Collegedunia NCERT Notes

NCERT Revision Notes

Chapter 5: Exploring Forces

These notes explain force as a push or pull, connect force with interaction, and separate contact forces from non-contact forces. They also cover friction, muscular force, magnetic force, electrostatic force, gravity, weight measurement, and floating and sinking.

Also see for this chapter: NCERT Solutions

Contents

1 Force as a Push or Pull

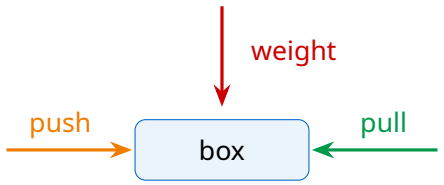
The chapter begins with familiar actions: pushing pedals, lifting a box, pulling an object, ringing a bicycle bell, and turning a handle. Each action has one common idea. A force is a push or pull that appears when objects interact.

1.1 Starting idea from daily life

When Sonali and Ragini cycle against the wind, the air pushes against them. When they go uphill,

they must push the pedals harder. When they come down a slope, gravity pulls the cycle and rider downward along the slope.

- A push can start motion, stop motion, or change motion.
- A pull can lift, stretch, drag, or slow an object.
- The same object may experience more than one force at the same time.
- A force is not a thing stored inside an object. It appears during interaction.



Different forces can act on the same object.

Meaning of Force

A force is a push or pull on an object resulting from the object's interaction with another object. The SI unit of force is newton, written as N.

1.2 Effects of a force

The effect of a force depends on the object, the direction of the force, and the situation. The textbook examples include stopping a bicycle,

hitting a moving ball, pressing a balloon, and stretching a rubber band.

Situation	Force applied	Effect
Pushing a still box	Push by hand	The box may start moving.
Holding a moving bicycle	Pull or backward force	Speed decreases and the bicycle may stop.
Hitting a moving ball	Push by bat	Direction and speed may change.
Pressing a balloon	Push by hands	Shape changes.
Turning a handle	Push or pull at the handle	Direction of motion changes.

NCERT Effect Chain

force ⟶ change in speed, direction, shape, or more th

No change in speed, direction, or shape happens without the action of force.

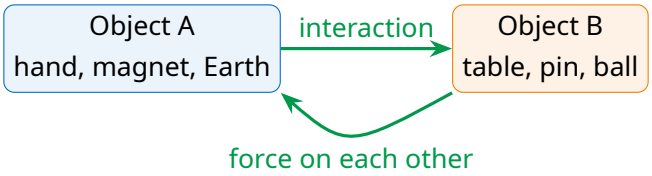
Effect First

In short-answer questions, first identify the effect: start, stop, speed change, direction change, or shape change. Then name the force

involved.

1.3 Interaction is necessary

Force needs interaction. A hand pushes a table. A bat hits a ball. A magnet pulls an iron pin. Even when objects do not touch, there is still interaction between them.



> ***No Lone Force***
>
> *Do not write that a force exists by itself. In Class 8 language, force results when two objects interact with each other.*

---

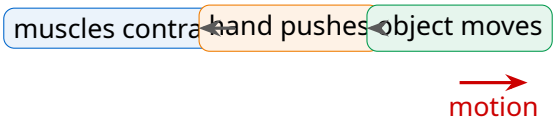
2 Contact Forces

Contact forces act when the objects are in physical contact. The contact can be direct, such as a hand pushing a wall, or indirect, such as a rope pulling a bucket.

2.1 Muscular force

Muscular force is produced by the action of muscles. Humans use it while walking, lifting, chewing, cycling, jumping, and pushing. Animals also use muscular force for movement and survival.

- The force comes from contraction and relaxation of muscles.
- It usually needs contact with the object being moved or held.
- It can act through tools, ropes, sticks, or handles.
- Inside the body, muscles help in chewing, swallowing, breathing, and blood circulation.



Body Forces

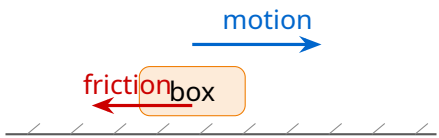
The heart uses muscular force to pump blood. Muscles in the alimentary canal push food forward during digestion. The chapter uses these examples to show that muscular force is not only for sports.

2.2 Friction as a contact force

Friction acts when one surface moves or tries to move over another surface. It acts opposite to the direction of motion or attempted motion. This is why a rolling ball slows down on the ground.

Friction

The force that comes into play when an object moves or tries to move over another surface is called friction. Friction opposes motion between the surfaces in contact.



Direction Rule

friction acts opposite to motion or attempted motion

If a box tries to slide right, friction on the box acts left.

2.3 Why rough surfaces give more friction

Surfaces have tiny irregularities. Even smooth-looking surfaces are not perfectly smooth at a small scale. When two surfaces touch, these irregularities lock with each other and oppose

motion.

Surface	Friction	Observation
Glass or smooth tile	Less friction	Object travels farther before stopping.
Wooden table	Moderate friction	Object stops after a medium distance.
Cloth or sand	More friction	Object stops sooner.
Water or air	Fluid friction	Shape matters for boats, aircraft, and trains.

> ***Rough Means More***
>
> *If a question asks why a bicycle slows sooner on a rough road, write that rough surfaces produce greater friction.*

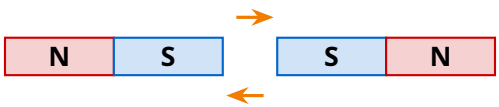
> ***Friction Is Not Always Bad***
>
> *Do not write that friction is only harmful. Friction helps us walk, hold a pencil, apply brakes, and keep objects from slipping.*

3 Non-contact Forces

Some forces act without direct touch. In this chapter, the non-contact forces are magnetic force, electrostatic force, and gravitational force.

3.1 Magnetic force

A magnet can attract magnetic materials such as iron. Two magnets can attract or repel each other depending on which poles face each other. This action occurs without contact, so magnetic force is a non-contact force.



like poles repel

Magnetic Force

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

3.2 Electrostatic force

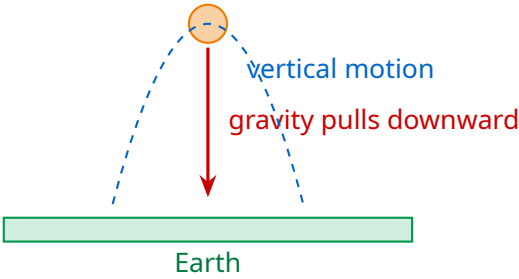
When a plastic scale, straw, or balloon is rubbed with another material, charges can build up on its surface. A charged object can attract small paper pieces. Two similarly charged balloons repel each other.

- Charges formed by rubbing are called static charges.
- Like charges repel each other.
- Unlike charges attract each other.
- A charged object can attract some uncharged objects.

> ***Static Charge vs Current***
>
> *Static charges do not move by themselves through a circuit. Moving charges form electric current, which you studied in the electricity chapter.*

3.3 Gravitational force

The Earth pulls objects towards itself. A ball thrown upward slows down, stops momentarily, and then falls back. An object dropped from a height follows a downward path because of gravity.



Gravity and Weight

weight = gravitational force on an object

The SI unit of weight is newton, because weight is a force.

Why the Swing Feels Light

Near the highest point of a swing, your speed and direction are changing quickly. Your body feels a changing support force from the seat, so the sensation can feel light for a moment.

M-E-G

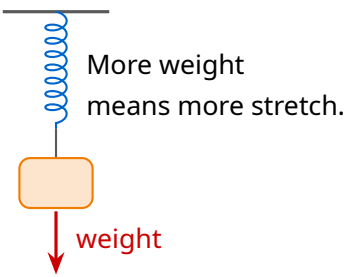
*Remember the three non-contact forces as **M-E-G**: Magnetic, Electrostatic, Gravitational.*

4 Weight and Spring Balance

Weight is the force with which the Earth pulls an object. Mass is the amount of matter in the object. These two words are often mixed in daily speech, but science uses them carefully.

4.1 Spring stretch and weight

When an object is hung from a spring, the spring stretches. A heavier object usually stretches the spring more. This stretch can be marked on a scale to make a spring balance.



Spring Balance

A spring balance measures weight or force. Its scale is marked in newton. Some spring balances also show a mass scale for common use on Earth.

4.2 Range and least count

The range of an instrument tells the maximum value it can measure. The least count tells the

smallest value it can read. In the textbook spring balance example, the range is 0 to 10 N and one small division is 0.2 N.

Term	Meaning	Example
Range	Maximum measurable value	0 to 10 N spring balance
Big division	Difference between two numbered marks	1 N
Small division	Smallest readable value	1 N divided by 5 = 0.2 N
Reading	Value shown by pointer	Object weight in N

Least Count

$$\text{least count} = \frac{\text{value between two big marks}}{\text{number of small divisions}}$$

For 1 N divided into 5 equal divisions, least count is 0.2 N.

Instrument Reading

Before taking a reading, check the range and least count. Then keep your eye level with the pointer to avoid reading error.

4.3 Mass and weight

Mass is the amount of matter in an object. It is measured in gram or kilogram. Weight is a force. It is measured in newton. Mass remains the same everywhere, but weight can change because gravitational pull can change.

Point	Mass	Weight
Meaning	Amount of matter	Gravitational force on the object
SI unit in school use	kilogram or gram	newton
Instrument	Beam balance or electronic balance	Spring balance
Place effect	Same at all places	Can change from place to place
Moon example	Same as on Earth	About one-sixth of Earth value

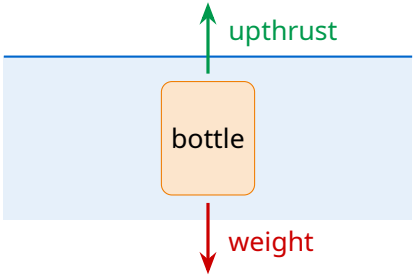
> ***The Kilogram Trap***
>
> *In everyday speech people say a bag's weight is 10 kg. In science, kilogram is a unit of mass. Weight should be stated in newton.*

5 Floating, Sinking, and Upthrust

Gravity pulls objects downward, but a liquid can push an immersed object upward. This upward push helps explain why some objects float and others sink.

5.1 Upthrust in water

When you push a closed empty bottle under water, you feel an upward push. When you release it, the bottle comes back to the surface. This upward force by the liquid is called upthrust or buoyant force.



Buoyant Force

When an object is placed in a liquid, the liquid applies a force on it in the upward direction. This upward force is called upthrust or buoyant force.

5.2 Floating and sinking rule

An object sinks if its weight is greater than the buoyant force on it. An object floats when the upward buoyant force balances its weight. One important factor is the density of the liquid and object, which is studied in more detail later.

Float or Sink

$$\textit{weight} > \textit{buoyant force} \Rightarrow \textit{object sinks}$$

$$\textit{weight} = \textit{buoyant force} \Rightarrow \textit{object floats}$$

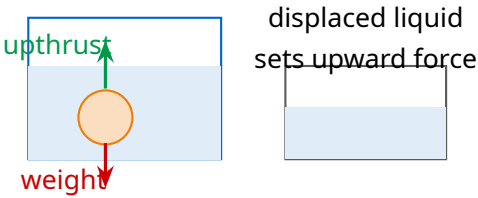
Object	**What happens**	**Reasoning**
Coin in water	Sinks	Weight is greater than upthrust.
Closed empty bottle	Floats or bounces up	Upthrust can balance its weight.
Wooden block	Floats	It displaces enough water to balance weight.
Pumice rock	May float	It has many air pockets, so average density is low.

Ships and Shape

A large ship can float because its shape helps it displace a large amount of water. The upthrust from displaced water balances the ship's weight.

5.3 Archimedes' idea

Archimedes' Principle states that an object fully or partially immersed in a liquid experiences an upward force equal to the weight of the liquid it displaces. This helps connect floating with displaced liquid.



W-B Balance

*For floating questions, remember **W-B**: Weight pulls down, Buoyant force pushes up.*

6 Force Reasoning for Exam Questions

Most questions in this chapter ask students to name the force, state its direction, and connect it with the observed effect. The best answer is short but complete.

6.1 Identify the force and direction

When an object moves in non-uniform motion, some force must be acting on it. Non-uniform motion means speed changes, direction changes, or both change.

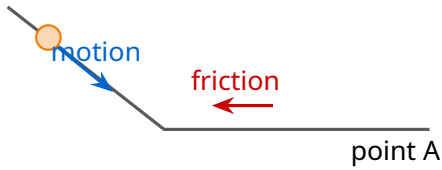
Situation	Force	Direction or effect
Ball thrown upward	Gravity	Downward, so speed decreases while going up.
Ball falling downward	Gravity	Downward, so speed increases while falling.
Ball at top point	Gravity	Still downward, even when speed is momentarily zero.

Ball rolling on floor	Friction	Opposite motion, so it slows down.
Charged balloon near hair	Electrostatic force	Attraction without contact.

> ***Top Point Rule***
>
> *At the top point of a vertical throw, the ball's speed is momentarily zero, but gravity still acts downward.*

6.2 Inclined plane and friction

If a ball rolls down an inclined plane and then stops on a horizontal surface, friction is the key force on the horizontal part. To stop before a point, increase friction. To stop after crossing the point, reduce friction.



Changing Stopping Distance

more friction ⇒ shorter stopping distance

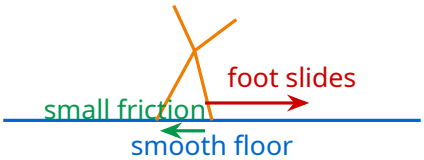
less friction ⇒ longer stopping distance

Force at Rest

An object at rest can still have forces acting on it. At rest often means the forces are balanced, not that no force exists.

6.3 Slipping on smooth surfaces

Smooth surfaces such as ice or polished floors offer less friction. With less friction, the foot cannot grip the ground well, so slipping becomes easier.



Shoes and Tyres

Shoe soles and tyre treads are designed to increase grip. They help friction act properly between two surfaces.

7 Quick Reference Summary

This final section gathers the definitions, comparisons, and answer frames that are most useful for revision. Read it after completing the chapter once from the textbook.

7.1 Definitions to memorise

Term	Class 8 definition
Force	Push or pull on an object due to interaction with another object.
Newton	SI unit of force, symbol N.
Contact force	Force that acts only when objects are in contact.
Muscular force	Force caused by action of muscles.
Friction	Contact force that opposes motion or attempted motion between surfaces.
Non-contact force	Force that acts without physical contact.
Magnetic force	Force exerted by a magnet on another magnet or magnetic material.
Electrostatic force	Force exerted by a charged body on another charged or uncharged body.

Gravity	Force with which Earth attracts objects towards itself.
Weight	Gravitational force acting on an object.
Upthrust	Upward force applied by a liquid on an object placed in it.

> ***C-N-F-W***
>
> *For this chapter's big map, remember **C-N-F-W**: Contact forces, Non-contact forces, Friction, Weight.*

7.2 Common comparisons

Comparison	First idea	Second idea
Contact vs non-contact	Needs physical contact	Acts from a distance
Muscular force vs friction	Produced by muscles	Produced by surfaces in contact
Magnetic vs electrostatic	Acts due to magnets or magnetic materials	Acts due to electric charges
Mass vs weight	Amount of matter, kg	Force of gravity, N

Float vs sink	Upthrust balances weight	Weight is greater than upthrust

7.3 Ready answer frames

- **Why does a rolling ball stop?** Friction acts opposite to motion between the ball and ground, so the ball slows down and stops.
- **Why do two rubbed balloons repel?** Both balloons acquire similar charges, and like charges repel each other.
- **Why does a ball fall back after being thrown up?** Gravity acts downward throughout its motion.
- **Why does a coin sink but wood float?** The coin's weight is greater than upthrust, while the wooden block receives enough upthrust to balance its weight.
- **Why can weight change on the Moon?** The Moon's gravitational pull is weaker than Earth's pull, but the object's mass remains the same.

> ***One Sentence Method***
>
> *For every answer, write: name of force, direction of force, and effect on motion or shape. This keeps Class 8 force answers complete.*

7.4 Formula and unit sheet

Unit and Measurement Recap

$$\text{force unit} = \text{newton} = N$$

$$\text{weight is a force, so weight is measured in } N$$

$$\text{mass is measured in kg or g}$$

$$\text{least count} = \frac{\text{value between two large marks}}{\text{number of small divisions}}$$

Chapter in One Scene

Cycling through a village can show almost the whole chapter: muscular force on pedals, friction at tyres, air resistance from wind, gravity on slopes, magnetic force in a compass, and weight measured by a spring balance in the lab.

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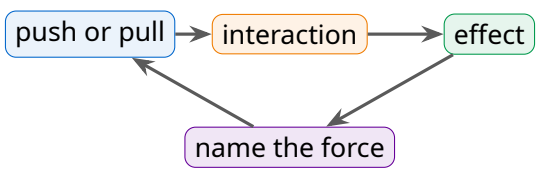
8 NCERT Activity Map

The chapter has many classroom activities. This map helps students connect each activity with the main idea tested in school questions.

8.1 Activities on push, pull, and interaction

Activity	What students do	Learning point
Moving a box	Push, pull, lift, and carry a cardboard box	A force is experienced as push or pull.
Action table	List daily actions and their effects	Force can change speed, direction, shape, or more than one of these.
Hand and table	Push a table with the hand	Interaction involves two objects and both experience force.
Cycling story	Study uphill, rough road, wind, and downhill motion	Several forces can act in one real scene.

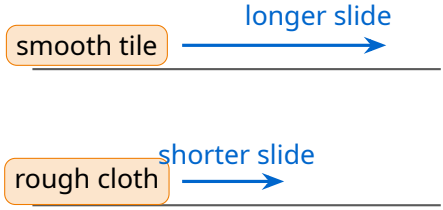


Activity Answer Style

For an activity-based answer, write the observation first, then the inference. Example: the box starts moving after a push, so the push changed the state of motion.

8.2 Activities on friction and surfaces

Observation	Reason	Conclusion
Object stops after sliding	Friction acts opposite to motion	Motion needs force to change.
Object stops sooner on cloth	Cloth gives more friction than a smooth tile	Friction depends on surface nature.
Object travels farther on smooth surface	Less surface locking occurs	Smooth surfaces usually give less friction.
Boats and aircraft have special shapes	Air and water also exert friction	Fluid friction can be reduced by shape.

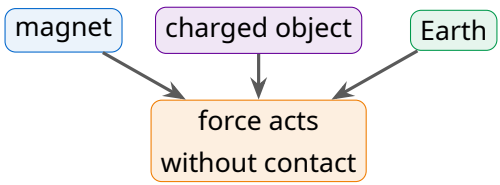


Friction Investigation

Keep the object and push nearly the same. Change only the surface. Then the stopping distance can be linked to friction from the surface.

8.3 Activities on forces from a distance

Activity	Observation	Force shown
Ring magnets on a stick	Like poles can keep one magnet floating above another	Magnetic force
Rubbed scale near paper bits	Paper pieces move towards the scale	Electrostatic force
Two rubbed balloons	Balloons repel each other	Electrostatic force between like charges
Ball thrown upward	Ball comes back to Earth	Gravitational force



9 Practice Drill and Scoring Points

This section turns the chapter into exam-ready checks. It is meant for a final revision round after reading the main notes.

9.1 One-mark checks

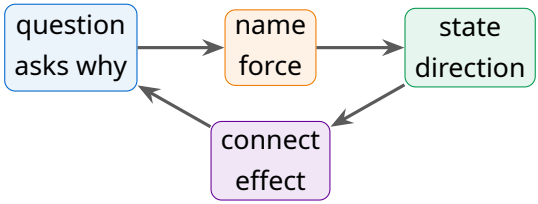
Question	Best short answer
What is a force?	A push or pull on an object due to interaction.
Name the SI unit of force.	Newton, symbol N.
Give two contact forces.	Muscular force and frictional force.
Give two non-contact forces.	Magnetic force and gravitational force.
What is friction?	Force opposing motion or attempted motion between surfaces.
What is upthrust?	Upward force applied by a liquid on an object placed in it.
What does a spring balance measure?	Weight or force, usually in newton.

Scoring Point

Use the exact unit symbol N for newton. Also write newton with a small n when it is written as a word.

9.2 Two-mark reasoning checks

Question type	Answer frame
Why does a cyclist pedal harder uphill?	Gravity pulls the cyclist and bicycle downward. The rider uses more muscular force to move upward against this effect.
Why is it easier to slip on wet floors?	Water reduces effective friction between foot and floor. With less grip, the foot slides more easily.
Why does a rough road slow a bicycle faster?	A rough road provides more friction at the tyres. This friction acts opposite to motion and reduces speed.
Why do like charges repel?	The two objects have similar static charges. Similar charges repel each other due to electrostatic force.
Why does a floating object not sink?	The upward buoyant force balances the downward weight of the object.



9.3 Three-mark comparison checks

Question	Point 1	Point 2
Contact and non-contact forces	Contact force needs touch between objects.	Non-contact force acts from a distance.
Friction and muscular force	Friction arises between surfaces and opposes motion.	Muscular force is produced by muscles.
Weight and mass	Weight is gravitational force and is measured in N.	Mass is amount of matter and is measured in kg or g.
Magnetic and electrostatic force	Magnetic force acts due to magnets or magnetic materials.	Electrostatic force acts due to electric charges.

Floating and sinking	Floating occurs when upthrust balances weight.	Sinking occurs when weight is greater than upthrust.

Last-Minute Strategy

If a comparison question has three marks, write at least two direct differences and one example. This prevents vague answers.

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