CHAPTER – 2
TYPES OF FORCES
8th Class
Physical Science
Running Notes

Introduction

Swathi and Geetha planned to go cycling during their summer vacation. After pumping air into their bicycle tyres, they started their journey.

While riding:

- The wind pushed against them.
- Swathi explained that they had to pedal harder while riding against the wind.
- Some parts of the road were rough, making cycling difficult.
- On reaching the hilltop, they heard thunder and saw flashes of lightning.
- While returning, they rang the bicycle bells and turned the handles to change direction.
- While coming down the hill, they noticed that the bicycles moved fast even without pedalling.

This story shows that several forces act in our daily life.

2.1 What is a Force?

To understand force, we observe different ways of moving a box.

A box can be moved by

- pushing,
- pulling,
- lifting, or
- carrying.

In every case, we apply either a push or a pull.

Therefore,

Force is a push or a pull applied on an object.

Activity 2.1 – Let us Explore

Take a large cardboard box.

Try moving it by

- pushing,
- pulling,
- lifting, and
- carrying.

Observe that every method involves applying a push or a pull.

Hence, **The push or pull applied on an object is called force.**

2.2 What Can a Force Do to the Bodies on Which It Is Applied?

Force can produce different effects on objects.

Some examples are given below.

Action	Push/Pull	Effect
Holding a moving bicycle from behind	Pull	Stops or decreases its speed
Hitting a moving ball with a bat	Push	Changes its direction
Pressing an inflated balloon	Push	Changes its shape

Effects of Force

The force applied on an object may

a. Make an object move from rest.

Example: A stationary object starts moving when a force is applied.

b. Change the speed of an object.

Force can

- increase speed, or

- decrease speed.

Example: Applying brakes reduces the speed of a bicycle.

c. Change the direction of motion.

Example: Turning the handle of a bicycle changes its direction.

d. Change the shape of an object.

Example: Pressing an inflated balloon changes its shape.

e. Cause one or more of the above effects simultaneously.

Sometimes force changes both speed and direction together.

Everyday Examples: Opening a drawer, stretching a rubber band, kicking a football, applying brakes on a bicycle, rolling a chapati, turning the steering handle of an autorickshaw.

2.3 Are Forces an Interaction Between Two or More Objects?

When you push a table, your hand applies force on the table, the table also exerts force on your hand. Thus, two objects interact with each other.

Conclusion: A force exists only when **two or more objects interact with each other.** Without interaction, force does not exist.

Definition of Force: Force is a push or a pull on an object resulting from the object's interaction with another object.

SI Unit of Force: The SI unit of force is **newton**

Symbol: **N**

2.4 What Are the Different Types of Forces?

Forces are broadly classified into two types. 1. Contact Forces 2. Non-contact Forces

2.4.1 Contact Forces: Many forces require physical contact between the object applying the force and the object on which the force acts. The contact may be

- Direct contact (using hands or other body parts)
- Indirect contact (using a stick or a rope)

Definition: Forces that act only when there is physical contact between objects are called contact forces.

Muscular Force: Muscular force is an example of a contact force.

Whenever we perform activities like walking, running, lifting, pushing, jumping, stretching our muscles contract and elongate to produce force.

The force produced due to the action of muscles is called **muscular force**.

Muscular Force in Living Beings: Humans use muscular force in their daily activities.

Animals, birds, fish and insects also use muscular force for movement, survival

Examples: Deer running, Snake moving, Dolphin swimming, Bird flying, Baby crawling, Person walking.

Muscular Force of Animals: Humans have used the muscular force of animals for a long time.

Examples: Ploughing fields using oxen, Pulling bullock carts.

Friction

Observe a moving ball.

The ball gradually stops after moving some distance.

Similarly,

- a bicycle stops after we stop pedalling,
- an object pushed on a floor stops after some distance.

Why does this happen?

A force acts opposite to the direction of motion.

This force is called friction.

Definition: The force that comes into play when an object moves or tries to move over another surface is called friction (or force of friction).

Characteristics of Friction: Friction is a contact force, It always acts opposite to the direction of motion, It slows down moving objects, Finally, it brings the object to rest.

Why Does Friction Occur?

- ✓ Even surfaces that appear smooth have many minute irregularities.
- ✓ When two surfaces come into contact,
- ✓ their irregularities lock into each other.
- ✓ These irregularities oppose motion.

Hence friction is produced.

Activity 2.4 – Let us Explore

Push the same object over different surfaces such as glass, cloth, wood, ceramic tile, sand.

Observe that the object does not travel the same distance on every surface.

Conclusion: The force of friction depends upon the nature of the surfaces in contact.

2.4.2 Non-contact Forces: Some forces act even when objects are not in physical contact.

Such forces are called non-contact forces.

Examples: Magnetic force, Electrostatic force, Gravitational force.

Magnetic Force: Magnets attract magnetic materials.

When two magnets are brought near each other,

- Like poles (North-North or South-South) repel.
- Unlike poles (North-South) attract.

These attractions and repulsions are forces.

Definition: The force exerted by a magnet on another magnet or on a magnetic material is called magnetic force.

Electrostatic Force:

- When two objects made of certain materials are rubbed together,
- electrical charges build up on their surfaces.
- These are called **static charges.**
- The object acquiring these charges becomes a **charged object.**

Observation: A rubbed plastic scale attracts small pieces of paper. Similarly, two rubbed balloons repel each other. A rubbed balloon attracts the woollen cloth used for rubbing.

Conclusion: Similar charges repel each other. Unlike charges attract each other.

There are two kinds of static charges. Positive charge and Negative charge

Definition: The force exerted by a charged body on another charged body or on an uncharged body is called electrostatic force.

Electrostatic force is a non-contact force.

Gravitational Force

- Throw a ball vertically upwards.
- The ball comes back to the ground.
- Objects thrown in any direction finally fall towards the Earth.
- This happens because the Earth attracts all objects.

Definition: The force with which the Earth attracts objects towards itself is called gravitational force.

It is also called gravity.

Characteristics of Gravitational Force i) It acts without contact. ii) It is a non-contact force.

iii) It is always attractive. iv) It acts on all objects.

Motion Under Gravity: When an object is dropped, it falls vertically downward.

When an object is thrown upward, i) it moves upward,

ii) slows down,

iii) stops for a moment,

iv) then falls vertically downward,

v) gains speed while falling.

2.5 Weight and Its Measurement: The Earth pulls every object towards itself.

This pulling force is called the weight of the object.

Definition: The force with which the Earth pulls an object towards itself is called the weight of the object.

Weight tells us how strongly the Earth pulls an object.

SI Unit of Weight: SI unit is newton (N).

Activity 2.9 – Let us Explore

- o Hang different objects from a spring.

- Observe the stretch in the spring.
- Different objects stretch the spring by different amounts.
- This shows that
- different objects have different weights.

Spring Balance: A spring balance is a simple device used to measure weight (force).
It consists of a spring fixed at one end, a hook at the other end.
When an object is hung, the spring stretches.
The amount of stretch indicates the weight.

Scale on a Spring Balance: The scale is marked in newton (N). Sometimes another scale is marked in grams (g). The gram scale is based on the assumption that the spring balance is used on the Earth.

Activity 2.10 – Let us Observe

- Observe the spring balance carefully.
- The maximum weight shown is10 N.
- Hence, its range is 0 to 10 N.

Activity 2.11 – Let us Calculate

- Observe the scale carefully.
- Difference between two major divisions = 1 N
- Number of smaller divisions = 5

Therefore,
Least count 1N/5=0.2N
Hence, Least count of the spring balance = 0.2 N

Activity 2.12 – Let us Measure

- Suspend different objects from the spring balance.
- Read the scale carefully.
- Record the observations in the table.
- Examples: Pencil box, Partially filled water bottle

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