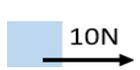
AQA FORCES – P8

Forces and their interactions

Scalar and vector quantities

Scalar	*A quantity that only has magnitude (size)*	e.g. mass, time, speed, temperature, energy,
Vector	*A quantity that only has magnitude and direction*	e.g. force, velocity, momentum

An arrow can be used to show vectors	*Length of arrow = magnitude of vector*
	Direction of arrow = direction of vector



Velocity	*Speed + direction*	The speed of a car is 30m/s. A car moves forward with a velocity of 30m/s
Distance	*How far*	The table is 1m long
Displacement	*Distance + direction*	The beach is 1km due east of the town

Area	*Metres squares (m^2)*
Weight	*Newton (N)*
Mass	*Kilograms (kg)*
Gravitational field strength	*Newton per kilogram (N/Kg)*
Force	*Newton (N)*
Work done	*Joules (J)*
Distance	*Metres (m)*
Moment	*Newton-metres (Nm)*

Pressure = height X density X gfs

Gravity

Weight	*Force acting upon an object due to gravity*	Newton (N)
Mass	*How much matter*	Kilograms (Kg)

Weight = mass X gravitational field strength — W = m X g

Gravitational field strength	*Gravity exerted around an object.*	Earth's gfs = 9.8N/kg

Each Kg has a gravitational pull of 9.8N.

Unit	*Newton (N)*	1N
Kilo	*Kilonewton (KN) = 1000*	1X 10^3
Mega	*Meganewton (MN) = 1000,000*	1 X 10^6

Centre of mass	*The weight of an object acts through a single point*

Moments, levers and gears

PHYSICS ONLY

M = F X d

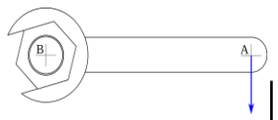
Moment = force X distance

Moment	*Turning effect of a force about a pivot*
Lever	*A small force exerted with a long lever applies a large force*

Principle of moments

In a balanced system, the sum of the clockwise moments = the sum of the anti-clockwise moments

Gears	*Increase or decrease the rotational effect of a force*



Contact and Resultant forces

Force	*Push or pull*	Stretch, squash, turn.
Contact force	*Exerted between two objects when they touch*	Friction, air resistance, tension.
Non-contact force	*Exerted between two objects without touching*	Gravity, electrostatic forces, magnetic forces.

Resultant force	*The overall effect of all of the forces acting upon an object*	Two forces acting in the same direction are added.
		Two forces acting in the opposite direction are taken away.

Resolving forces	*An object pulled with a force at an angle*	A single force can be split into two components acting at right angles to each other.

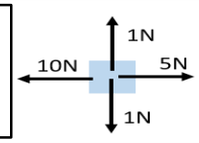
The component forces combined have the same effect.

HIGHER ONLY

Free body diagram	*Show magnitude and direction of all forces upon an object*

Work done against frictional forces, temperature of object rises.

Object moves left with a force of 5N



If force is at right angles to direction of movement, NO work is done.

Work done and energy transfer

Work done	*When work is done, energy is transferred*	Work done = force X distance moved W = F X s
		1J of work is done when 1N of force moves an object through a distance of 1m, in the direction of the force.

Forces and elasticity

One force	*The object changes speed or direction*
More than one force	*The object changes shape*

Elastic deformation	*The object has been stretched but returns to its original length*
Inelastic deformation	*The object has been stretched but does not return to its original length*
Extension	*The difference between stretched and unstretched lengths*

Two balanced forces can stretch a object.

Two balanced forces can compress an object.

Three balanced forces can bend an object.

Limit of proportionality

Beyond this point the spring is permanently deformed

Stretching a spring	Force = spring constant X extension, F = k X e
	EPE = ½ X spring constant X (extension)^2, EPE = ½ ke^2

Elastic Potential energy (EPE)	*Energy stored in a stretched spring*

Force	*Newton (N)*
Spring constant	*Newton per metre (N/m)*
Extension	*Metres (m)*
EPE	*Joules (J)*

Newton's first Law	*Balanced forces*	When the resultant force on an still object = 0, the object is stationary.
		When the resultant force on a moving object = 0, the object is at a constant speed.
Newton's third Law	*Equal and opposite forces*	When two objects interact the forces exerted are equal and in an opposite direction.