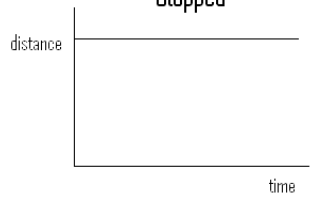
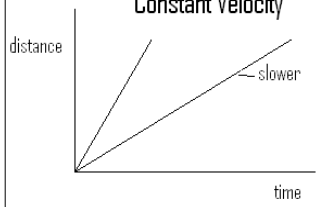
P2a Forces and Their Effects

Distance vs Time Graphs

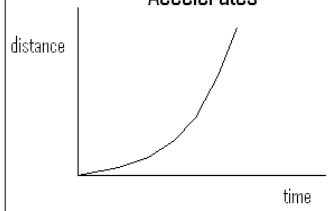
Stopped



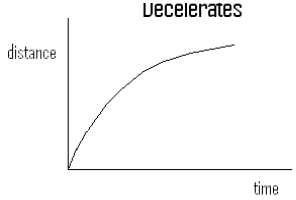
Constant Velocity



Accelerates



Decelerates



*The slope of a distance time graph gives the velocity of the moving object

Distance / Speed x time

Speed and velocity in in m/s

Reaction Force: This is the equal and opposite force when two objects are touching

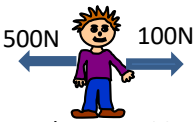
Frictional Force: Friction slows thing down, think of it as grip. Sometimes it is useful and sometimes it is a nuisance. It can change up to a maximum eg when pulling something across the table, but it doesn't disappear when you pull something hard enough to beat it.

Drag: This is friction from fliuds (liquid or gas), if the gas is air it is sometimes called air resistance, It depends on speed and surface area

Terminal Velocity: This is the constant speed reached when drag = weight. If you change your shape when falling you can change your terminal velocity. (open a parachute)

Newtons 2nd law of Motion: an object with **unbalanced** forces acting on it will **accelerate** in the direction of the resultant force

Speed is how fast
velocity is how fast in a certain direction



Resultant Force is the overall force acting on an object. It is the single force which has the same effect as all the other forces acting on it

1. acceleration

2. Terminal Velocity

3. deceleration

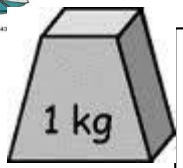
4. Lower Terminal Velocity

Gravity: the attractive force which acts between any two masses. On earth gravity or Gravitational field strength 10 N/kg and acceleration due to gravity 10 m/s² always have the same value.

Newtons 1st law of Motion: an object with **balanced** forces acting on it will stay still if already still. But if it is moving will stay moving at a **constant speed** in a straight line

Weight is the **force** of gravity pulling a mass down it is measured in **Newtons (N)**

Weight / Mass x gravity



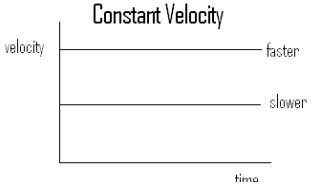
Mass is the amount of matter a body is made from it is measured in **Kilograms (Kg)**

Force / Mass x accel

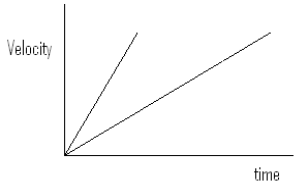
Velocity vs Time Graphs

Stopped

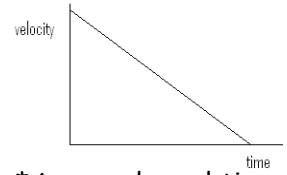
Constant Velocity



Acceleration



Deceleration



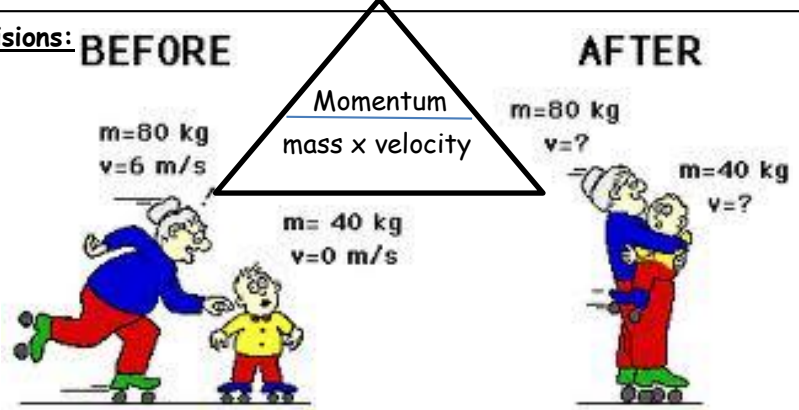
*Area under vel time graphs gives the distance travelled

*The slope gives the acceleration

Change in velocity / Acc x time

Acceleration in m/s²

Collisions:



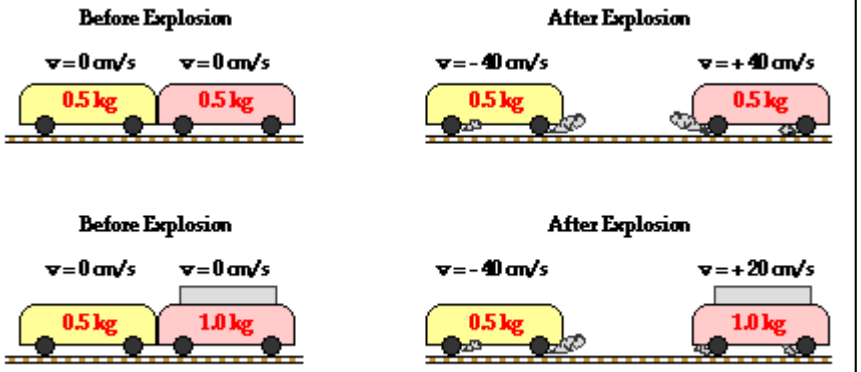
Total momentum before = (80 x 6) + (40 x 0) = 480

Total momentum after = (80+40) x v

So 480 = 120 x v

Answer: v = 4m/s

Explosions:



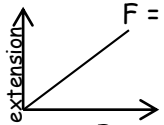
Stopping distance
Total stopping distance = Thinking distance + Braking distance

Momentum: is property of moving objects which is calculated
momentum = mass x velocity.
The unit of momentum is kgm/s

Conservation of Momentum: the total momentum before a collision or explosion is the same as the total momentum after a collision or explosion. So long as no other forces are acting.
mass A x velocity A = Mass B x velocity B

Energy
Power x time

Hookes Law: extension of a spring is proportional to the force on the end



Force
spring constant x extension

Grav potential energy
Weight x height

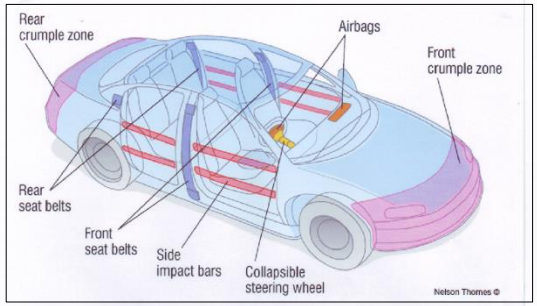
Kinetic Energy: The energy of movement. More energy if more mass and going faster. Measured in Joules (J)
Ek = ½ mass x velocity² .

Kinetic energy
½ Mass x vel²

Gravitational Potential energy:
When energy is transferred to an object and it gains height, we say we have done work against gravity. It has gained gravitational potential energy. Measured in Joules (J).
Work = force x distance moved in the direction of the force
Ep = weight x height

Energy Conservation Falling Object changes gravitational potential energy into Kinetic Energy. loss in Ep = the gain in Ek

Car safety: The force on a passenger will be large if there is a large change in momentum in a short time. The key to safety is to extend the time of impact to reduce the force. This is done by: seat belts stretch a little, crumple zones at the front and rear, air bags to cushion the impact.



Work
Force x dist

Power: is the rate of transfer of energy. Measured in Watts (W)

big thinking distance	Big braking distance
Faster speed	Faster speed
Drugs/alcohol	Poor tyres/brakes
Older /tired	Wet/ icy road

Braking a car: The kinetic energy, Ek is transferred to the brakes, we say the brakes have done work
Ek = ½ mass x velocity² = braking force x stopping distance

Work done: When energy is transferred we say we have done work. Work is measured in Joules (J)
Work = force x distance moved in the direction of the force