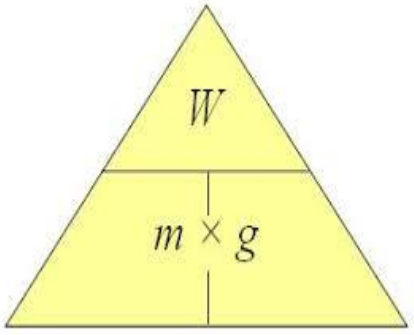
Physics topic 5a: Forces

1. Forces keywords	
Force	Something that makes a change happen
Magnitude	The value of a force in newtons
Scalar	Things that have magnitude but not direct
Vector	Things that have a magnitude and a direction. Forces are always vectors
Contact force	Can only act when two things touch
Non-contact force	Can act on things not touching
Balanced (forces)	When forces are equal and opposite each other also called **equilibrium**
Unbalanced (forces)	When opposing forces are not equal to each other
Resultant (force)	The overall force once all the forces are considered
Force arrows	Show direction and size of a force
Newton	Unit force is measured in
Newtonmeter	A spring calibrated so it has a scale to measure force
Centre of mass	A point in the middle of an object where all its mass acts
Elastic	A material that returns to its original shape after being deformed
Plastic	A material that does NOT return to its original shape after being deformed

2. Types of force			
Force	**Between**	**Contact or non-contact**	**Example**
Friction	Two moving surfaces	Contact	Brakes
Upthrust	An object and water	Contact	Boat
Reaction	Two stationary objects	Contact	Book on shelf
Air resistance	A moving object and air	Contact	Plane
Gravity	Two masses	Non-contact	You and the earth
Tension	Two ends of an elastic material	Contact	Spring
Magnetic	Magnets and magnetic materials	Non-contact	Magnet picking up a nail

3. Calculating weight		
Symbol	**Name**	**Calculated by..**
W	Weight (N)	= Mass x Gravity
m	Mass (Kg)	= Weight ÷ Gravity
g	Gravitational field strength	= Weight ÷ mass
On earth g = 10 N/kg		



4. Calculating work

Symbol	Name	Calculated by..
W	Work (J)	= Force x Distance
F	Force (N)	= Work ÷ Distance
s	Distance (m)	= Work ÷ Force

$$W = Fs$$

5. Hooke's law

Symbol	Name	Calculated by..
F	Force (N)	= Spring constant x Extension
k	Spring constant (N/m)	= Force ÷ Extension
e	Extension (m)	= Force ÷ Spring constant

$$F = ke$$

6. Energy stored in a spring

Symbol	Name	Calculated by..
Ep	Elastic potential energy stored (J)	$Ep = \frac{1}{2}ke^2$
$\frac{1}{2}$	Half (0.5)	N/A
k	Spring constant (N/m)	$k = \frac{2\,Ep}{e^2}$
e	Extension (m)	$e = \sqrt{\frac{2\,Ep}{k}}$

$$Ep = \frac{1}{2}ke^2$$

To calculate extension:

1. Measure the original length of the object
2. Measure the stretched length of the object
3. Extension = stretched length – original length

7. Moments:

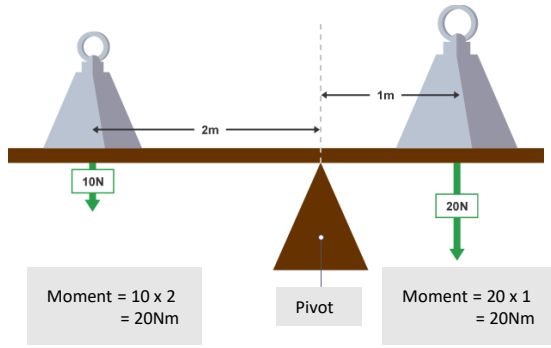
1.To calculate a moment you need to know:

- How much force is being applied (Newtons, N)
- The distance from the pivot that the force is being applied (Meters, m)

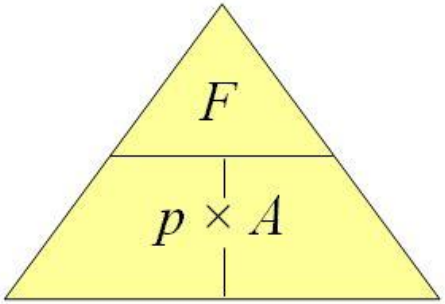
Moment = force x distance

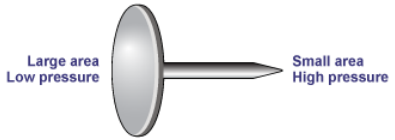
2.The unit for moment is newton metre (Nm)

3.A small force over a large distance can generate the same moment as a large force over a small distance.



8. Calculating pressure		
Symbol	**Name**	**Calculated by..**
F	Force (N)	= pressure x area
p	Pressure (Pa = n/m^2)	= force ÷ area
A	Area (m^2)	= force ÷ pressure





9. Calculating pressure in column of liquid (HT ONLY)		
Symbol	**Name**	**Calculated by..**
g	Gravitational field strength (10 N/Kg)	$g = \frac{p}{h\rho}$
p	Pressure (Pa =n/m^2)	$p = h\rho g$
h	Height (m)	$h = \frac{p}{g\rho}$
ρ	Density (kg/m^3)	$\rho = \frac{p}{gh}$
$p = h\rho g$		