Types of Forces

Contact forces: A contact force is any force that occurs as a result of two objects making contact with each other.

Types of Contact Forces:

- Muscular force: Force that is exerted by the weight of muscles.
- Mechanical Force: A mechanical force is defined as a force that involves direct interactions between two things and results in a change in the configuration of objects.
- Frictional Force: Friction is the force resisting the relative motion of solid surfaces, fluid layers, and material elements sliding against each other.
- Tension: A tension force is a force that develops in a rope, thread, or cable as it is stretched under an applied force.
- Air Resistance: Air resistance is a force that is caused by air. The force acts in the opposite direction to an object moving through the air.
- Normal Force: The normal force is the force that surfaces exert to prevent solid objects from passing through each other.

Non-Contact Forces: These forces do not need contact to be applied or occur.

Types of Non-Contact Forces:

- Gravitational: The force of attraction between all masses in the universe; especially the attraction of the earth's mass for bodies near its surface.
- Electrostatic: The electrostatic force is an attractive and repulsive force between particles caused to their electric charges.
- Magnetic: The magnetic force is a consequence of the electromagnetic force, one of the four fundamental forces of nature, and is caused by the motion of charges.

What is Weight:

Weight is the Gravitational force with which the Earth attracts the masses towards its center. Gravity is related to the resultant force with which a mass is attracted to Earth.

Formula For Weight: Mass x Gravitational Acceleration

Force	Nature	Explanation of how it works:	Example
Electromagnetic - electrical	Electrons carry negative charge and protons carry positive charge.	Electric charge act in different ways: **Same charges are repulsive: + and +, or - and - Different charges are attractive: + and -**	Bonding of atoms to form new compounds and chemicals

Electromagnetic - magnetic	North pole, south pole, like poles, unlike poles.	Unlike poles (opposite poles) are attracted to each other, and like poles (same pole) are repelled from each other.	Two magnets being attracted to each other.
Gravitational force	Keeps everything within a certain range on the ground.	Due to the mass of the planets, everything within a certain range is attracted to the center of the planet pulling it at a certain magnitude. For example, the Earth's gravitational force is 9.8N.	A table on the ground of the earth.
Applied force	Applying a force opposite of gravity upon an object lying on a surface.	When force from an external body is applied on an object causing it to change its state of motion or change its velocity.	When a box is pushed across the floor.
Normal force	When an object opposes the force of gravity.	When there is an object on a surface, the surface applies a force opposite of the direction gravity it is pulling it.	A laptop lying on a table stationery.
Frictional force	Slowing an object's speed/velocity.	Friction is a force that slows down the speed or velocity of an object as their surfaces grind upon each other.	Someone sliding a box across the grass.
Air resistance/drag	When an object is travelling through the air an opposing force is applied which slows the object down.	When an object is moving through the air and the movement of the body is causing the wind to oppose the object and slow down its overall velocity.	A plane moving through the air.
Tension force	When objects or bodies are holding something which causes them to extend, such as wires, ropes.	When an object is suspended from a height causing gravity act upon the object, and the wire carrying the object will stretch, and the wire extends due to the weight of the object.	A light bulb being suspended from the ceiling.
Spring force	Spring force is restoring force in nature. It acts in a direction such that it tries to bring the object to the mean position always.	When a spring like object is put under pressure causing it to compress, but when released, it will return back to its old shape with the potential energy of itself.	Me pressing my hand on spring and it returning to the old shape.

Free body diagram: A diagram used to display the different forces acting on an object, the forces are depicted by arrows and the length of the arrows show the magnitude of the force.

A vector quantity is a quantity with magnitude and direction e.g. velocity, displacement. Scalar is a quantity with only magnitude.

Moment of a Force: The measure of tendency of an object to move around its axis.

Centre of Mass: The point representing the mean position of mass of a body.

Question: Describe what happens when a force is applied to an object outside it's centre of mass.

The body will gain angular and linear momentum causing to move in the direction of force.

Question: State the formula for calculating the moment of a force.

Perpendicular Distance x Force

Law of Lever: In order for the lever to be in equilibrium, the load must be equal to the effort in terms of the distance to the fulcrum.

Newton's first law is an object will remain at rest if its not compelled to change by an external force.

Inertia is the tendency of an object to remain at rest or remain unchanged.

An object undergoing inertia would be when the bus stops people fall in a forward direction.

The second law states **that the acceleration of an object is dependent upon two variables - the net force acting upon the object and the mass of the** object.

F= mass x acceleration

Third Law: Every Action has an equal and opposite reaction.

P=Mass x Velocity

Mass-kg

Velocity-m/s

Impulse= Force x Time

F=ma

F=m(v-u/t)

F=mv-mu/t

F x T=Δmv

Impulse is the change in momentum.

Consider a boy kicking a stone with mass 1 kg and accelerating from rest to 10 m/s. Because the stone is rigid the force of his foot acts for only 1/100 second, calculate this force. Answer below.

1000N is the force.

a=(10-0/0.01)

F=m*a

F=1,000N

If the boy is kicking a football with mass 1 kg and accelerating from rest to 10 m/s, the boy's foot acts for 1/10, answer below.

F=100N

Law of conservation of linear momentum: When two or more bodies act on each other, their total momentum remains constant, provided there is no external force acting on the two bodies.

m1v1=m2v2

Momentum before collision=Momentum after collection

A bullet, mass 0.01 kg, is fired into a block of wood, mass 0.39kg lying on a smooth surface. The wood then moves at 10 m/s.

a. What's the velocity of the bullet?

Combined mass=0.4

Velocity of wood=10 m/s

Total momentum= combined mass*final velocity

=4

Velocity=P/m

= 4/0.01

=400

b. What is the kinetic energy before and after the collision?

=½*0.01*400^2

=800J

½*0.40*10^2

=20J

780 joules were lost and given away in sound and heat energy.