Class 8 Physics Force and Pressure

Introduction

In our daily life, we apply force on many objects, due to which the objects change their position or shape. Eg : When a football is kicked, it moves. When we throw a smash a fully inflated balloon in between our palms, it breaks. When a cricket fielder catches the ball, it stops. A man cycling. In this chapter, we will study about force and its characteristics.

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Force :A push or a pull

A **push or a pull** on an object is called a **Force**. **Push** refers to the force which tends to **'move the object away'** from the direction of the force applied. **Pull** refers to that force which tends to **'move the object towards'** the direction of the force applied.

Examples of Push :

(i) Pushing a door open (ii) Man pushing his luggage trolley (iii) Man hitting a golf ball


Examples of Pull:

(i)Opening the drawers (ii) Child pulling a wagon (iii) Crane pulling up an object

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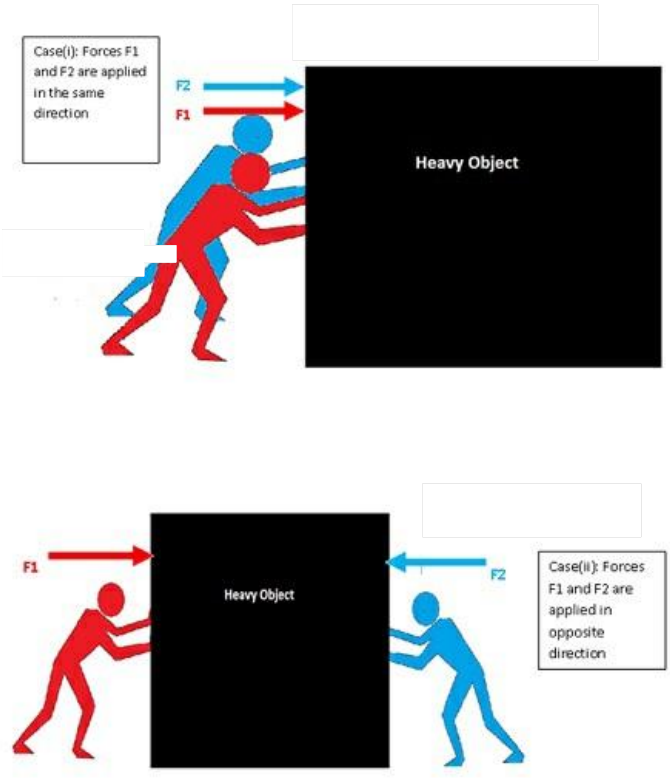
Forces are due to an interaction

As we can see in all of the above cases,**2 or more objects must interact for force to come into play** Eg 1: In the case of man pulling his luggage trolley, there is an interaction between the man and his trolley. The man is applying a **'push'** on his trolley to make it move forward. Eg 2: In the case of the crane pulling the object, there is an interaction between the crane and the object. The crane is applying force of the object to **pull** it up.

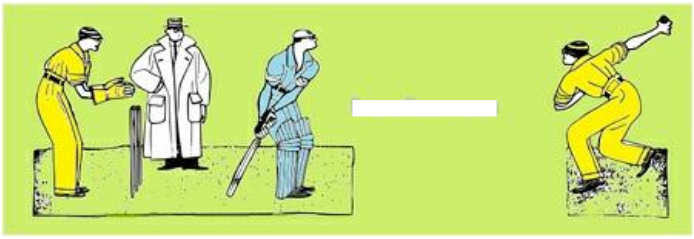


From the above figures, we can understand the following**characteristics of Force**

- Force has both magnitude and direction.
  - Case (i) Magnitude of forces : F1,F2, Direction of forces: Left to Right (--->)
  - Case(ii) Magnitude of forces applied: F1,F2.
    Direction of force F1 is Left to Right (--->).
    Direction of Force F2 is Right to Left (<---)
- More than one force can be applied on an object.
- Forces applied in the same direction add up to each other.
- If forces are applied in the same direction, the total force adds up in the same direction. In case(i), forces are applied in the same direction. So the total force applied on the 'Heavy Object' is F1+F2 towards Right (--->)
- If forces are applied in the opposite direction, then the net force acting on the object is the difference between the forces and the object tends to move in the direction of the greater force.
  - In case(ii),If F1=F2, the net force on the object is F = F1-F2=0. The object does not move in any direction.
  - If F1>F2, the net force on the object is F = F1-F2. The object moves in the direction of F1 ie towards Right (--->)
  - If F2>F1, the net force on the object is F = F2-F1. The object moves in the direction of F2 ie towards Left(<---)
- If the magnitude or direction of the force changes, its effect also changes.

Class 8 Physics Force and Pressure Force can change the state of motion.

A change in either speed of an object**or direction of an object**or **both** is described as a **change in its state of motion** Force can change the state of motion of an object.



Let's consider the following sequence of events

A cricket ball is initially at rest.
The bowler picks it up and bowls it towards the batsman.
The batsman hits it with the bat. Subsequently, any of the following events could happen
The batsman hit the ball very hard such that it goes for flying in the air for a six.
The batsman hits the ball such that it goes for a four along the ground.
The batsman hits the ball and the bowler catches it.
The batsman hits a defense shot such that it rolls on the ground for a short distance and stops.

Now from (1) to (2), the ball has changed its speed. Initially, the speed for 0 m/s (at rest) and then the bowler flings it. So, now it moves with a certain speed. When the batsman hits the ball, according to the force applied on the ball, the direction or speed or both change. Any one of the events (a),(b),(c),(d) occurs. When the strike is very hard and upwards, it goes for a six(3a). When the strike is reasonably hard and along the ground, it goes for a four (3b). When the bowler catches it (3c), the bowler has applied has applied a force on it to stop it. When the force of the batsman is very weak, the ball rolls on the ground and eventually stops.

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Force can change the shape of an object

Force can change the shape of an object in some cases.

- When making rotis from kneaded dough.
- When force is applied on the lead of a pencil, it breaks.

When a elastic is pulled hard, it expands and loses its elasticity.

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Effects of Forces

From the discussion above, we can summarize that Force can have any or all of the following effects on the object on which it is applied.

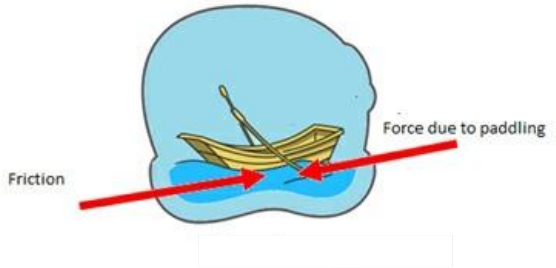
- Force can **change the speed of an object**(Batsman hitting a ball very hard)
- Force can **change the direction of motion**of an object (Batsman hitting a ball very hard)
- Force can **change the shape of an object** (When an elastic is pulled hard, it breaks)
- Force can **move an object from rest to a state of motion**(Bowler picking up a ball and then bowling it)

Class 8 Physics Force and Pressure — Contact forces and Non-contact forces

Contact forces : Force that arises with the contact of 2 or more objects involved**Examples : Muscular force and Frictional Force**

Muscular force is the type of force wherein we use our**physical strength** to change the state of motion of an object.**Eg: Man pushing a car, Bullocks pulling a cart of load, Cycling, Weight Lifting**

Frictional Force is a force that acts on all moving objects by the surface which it is in contact with. Eg: A ball rolling on the ground encounters friction by the ground surface and it eventually comes to a halt. When the rowing of the boat has stopped, the boat comes to a stop because of the frictional force exerted by water on it. The Frictional force is always in the direction opposite to the applied force.



Non-contact forces: Forces that arise without the contact of 2 or more objects involved**Examples: Magnetic Force, Electrostatic Force, Gravitational force.**

Magnetic Force is a force that attracts certain metal objects (like iron and iron filings) towards a magnet.

Electrostatic force is the force exerted by a charged body on another charged or uncharged body. Eg: Take a comb and brush it on a hair 3-4 times and then take it near some small bits of paper. Donot touch the comb with the paper. The bits of paper would get attracted to the comb. This is because the comb is charged because of the rubbing on your hair and it attracts uncharged objects like paper.

Gravitational force is a force exerted by the earth on all objects on it. When a ball is thrown up, it falls to the ground because of gravitational force. The water from a tap always flows downwards because of gravitational force.

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Pressure

Force acting on unit area is called Pressure ie Pressure = Force/Area

This explains why it is easier to hammer a nail into the wall. It is because we apply a greater amount of force into a very small area of the screw head. Going by the above equation, the force is large and the area is small. So, the pressure is very high. There are instances when you also can feel pressure - when you are having a body massage. When a person massages your body with his hands, the force applied is very high on a relatively small area of his hand. The pressure is high and there is bearable but curative pain and pressure that you feel.

Class 8 Physics Force and Pressure — Pressure exerted by Liquids and Gases

Liquids also exert pressure in **all directions** on the walls of the container they are stored in. We see water coming out from leaking pipes and taps. In case of a bath shower and fountain, water comes out tiny holes.

Gases (Air) also exert pressure in **all directions**. When you make a hole on a fully inflated balloon, then does the balloon not break, thereby releasing all the air from inside.

Atmosphere (which means the air all around us) also exerts pressure. This is known **as Atmospheric Pressure.** The value of atmospheric pressure is very high.