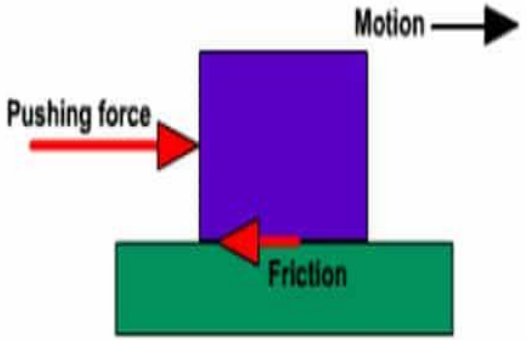
Muscles are normally arranged in such a way that as one group of muscles contract/shortens another group relaxes/expands.

If you throw a ball the muscles in the chest relaxes or expands and the muscles in the back contract or shortens.

If you pull the arm forward while release the ball the muscles in the chest contract or shortens and the muscles in the back relaxes or expands.

FRICTION



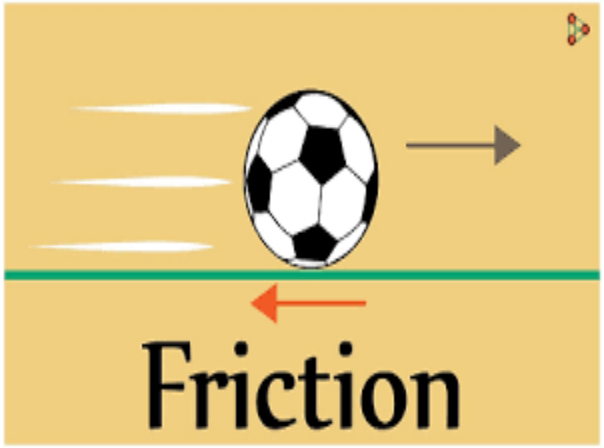


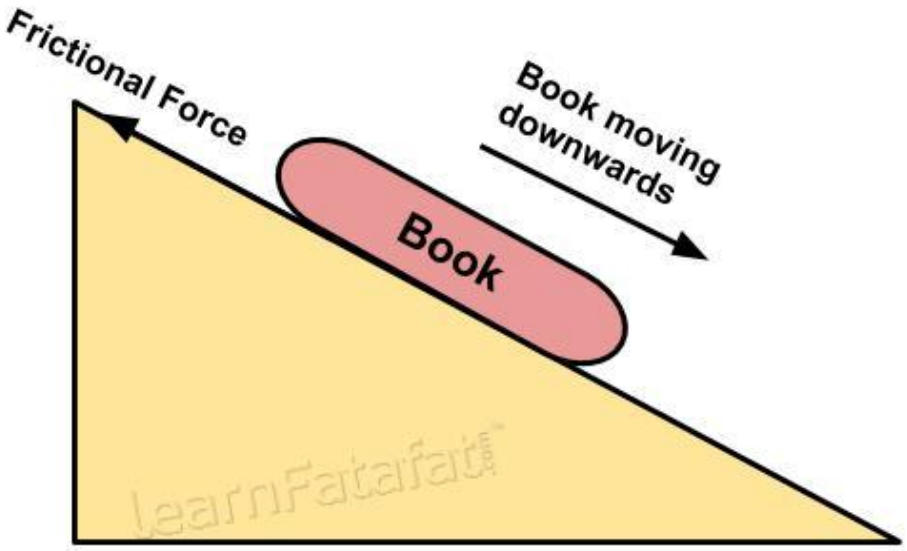
Friction is the resistance to the movement of a body over the surface of another body. This is a contact force.

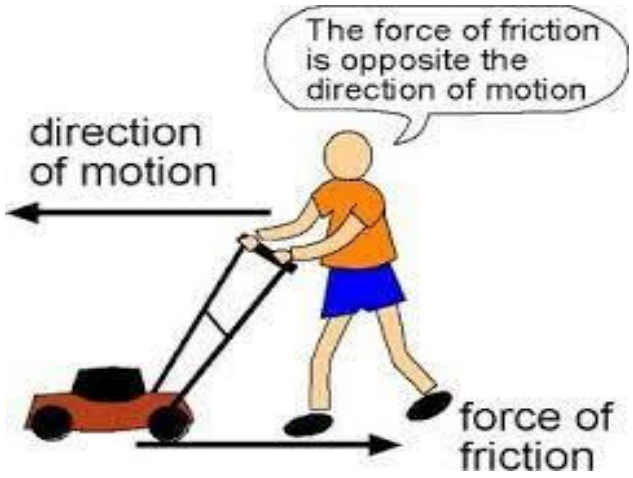
Friction

- Is the force which <u>opposes movement</u>

FRICTION is control or resist the motion.

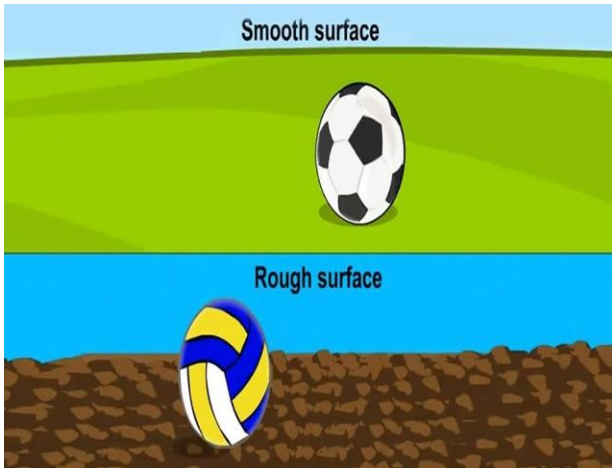






The direction of friction is opposite the direction of motion always.

In which situation does applied more friction and why.?

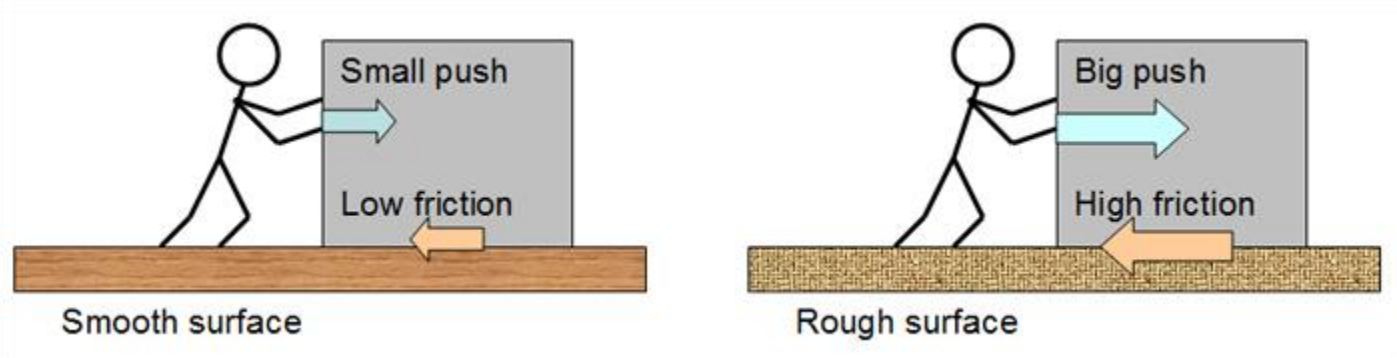


In which situation which ball moves fast and why.?

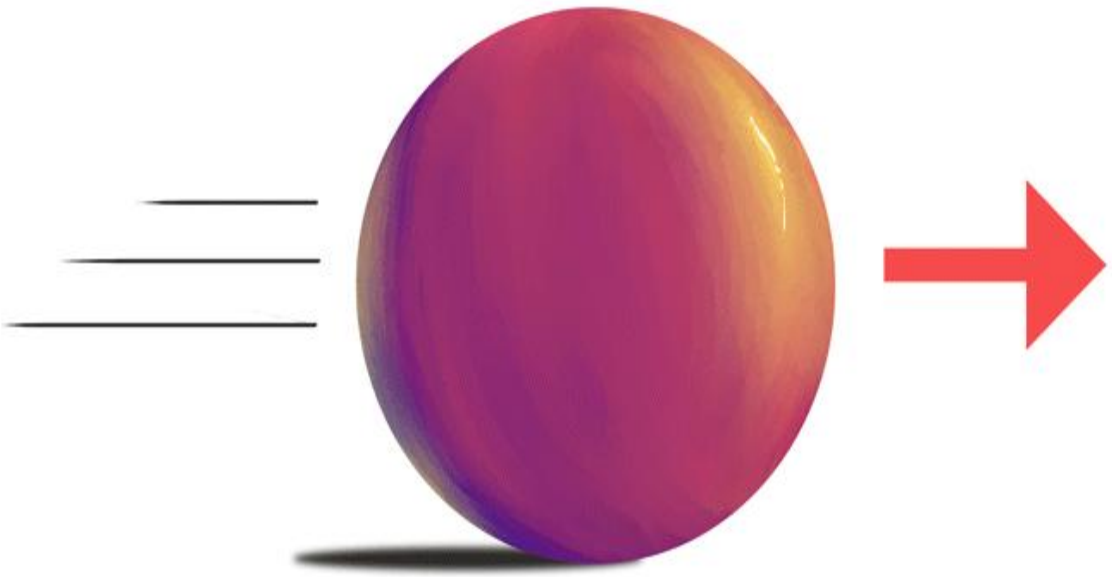
Why do slip when you step on the peel of banana or any smooth/oily surfaces.?

Why do most road accidents happen during the rainy days.?

Do you think the car get out from the mud easily.?



SMOOTH SURFACES have low friction even you exert small force but you have more force in ROUGH SURFACES so that they have high friction

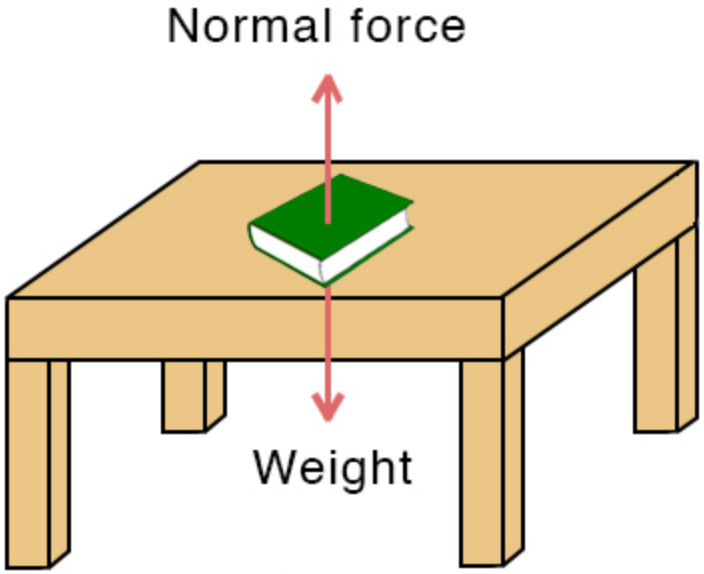


Now tell me moving ball has stopped after some time . why.?

Can you assume more examples of friction.?

Let you imagine a world without friction.?

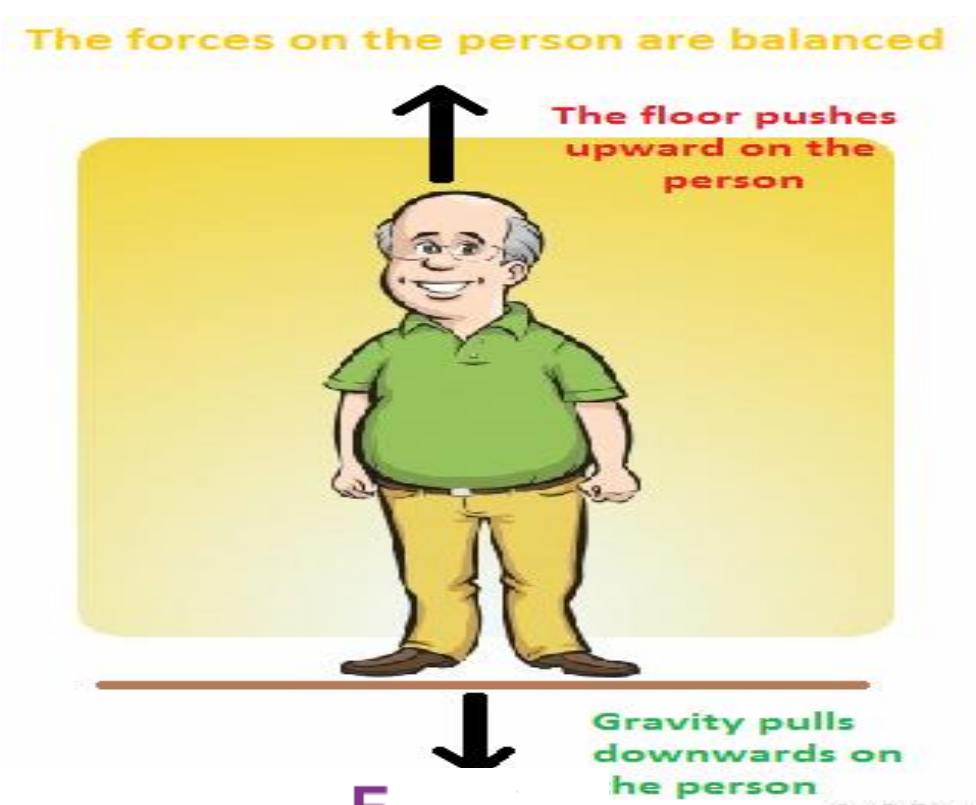
Normal Force

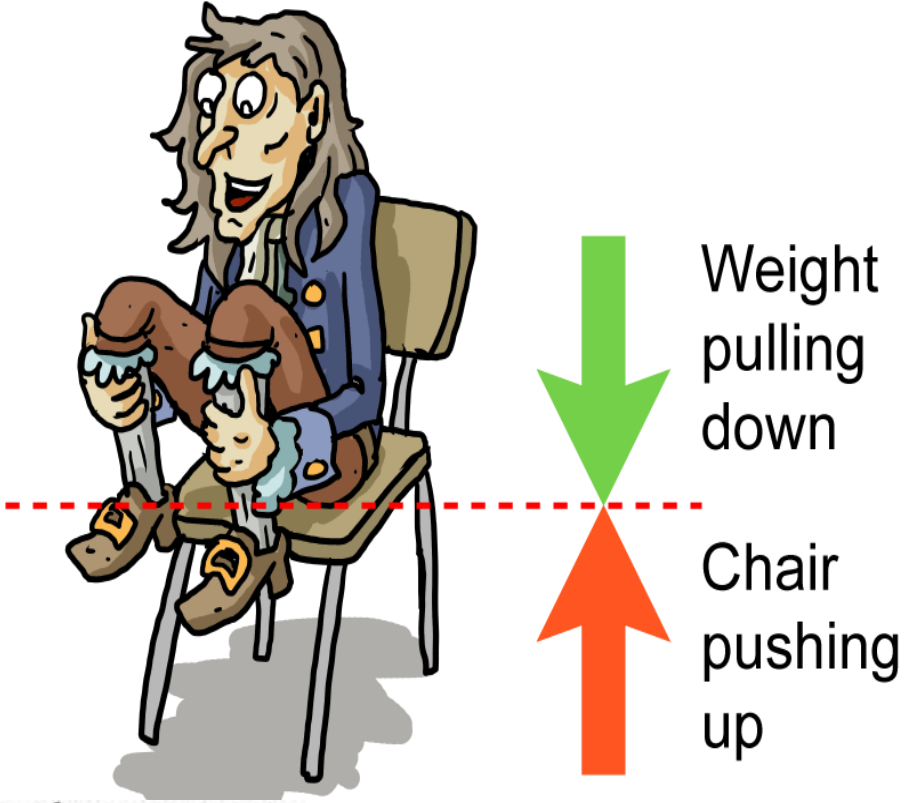


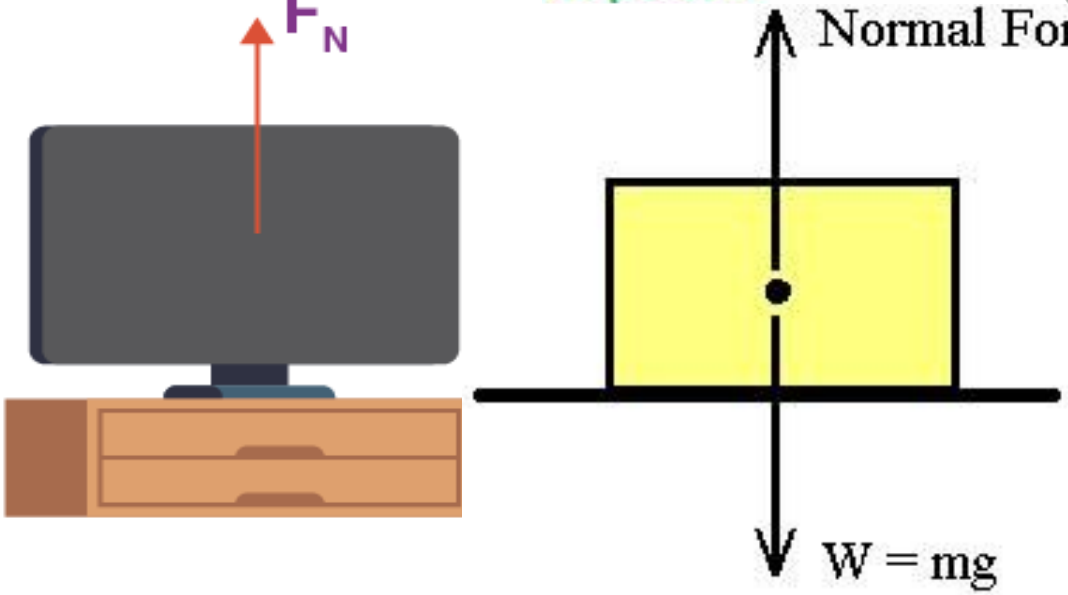
A direction which is **perpendicular(90 degrees)** to the plane of a surface is called **NORMAL.**

The force that acting on any object in the normal direction is called the **NORMAL FORCE.**

This force is always **upward direction** on the object which is opposite to the gravity / weight of the object and it is **CONTACT FORCE.**

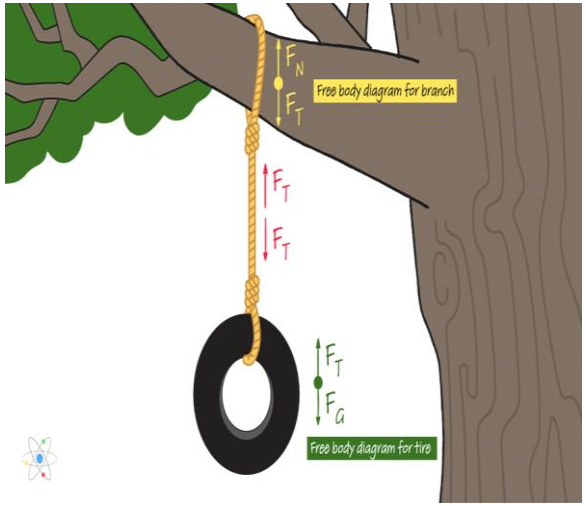


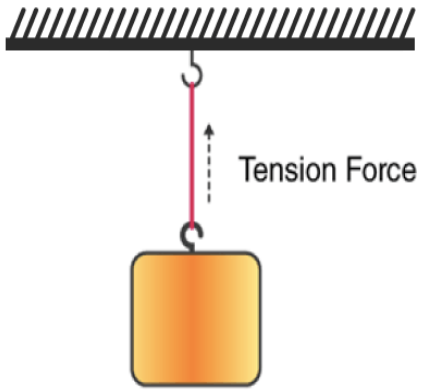


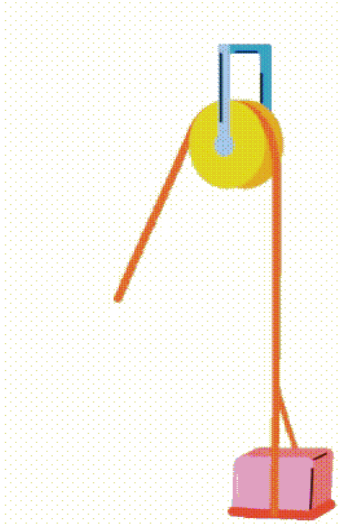


Normal force and Gravitational force are opposite in the direction and equal in magnitude so that the acting net force is zero means the object is in the rest position.

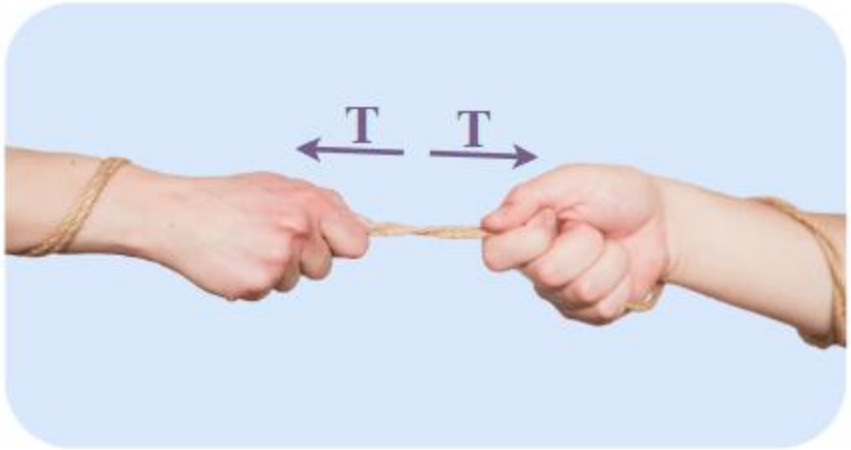
Tension Force

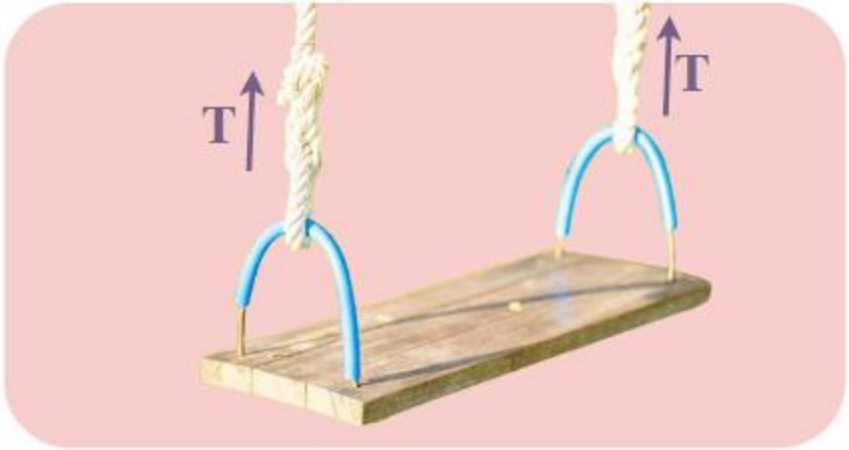




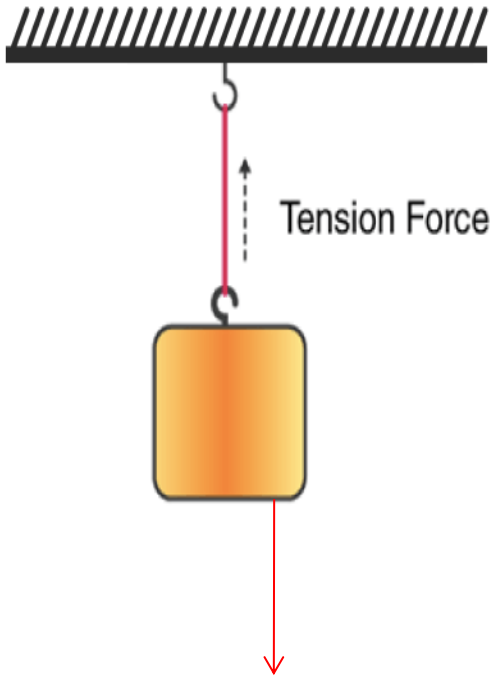


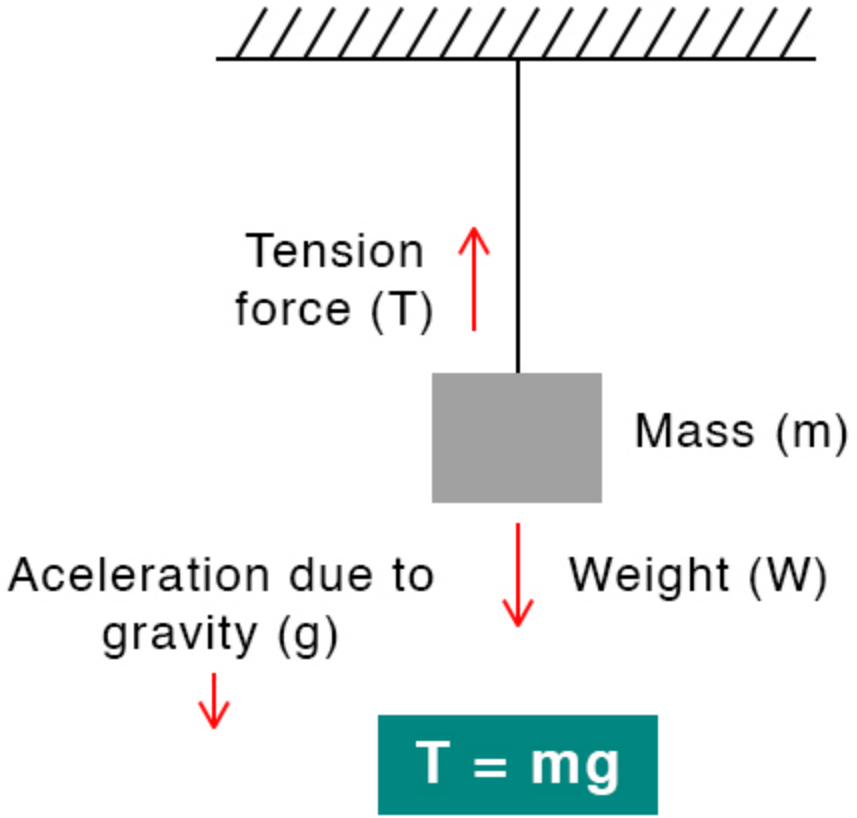
Tension force is a force that tightness of a rope or a string.





TENSION FORCE IS A CONTACT FORCE





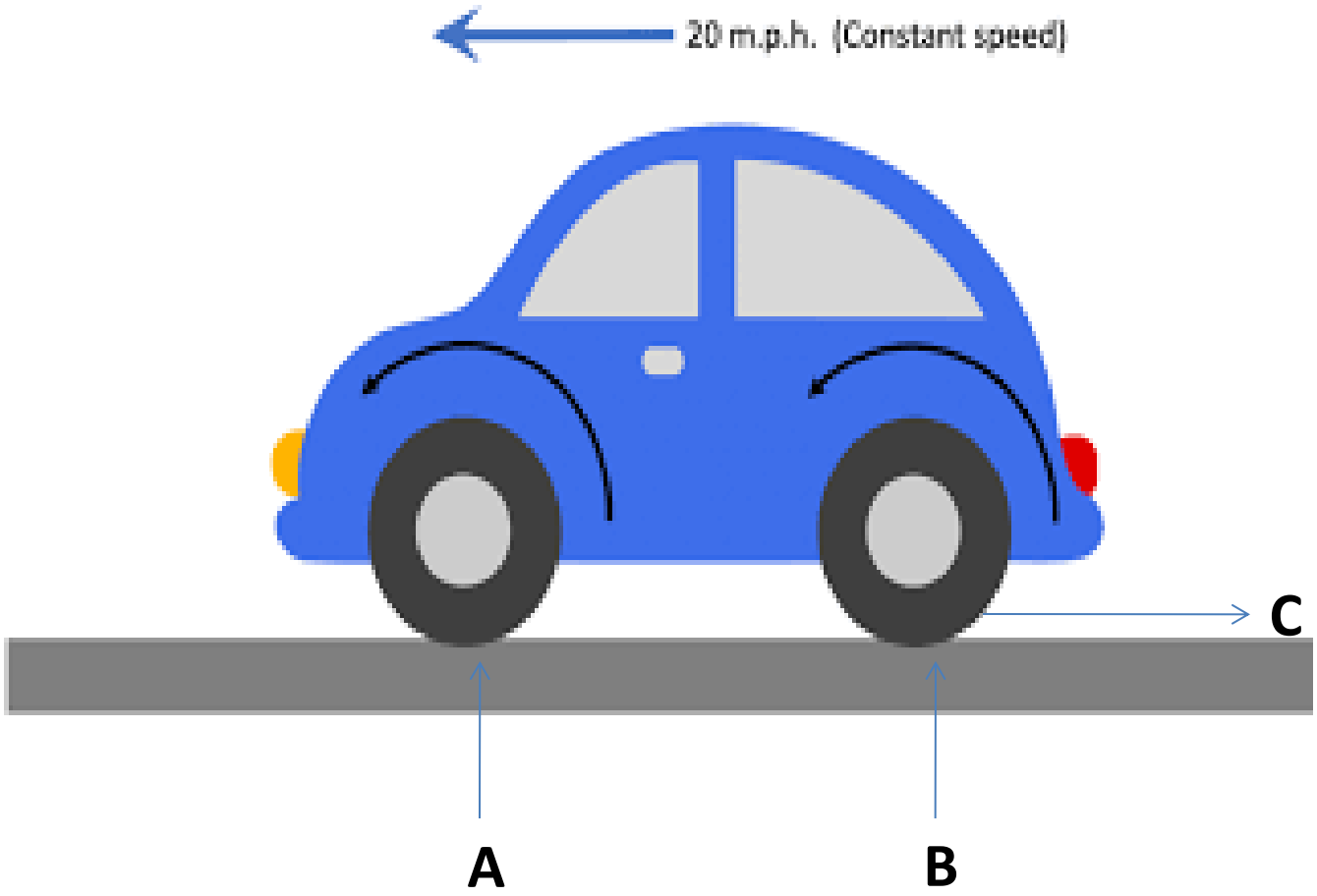
Direction of tension force is opposite to the direction of gravitational force.

Tension force also exert on a body in upward and perpendicular direction.

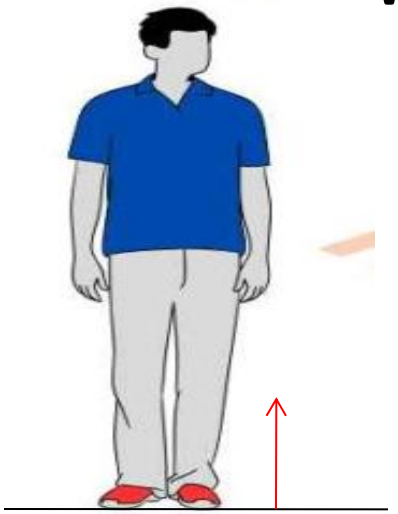
So,

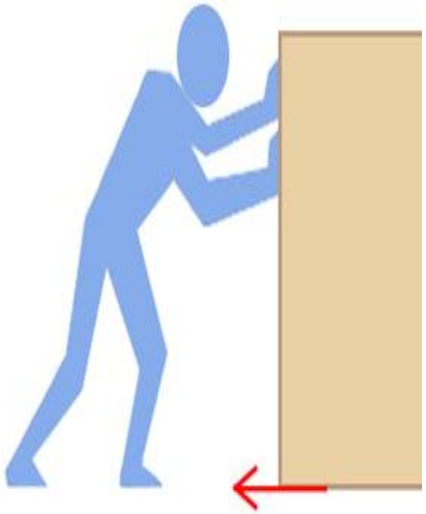
What is difference between the NORMAL FORCE and TENSION FORCE. Can you explain.?

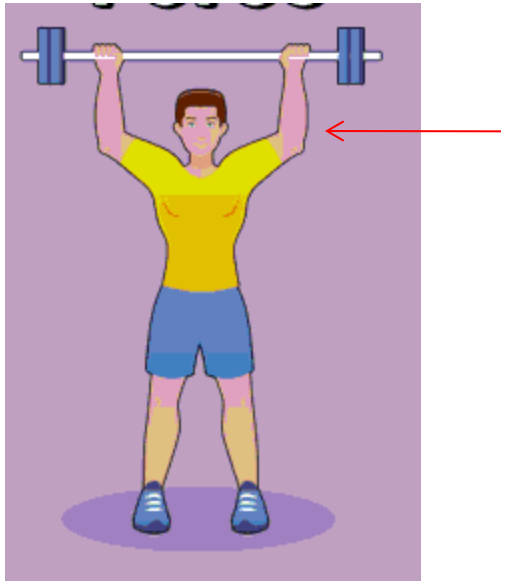
In this picture what forces are A,B and C.?

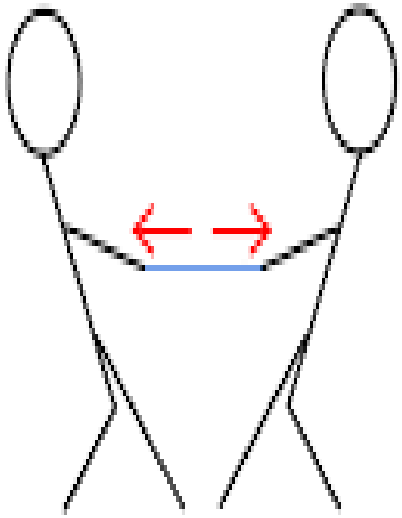


What forces show arrow marks in the pictures.?









Give more examples of contact forces in our daily life.?

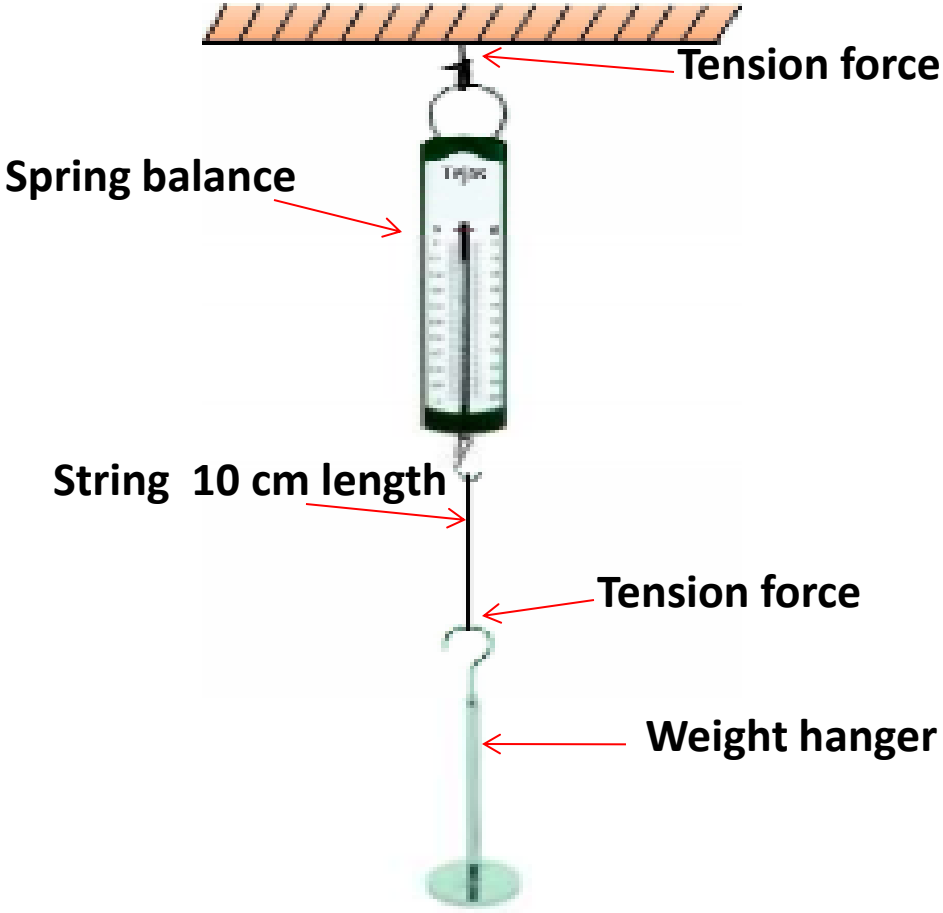
Can you do any work without exert the contact force.?

LAB ACTIVITY

AIM: To find the limiting force that can be borne by a string.

Materials used: Spring balance, weights, light strings are 10 cm length and equal thickness, Weight hanger.

PROCEDURE:



1. Hang the spring balance at wall.
2. Take 10 cm length of string and tied the end of spring balance
3. Take the weight hanger and hang with the second end of the string.
4. Now the string is tight
5. Take small amount of weight ie10 gm and put it in the weight hanger
6. Increase the weight with 10 gm until the string is broken
7. Record the weight that when string is broken
8. This is the limiting force that can borne the string
9. Again do the same procedure with another string and mention the weight in the table.

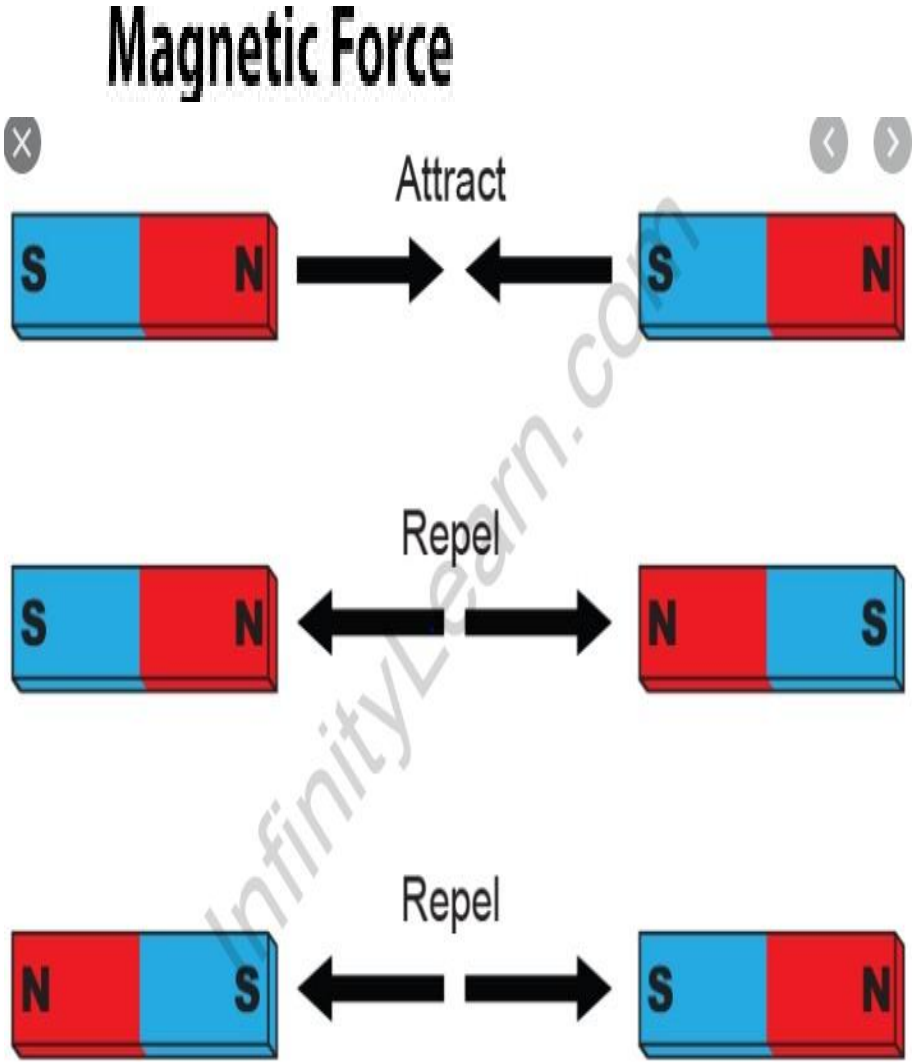
S.No.	Type of string	Limiting force
1.		
2.		

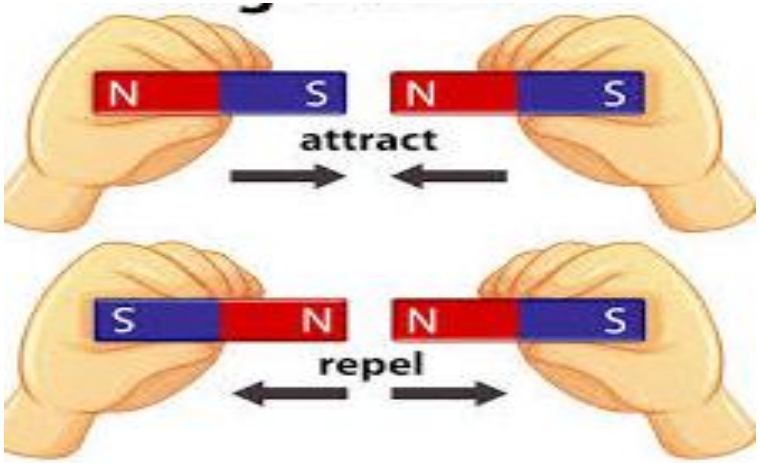
RESULT/GENERALISATION:

1. When Tension force is applied on the string it has specific limiting force
2. The limiting force is depends upon the nature of string.

FIELD FORCES/FORCE AT DISTANCE

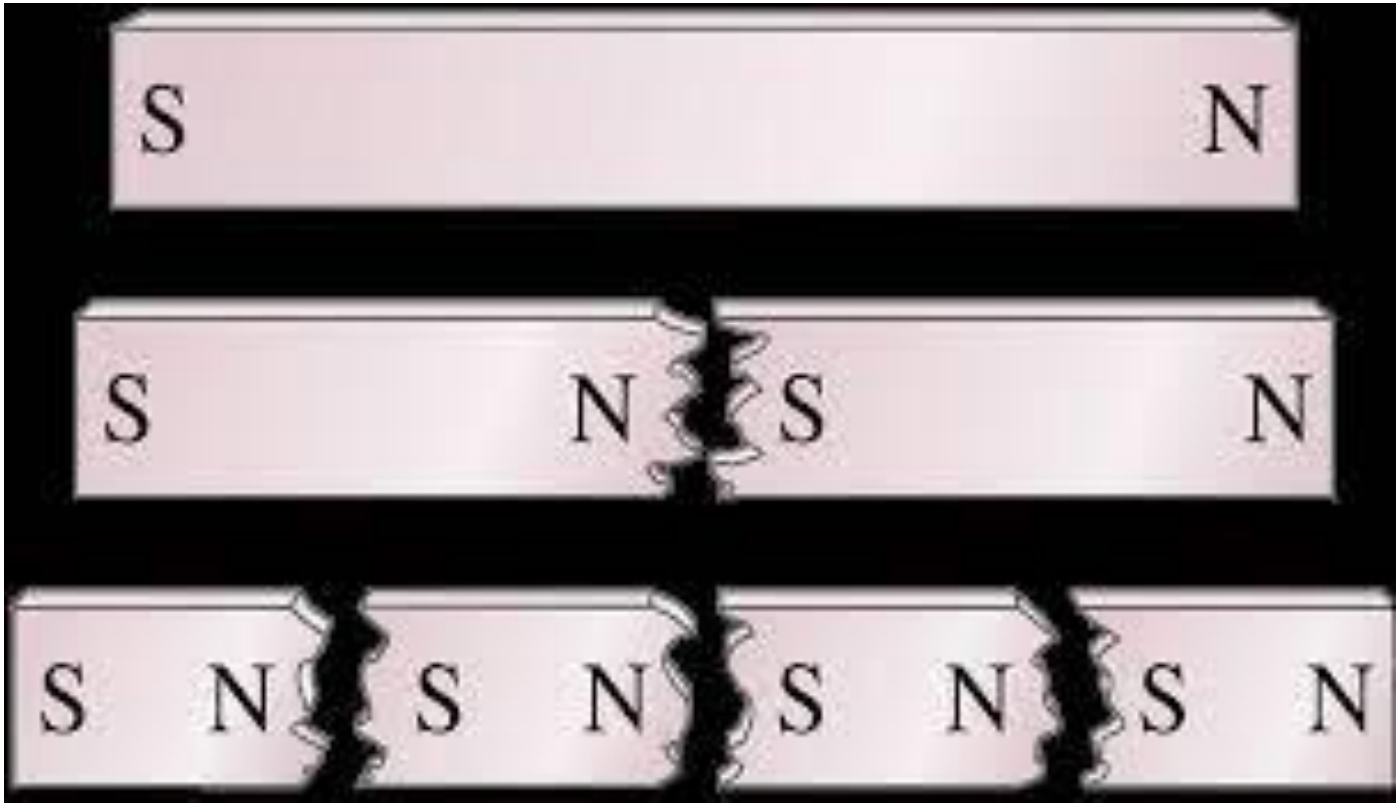
The force which occurs without any physical contact between two objects is called FIELD FORCE or FORCE AT DISTANCE.





The force between two magnets or magnetic materials like repel or attract is called MAGNETIC FORCE.

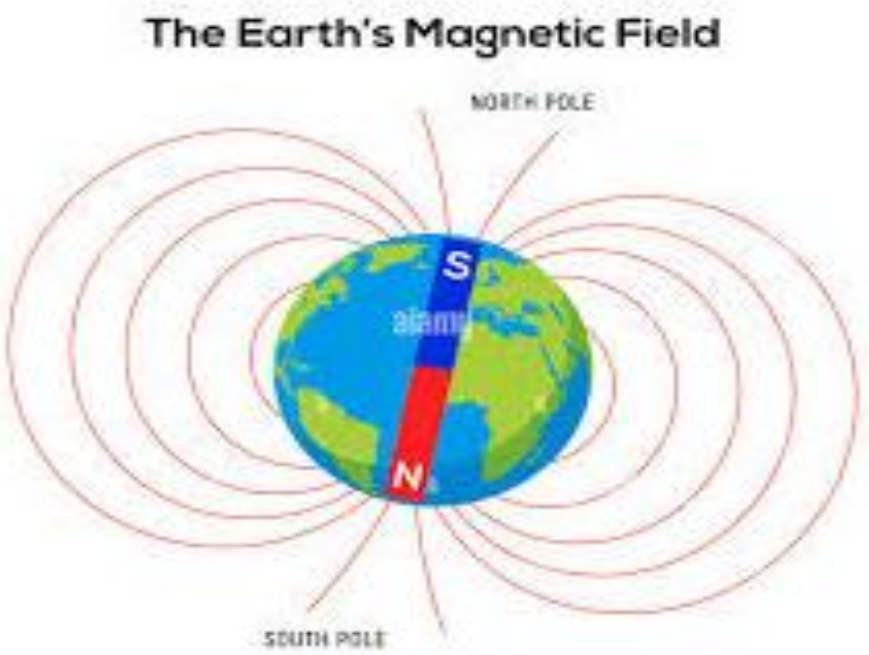
Do you say which are like poles and unlike poles from the figures.?

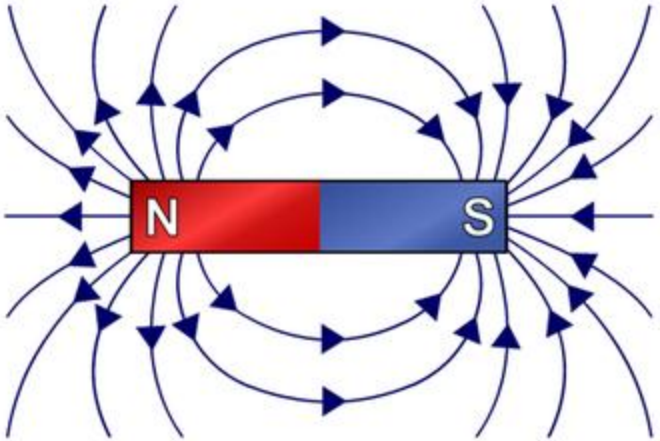


WHAT PICTURE GIVE THE INFORMATION HERE.?

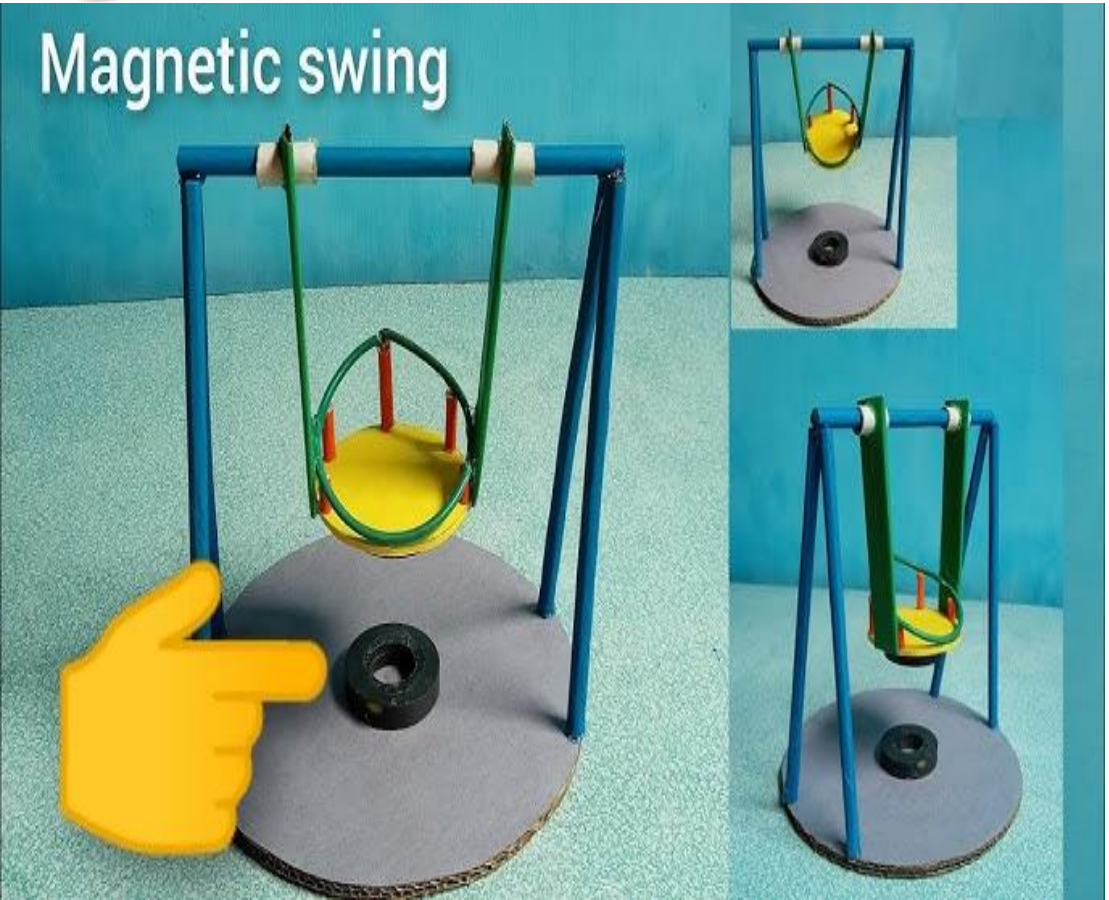
MAGNETIC FIELD

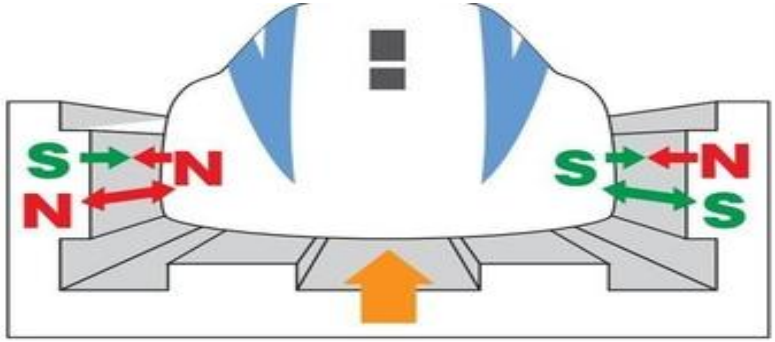
The space around the magnet where it influenced is called magnetic field.



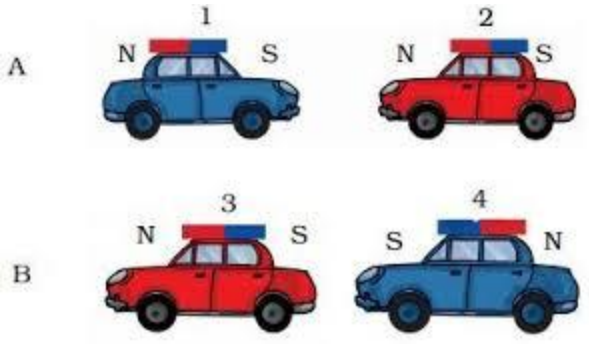


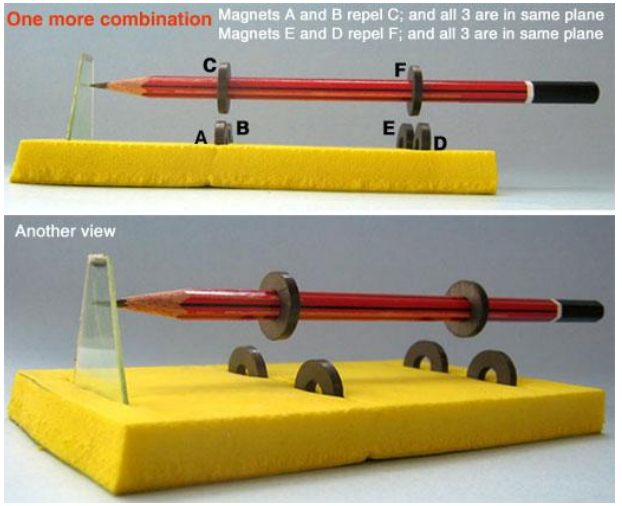
Magnetic field surrounds a magnet.
Magnetic field shows with field lines.
At poles of the magnets have more strength it represents thick field lines.





Magnetic Levitation





Can you see these magnetic toys.?

Can you make these kind of toys.?

Observing the magnetic force OR make a magnetic compass

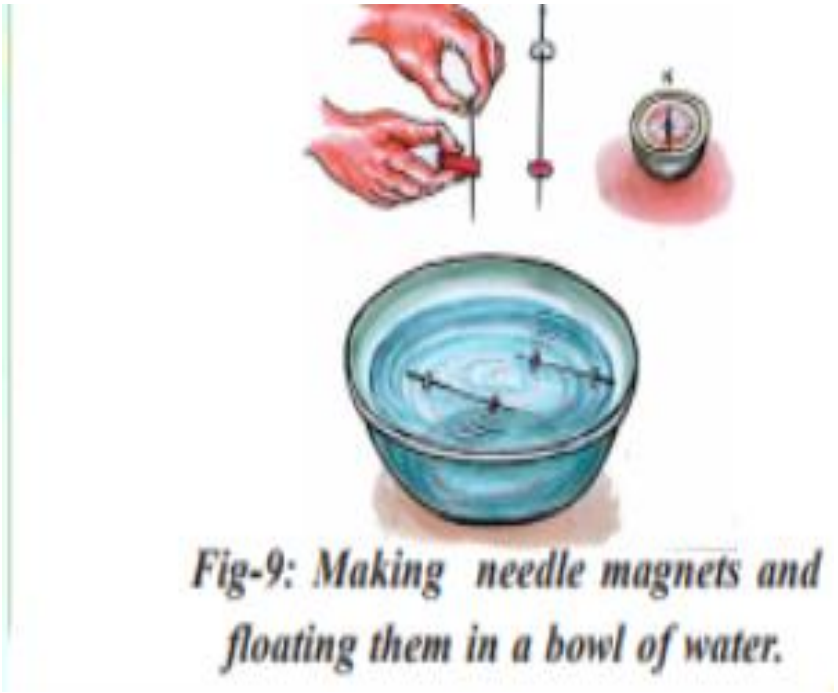


Fig-9: Making needle magnets and floating them in a bowl of water.

REQUIRED MATERIALS:

sewing needles
bowl
magnet
red and white colored corked ball
magnetic compass

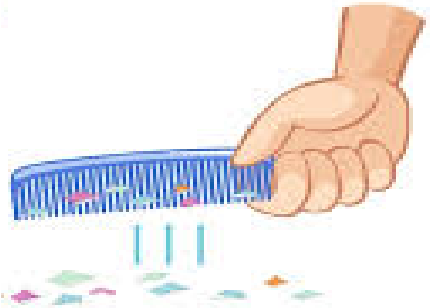
PROCEDURE:

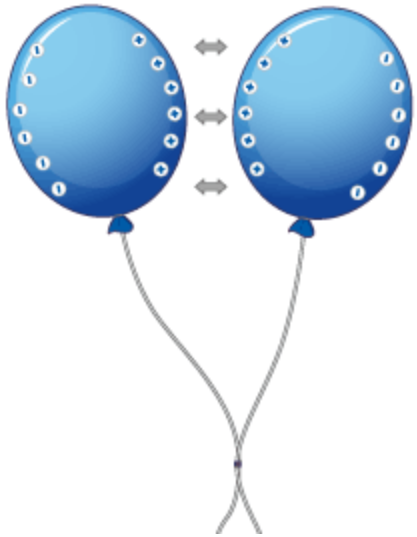
1. Take a sewing needle.
2. Rub with magnet several times moving the magnet in same direction
3. Now the needle acts like a magnet
4. With the help of magnetic compass find the north and south pole
5. Pin a red color cork ball to North pole and white color to South pole and drop in the water that is in the bowl.
6. Do this same an another needle and drop in the bowl.
7. Now, making of the magnetic compass is ready.

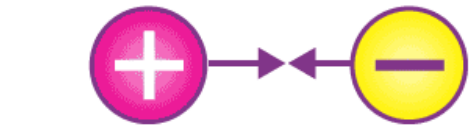
RESULT:

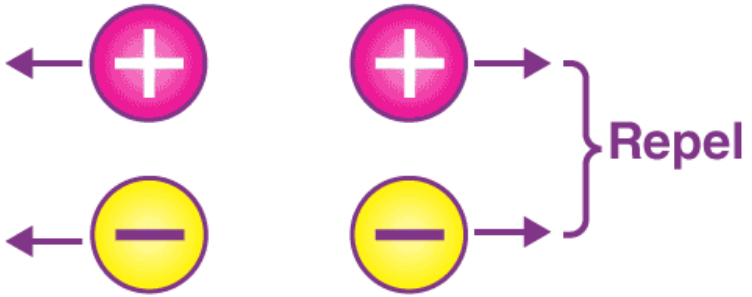
1. Red colored balls and White colored ball each other always repels so that they are like poles.
2. Red color and White color balls always attracts so that they are unlike poles.

ELECTRICAL FORCE









The force exerted by a charged body on another charged body is known as ELECTROSTATIC FORCE

This is also field force.

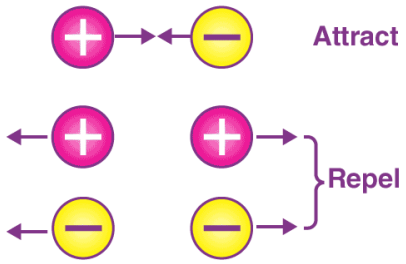
If you rubbed the balloon with your hair and it attracts the piece of papers because both surfaces have unlike charges.

ELECTROSTATIC FIELD

Any electric field surrounds electric charges.

Positive (+), Negative(-) are the two electric charges.

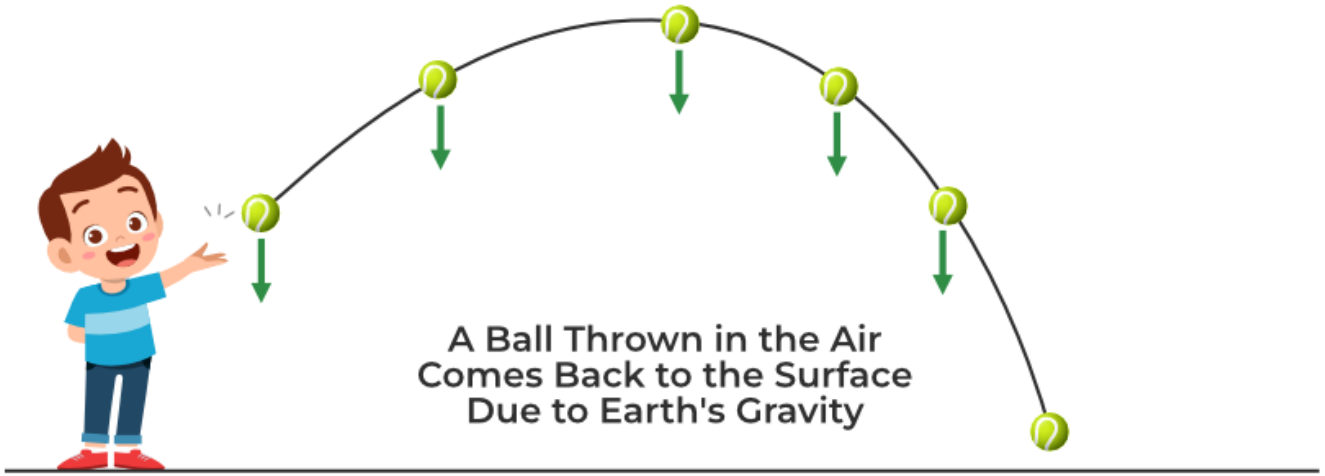
Write which are like and unlike electric charges from the picture.?



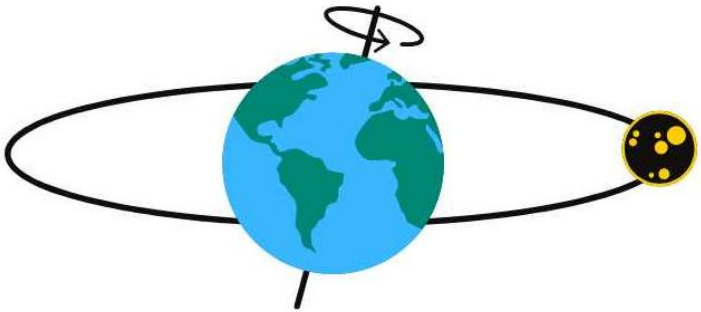
Can you assume the current (electricity) at your home is electrostatic force.?

Gravitational Force

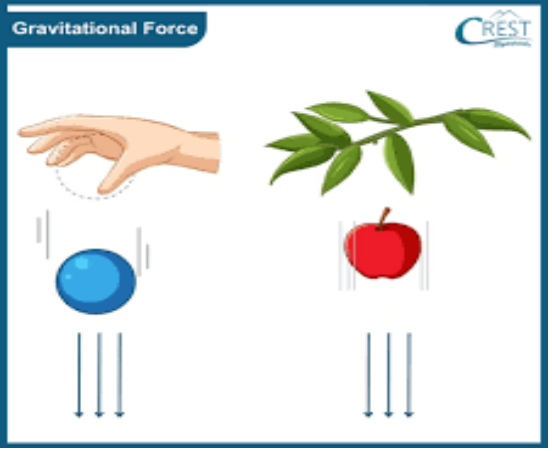
Gravity Force



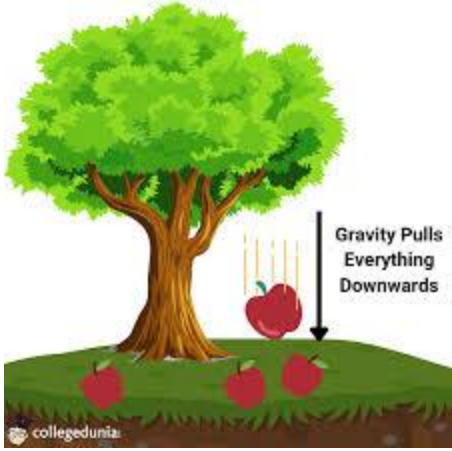
Falling Object



Planetary Orbits

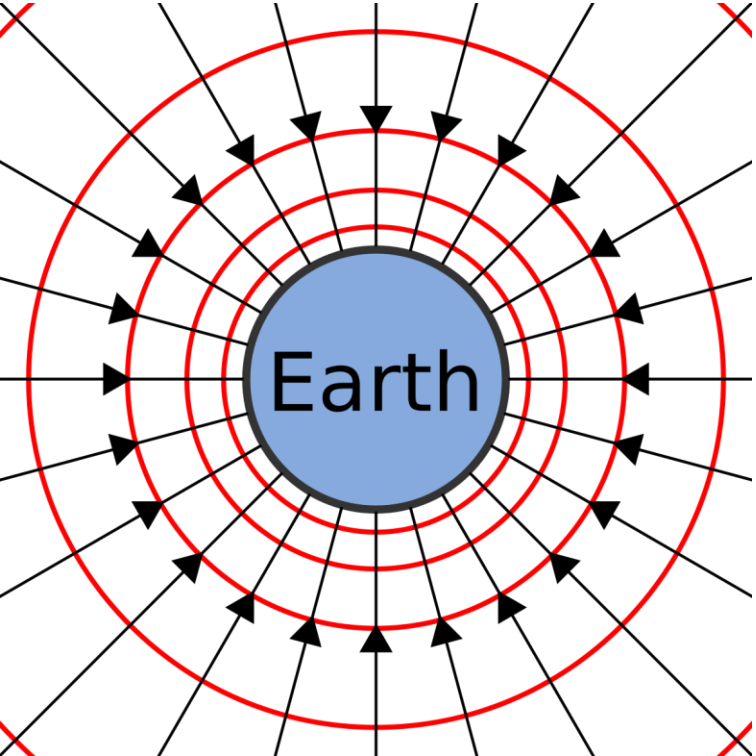


The force exerted by the earth on the masses of object is known as **GRAVITAIONAL FORCE**



This is also field force.

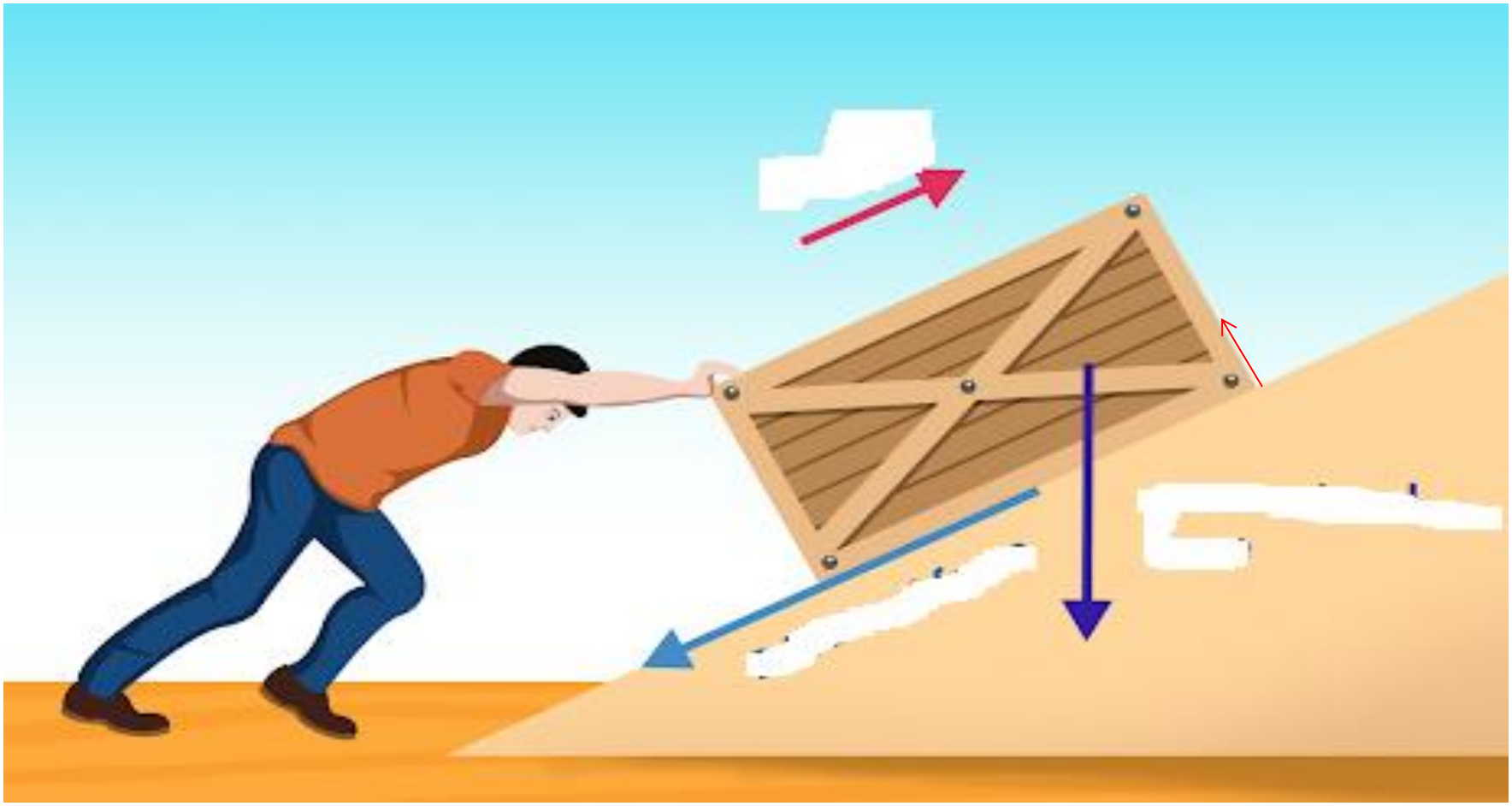
GRAVITAIONAL FIELD



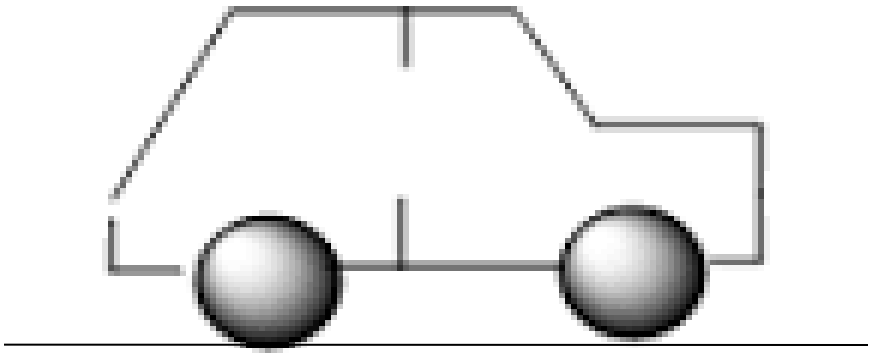
Gravitational field surrounds masses.

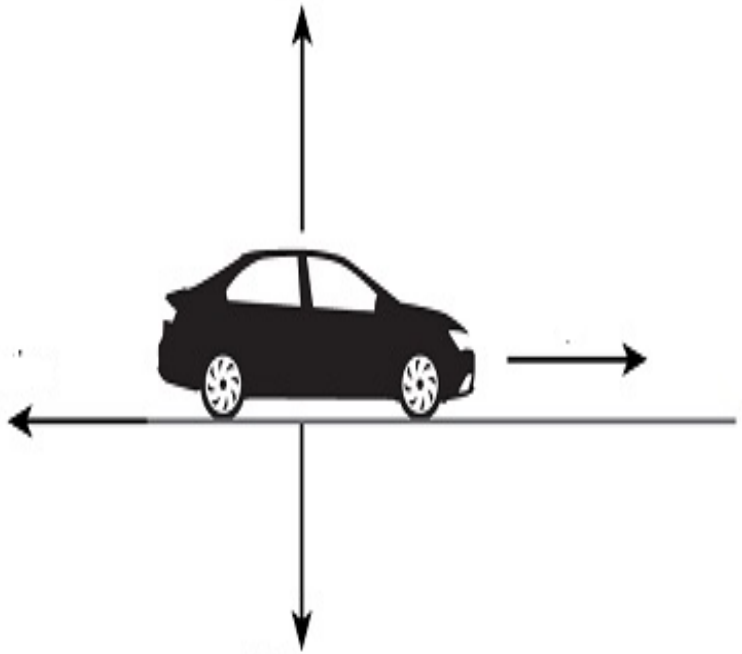
Do you walk /run stable without gravitational field.?

Do you assume what happens without gravitational field.?

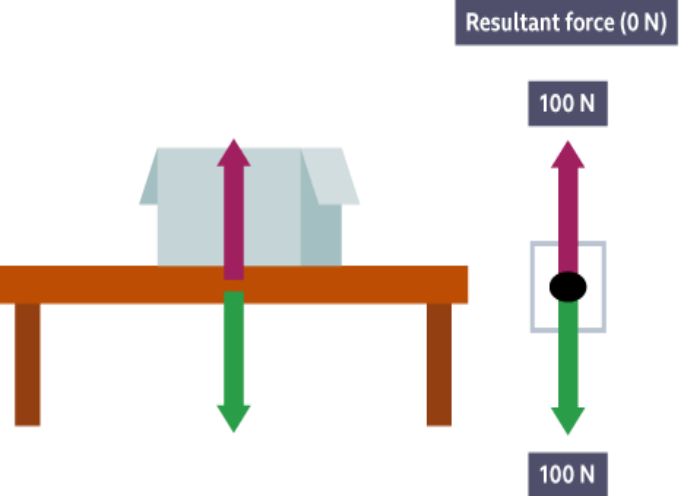


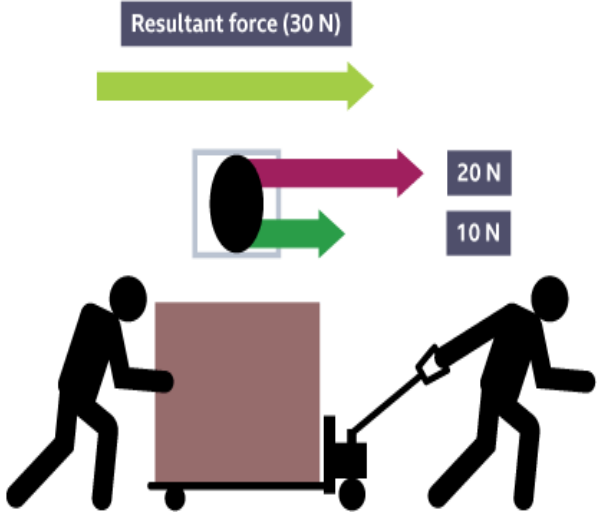
What forces acting on the box above the picture .?



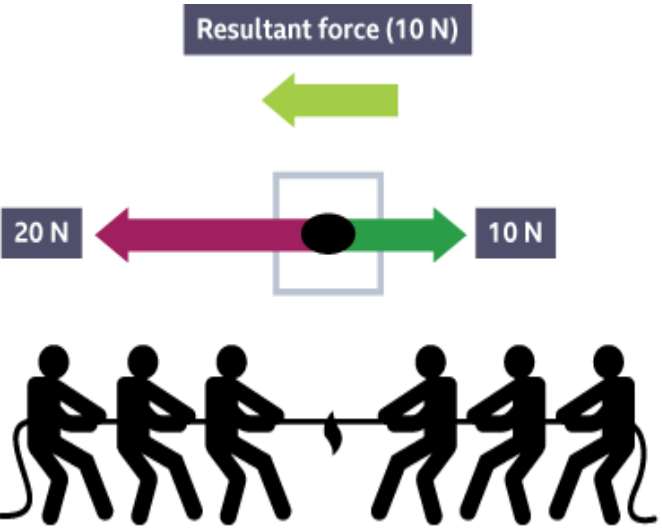


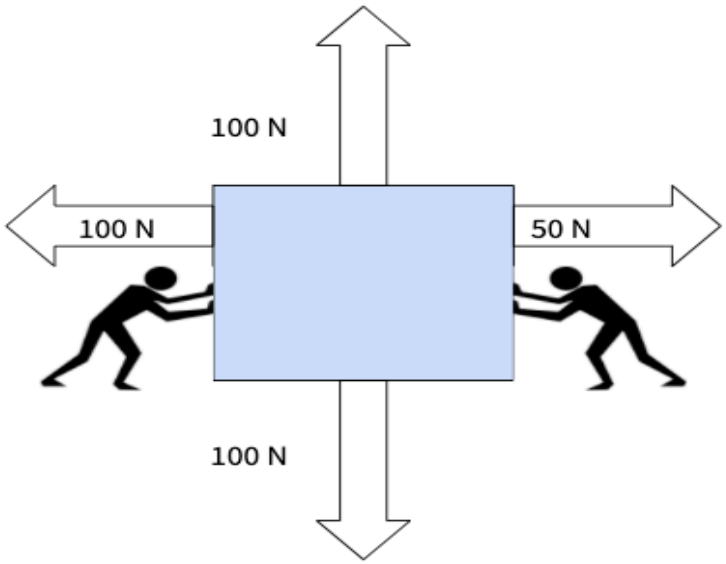
What forces acting in the picture separately.?





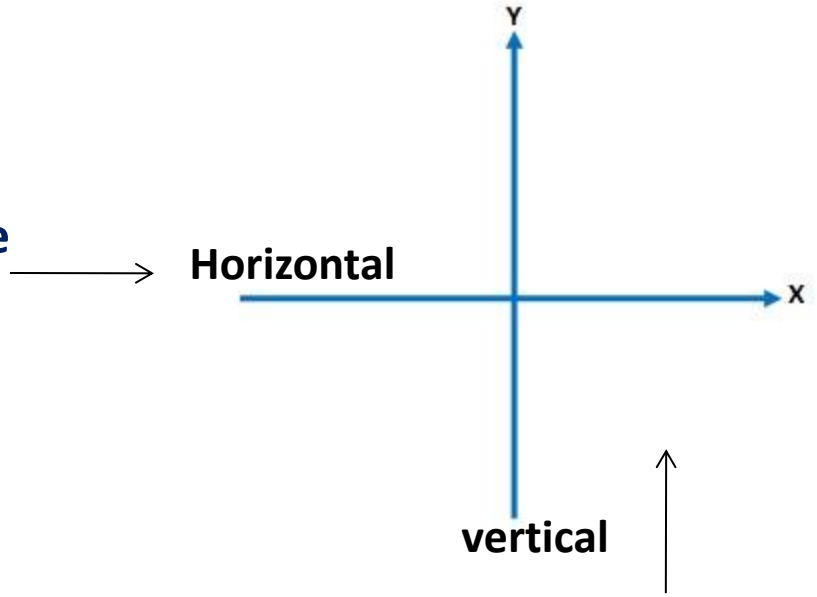
Look all the pictures, and which direction they move.? Why.?





NET FORCE(F_{net})

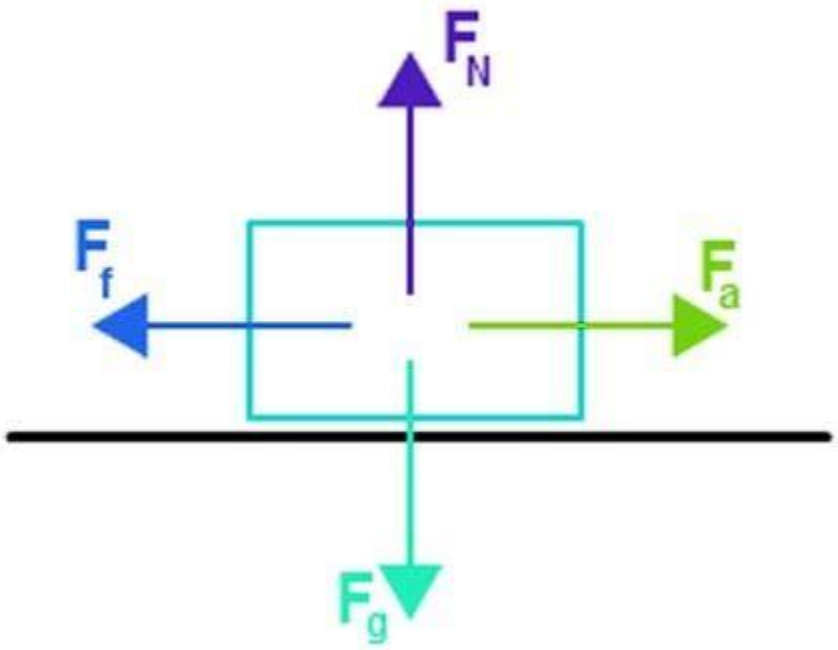
Net force means final force acting on the object either horizontal or vertical direction.



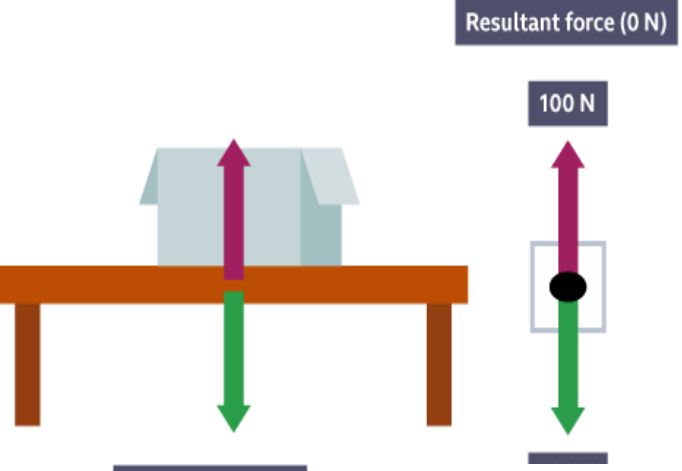
This is also called resultant force (F_{net})

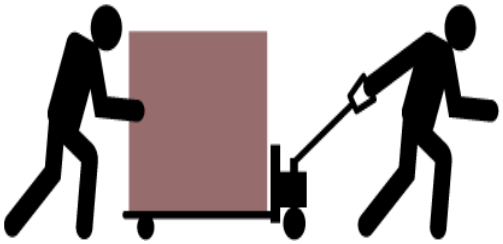
If $F_{net} = 0$, the object is in rest position

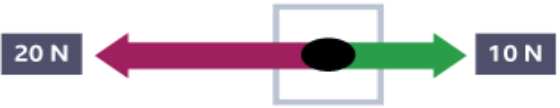
If $F_{net} \neq 0$, the object is moving

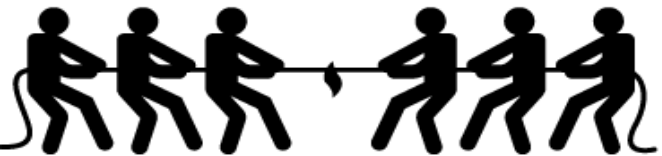


What forces acting on the horizontal direction and vertical direction.?



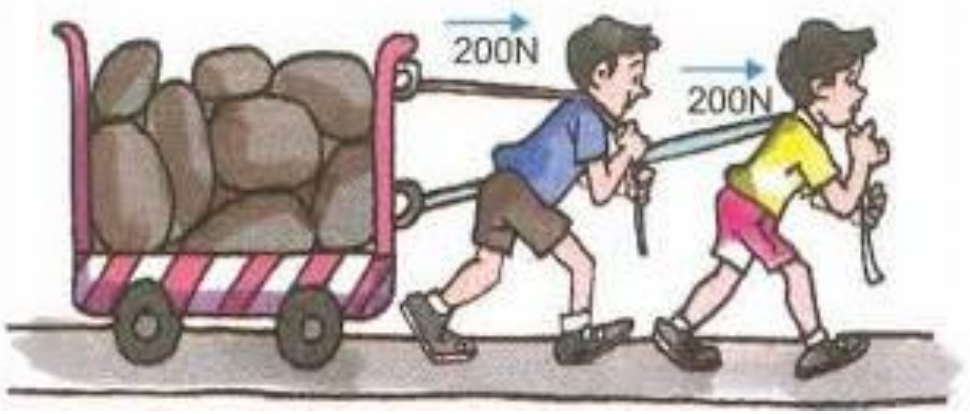


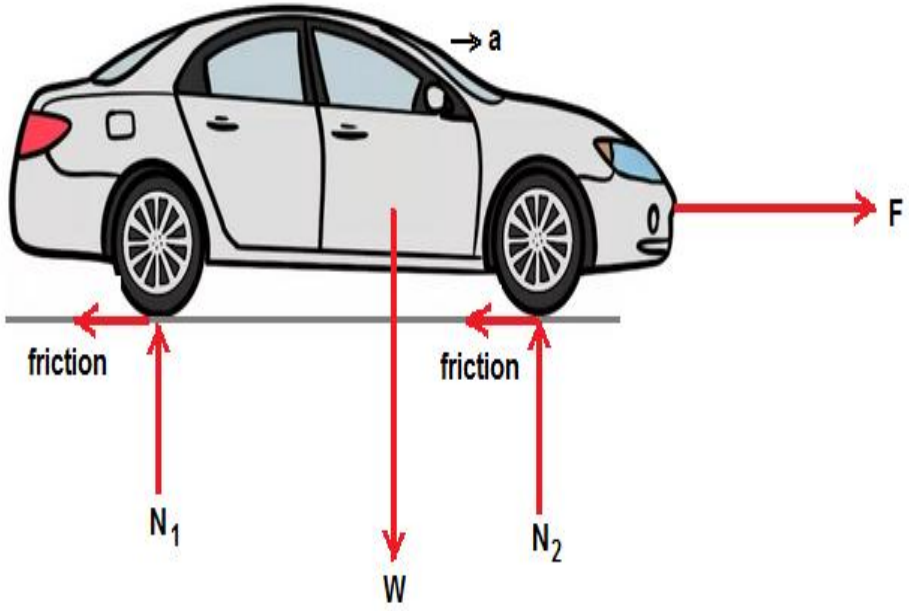




What is NET FORCE in the picture and how much.?

Which direction exerts the F_{net} in the picture.?

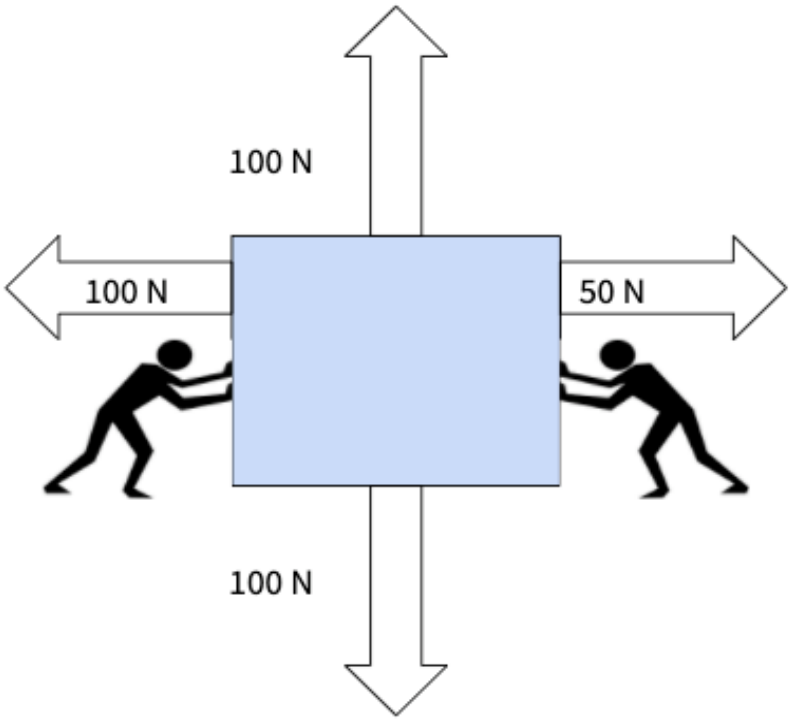




NET FORCE

In horizontal direction (X-axis)
F net = F+ (-f)

In vertical direction (Y-axis)
F net = (N1+N2) + (-W)

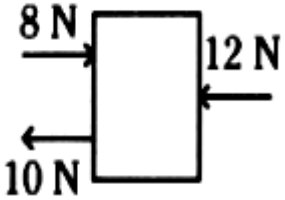


NET FORCE

In X-axis,
F net = 100 N – 50 N = 50 N

In Y-axis,
F net = 100 N - 100 N = 0

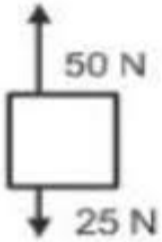
a)



b)

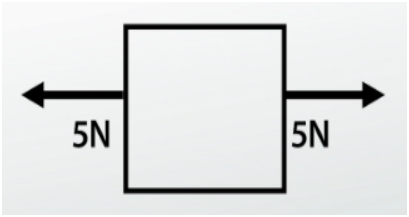
c)

d)

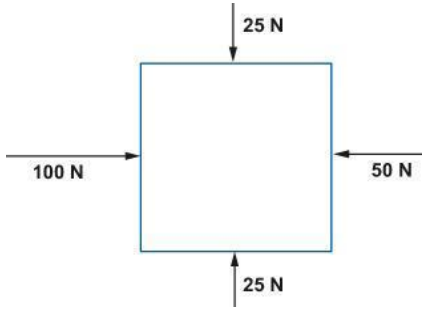


Find the F net.?

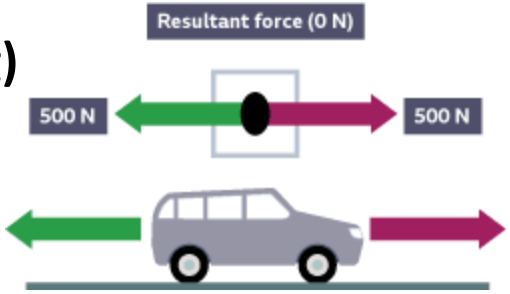
e)



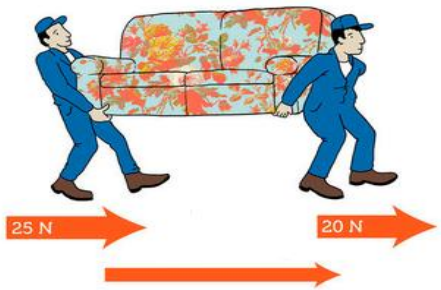
f)



g)



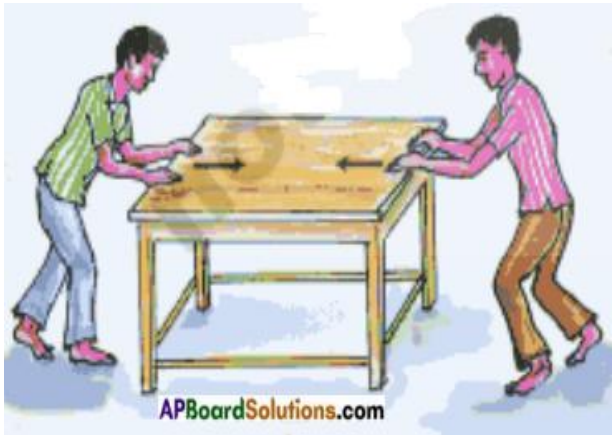
h)



EFFECT OF NET FORCE

(A)

(B)



(C)

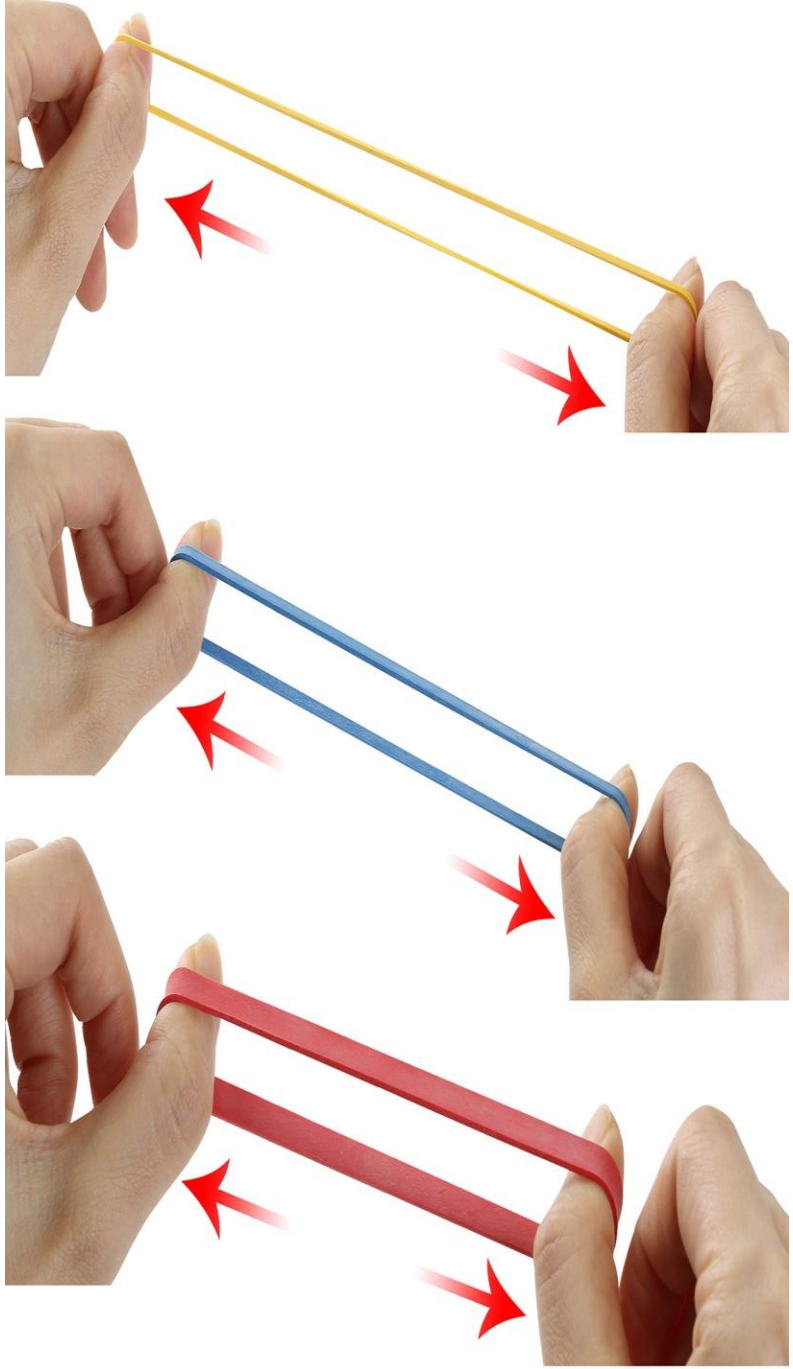
(A) Force in the particular direction acting

(B) Force is doubled F+F = 2F

So, Net force is increased.

(C) Force exerted in opposite to each other

Let you assume in (C) case, the one person exerted more force to another. What happens.?



- Take a rubber band.
- Stretch it using your fingers.
- You feel force of pull on your fingers.
- Single rubber band the net force is F
- If two, the net force is F+F = 2F

What is the net force that three rubber bands exerted on your finger.?

If you add another,
The net force is increased accordingly.

The force itself has a particular direction.

It shows arrow mark

The unit of FORCE in
SI system is NEWTONS (N)
CGS system is DYNES.

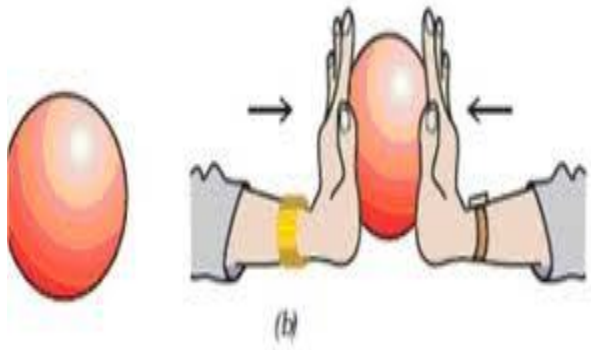
What can a force do?

1. Change the position of an obje
2. Change the speed of an object
3. Change the direction of a moving object
4. Change shape of an object.

(1)

(2)

(3)



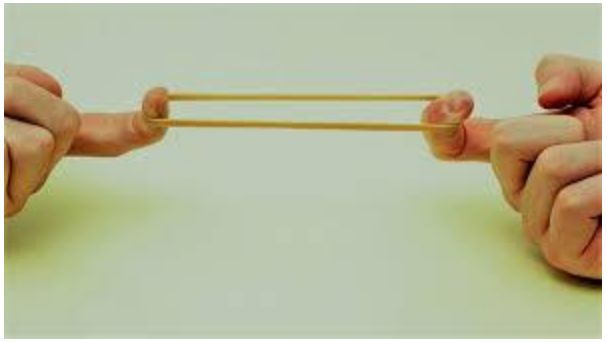
(4)

FORCE – CHANGE IN SHAPE

Change in shape → Permanent change

Change in shape → Temporary change

Tell me which are permanent/temporary changes

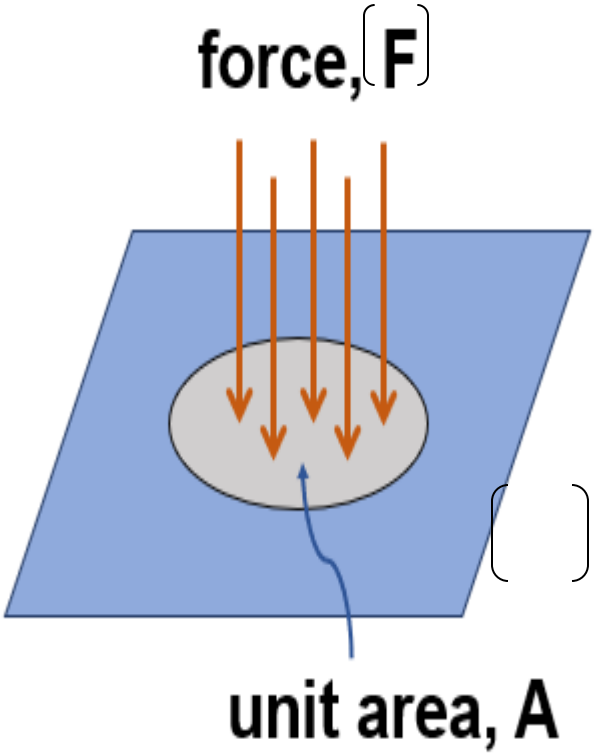


Fill the blank with appropriate

Action of force	Change in shape (Temporary/Permanent)
Stretching rubber band	
Squeezing sponge.	
Tearing paper.	
Crushing paper/plastic bottle.	
Making chapathi.	
Breaking glass.	
Squeeze a lump of clay	
Dropped a raw egg.	

PRESSURE

Pressure is depends upon the FORCE and AREA OF CONTACT



The force(F) acting perpendicularly on unit area (A) of surface is called PRESSURE(P).

$$\text{Pressure(P)} = \frac{\text{Force(F)}}{\text{Area(A)}}$$

$$P = \frac{F}{A}$$

Units of pressure in

SI system N/m^2

CGS system $dyne/cm^2$

PRESSURE is proportional to the FORCE ($P \propto F$)

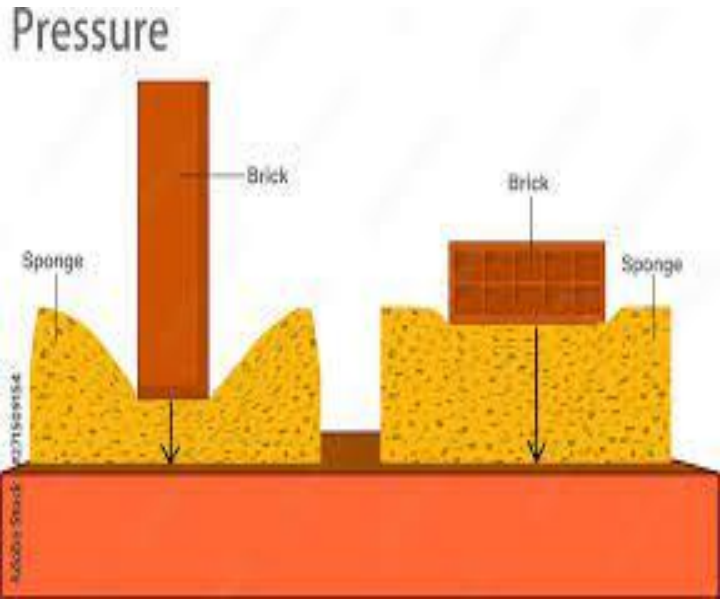
But inversely proportional to the CONTACT AREA($P \propto 1/A$)

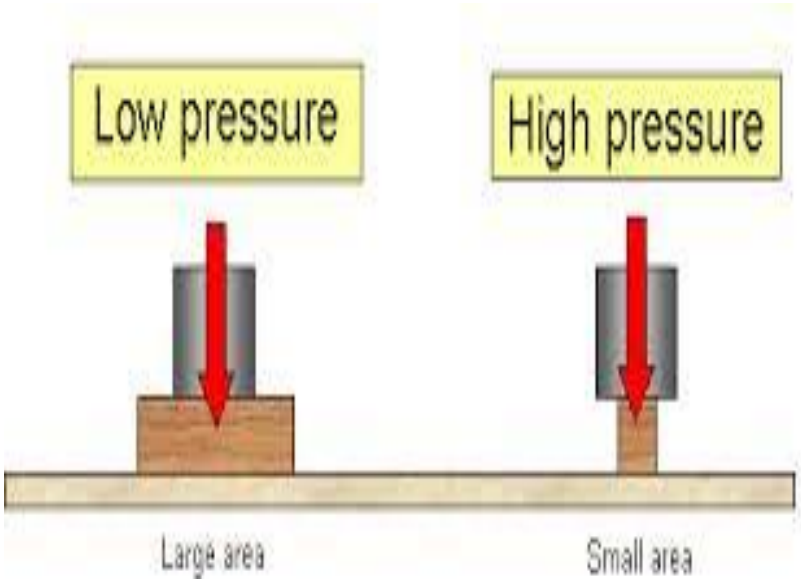
FORCE	PRESSURE
INCREASED	INCREASED
DECREASED	DECREASED

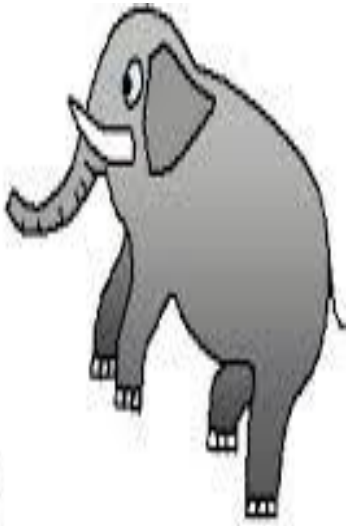
← **AREA is stable.**

AREA	PRESSURE
INCREASED	DECREASED
DECREASED	INCREASED

← **FORCE is stable.**



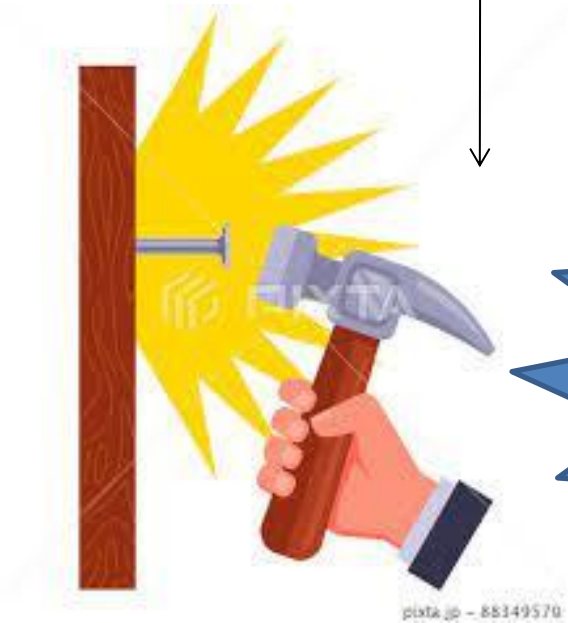




Why school bags or shopping bags have broad straps as handles.?

Why blunt side of knife should not cut easily.?

Why we can easily insert with sharp end of nail on the wall.?



Why heavy loaded vehicles have more and broader tyres .?

Assume the answers.?

From all the pictures,

1. **knife have sharp edge and easily cut with small force i.e. area of contact is smaller**
2. **sharp end of nail also smaller area**
3. **straps of bags are wide i.e. area of contact is greater so force applied on your shoulder is spreading.**
4. **broader tyres means greater area**

If the surface area is smaller the pressure will be greater even you exert the small force.

If you use larger area, the force is spreading and the pressure becomes smaller and in this time you use more force.

So that,

We can easily cut the vegetables with sharp edge of knife

We can easily bare the bags without burden

We can easily insert the sharp edge of nail on the wall

Lorry can easily move with broader tyres safely.

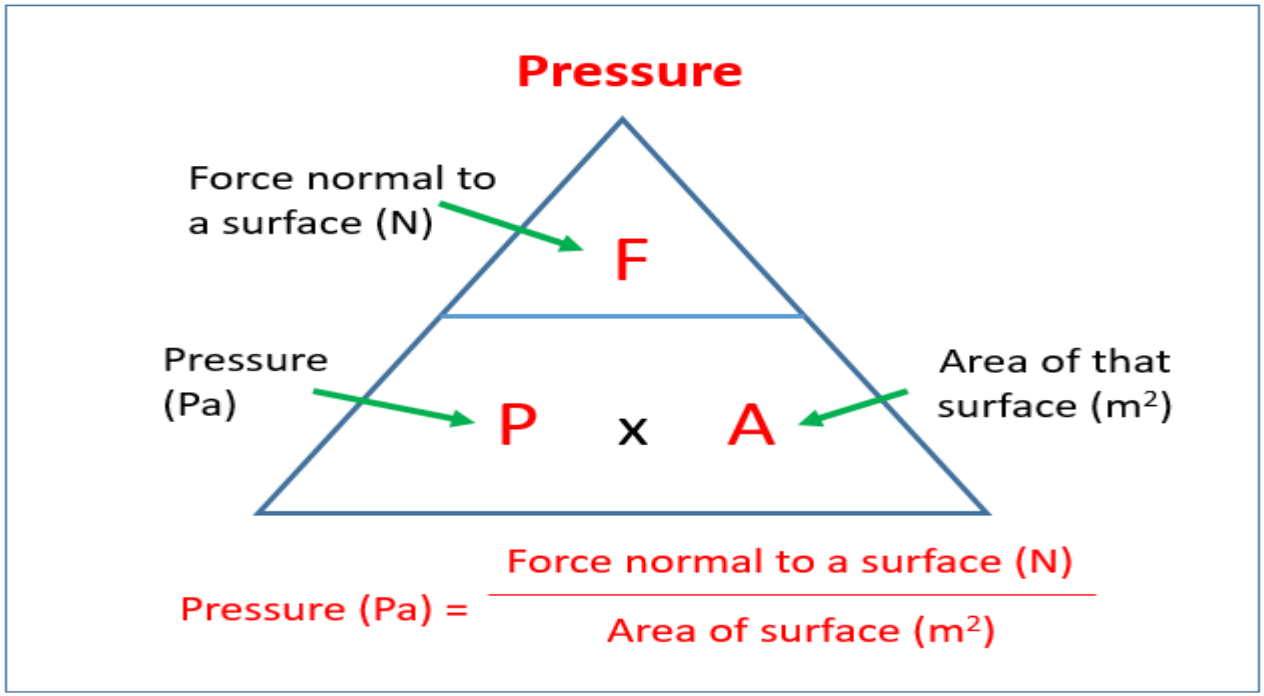
The surface area of an object is 20 m^2 and a force of 10 N is applied on it, then what is the pressure.?

area of contact = 20 m^2

force = 10 N

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Pressure = 10/20 = ½ = 0.5 N/m^2



Now recall the answers this questions…

1. **How many contact forces and what are they.?**
2. **How many force at distances and what are they.?**
3. **Draw the diagram of all forces running boy and find the net force.?**
4. **Why the moving ball stop after some time.?**
5. **Why do you get wounds in to slip on the rough surface.?**
6. **Give one example to change the direction while exert the force.?**
7. **Why blades/knifes are handle with care.?**
8. **How do you increase the pressure by keeping**
   a) area unchanged b) force unchanged
9. **Give two examples of gravitational force.?**
10. **Imagine that friction disappeared from the earth. What will happen.?**