SP8/9 Energy and Forces and their Effects

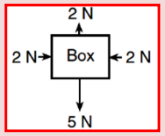
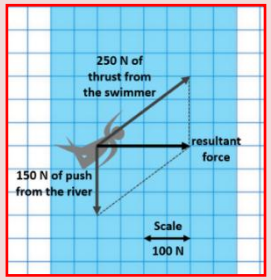
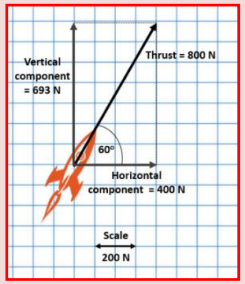
1. Work and Power

Energy	Needed to make things happen or change.
Joules	The units of energy, symbol = J.
Kilojoules	1000 J, symbol = kJ.
Work Done	The energy transferred by a force.
Calculating Work Done	Work done = force x distance E = F x d Work done = joules (J) Force = newtons (N) Distance = metres (m)
Power	The rate of energy transfer.
Watts, W	The unit of power: 1 W = 1 joule per second
Calculating Power	Power = work done / time P = E / t Power = watts (W) Work done = joules (J) Time = seconds (s)

2. Objects affecting each other

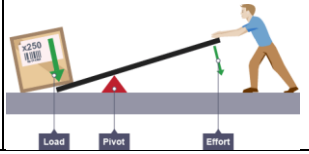
Contact Force	A force that acts when two objects touch.
Contact Force Examples	Normal contact force, friction, upthrust, air resistance.
Friction	A force between two surfaces that resists motion.
Upthrust	A force that pushes things up in liquids and gases.
Normal Contact Force	Force that acts at right angles to a surface as a reaction to a force on that surface.
Non-contact Force	A force that can affect something from a distance.
Non-contact Force Examples	Gravity, magnetism, electrostatic force.
Static electricity	Electric charges on insulating materials.
Action-Reaction Forces	Action–reaction forces are always the same size, in opposite directions, and acting on different objects. They are not the same as balanced forces, which act on a single object.
Force Field	The area around an object where its force can affect other objects.
Magnetic Field	The area of magnetic force around a magnet.
Magnetism	The force caused by magnets or magnetic materials.
Magnet	An object that has its own magnetic field around it. Attracts magnetic materials (iron, nickel, cobalt) and attracts or repels other magnets.
Electric Field or Electrostatic field	The area of electrostatic force around an object charged with static electricity.
Vector quantity	A quantity that has both size and direction.

3. Vector Diagrams (HIGHER ONLY)

Free Body Diagram	A diagram of an object showing all the forces acting on it and the size and direction of those forces. 
Vector Diagram Arrows	Arrows showing the size and direction of a force – must be drawn to scale.
Vector diagram	A diagram on which vectors are displayed (e.g. a scale diagram, a free body force diagram).
Scale Diagram	A way of working out the resultant forces or component forces by drawing a diagram where the lengths of arrows represent the sizes of the forces.
Resultant Force	The force left over when forces acting in opposite directions are cancelled out.
Net force	Another term for resultant force.
Resultant Force Diagram	Draw correct arrows for two forces, add lines to make a parallelogram. Resultant force = the diagonal of the parallelogram.
Resultant Force Diagram	
Resolving Forces	Breaking a force up into its horizontal and vertical components.
Component Forces	The vertical and horizontal forces that a diagonal force is made from.
Resolving Forces Diagram	Draw a correct force arrow, add arrows for vertical and horizontal component forces.
Resolving Forces Diagram	

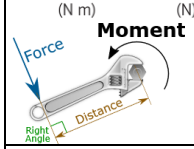
4. Rotational forces

Gears	A system of toothed wheels. The teeth interlock so that turning one wheel turns the one in contact with it. If gears of different sizes are used, the speed of rotation or the force transmitted can be changed.

In equilibrium	When things are balanced and not changing they are 'in equilibrium'.
Lever	A simple machine that consists of a long bar and a pivot. It can increase the size of a force or increase the distance the force moves.
Moment	The turning effect of a force. It is calculated by multiplying the force by the distance between the force and the pivot, measured at right angles to the force (this is called the normal distance).
Newton metre (N m)	The unit for the moment of a force.
Normal	If something is normal to something else, it is at right angles to it.
Pivot	A point about which a body can rotate. 

Moment of a force equation

moment of a force (N m) = force (N) × distance normal (perpendicular) to the direction of the force (m)



newton metre (Nm) – the unit for the moment of a force

When a system involving rotational forces is in equilibrium

the sum of clockwise moments = the sum of anti-clockwise moments

Lesson	Memorised?
1. Work and power	
2. Contact and Non-Contact Forces	
3. Vector diagrams	
4. Rotational forces	