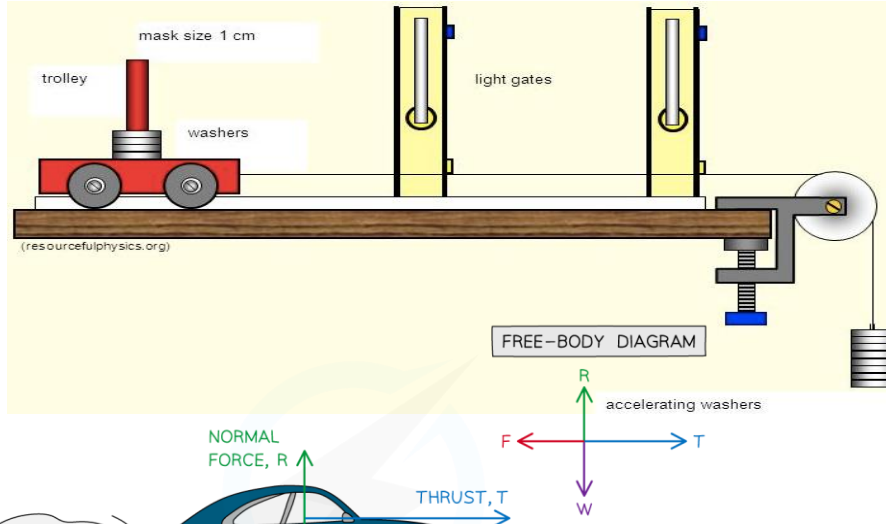
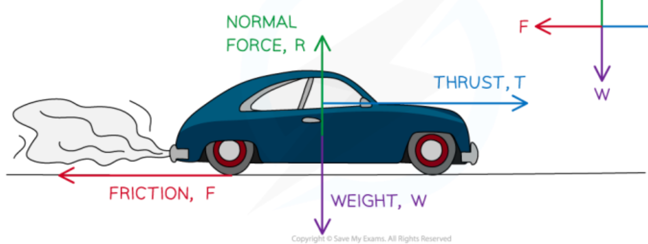
St Michael's
CE High

Knowledge Organiser: Physics, CP2a

Jesus grew in wisdom and stature" Luke 2:52

1	A **resultant** force is the **sum** of all the **forces** acting on an object.
2	A **free body diagram** represents all of the forces acting on one object and the forces are represented as arrows, the **size of the arrow** represents the **size of the force** and the direction of the arrow represents the direction the force is acting in.
3	To find the **resultant force** when two forces are acting on an object in **opposite directions** you **subtract** the smaller force from the larger force.
4	To find the **resultant force** when two forces are acting on an object in the **same** direction you **add** the forces together.
5	**Newton's first law of motion** states that **unless** an **external force** acts on the object then a moving object will continue to move at the same speed and direction and a stationary object will remain at rest.
6	A centripetal force can be any one of several different forces that keep an object moving in a circle. **(higher tier only)**
7	Examples of centripetal force include gravity, friction and tension.
8	The gravitational field strength on Earth is 10 N/kg
9	Weight (N) = mass (kg) x gravitational field strength (N/kg). W = m x g
10	Weight is a force so the standard units of measurement for weight are Newtons (N).
11	Newton's second law of motion states that the acceleration in the direction of a resultant force depends on • The size of the force (for the same mass, the bigger the force the bigger the acceleration) • The mass of the object (for the same force the more massive the object is the smaller the acceleration)
12	Force (N) = mass (kg) x acceleration (m/s^2). F = m x a



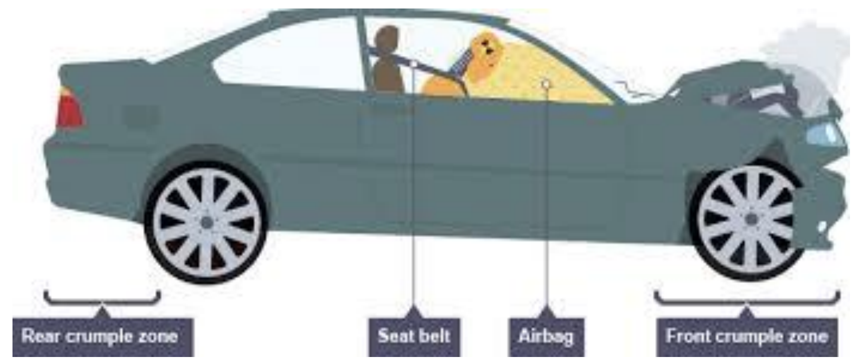


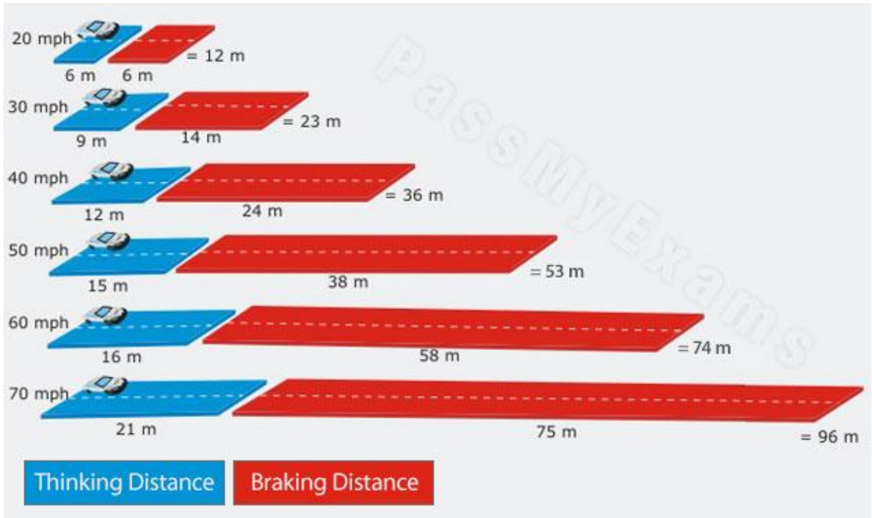
13	**Inertial mass** of an object is the **force** on it **divided** by the **acceleration** the force produces.
14	**Newton's third law of motion** states that for **every action force** there is an **equal and opposite reaction force**.
15	Newton's third law applies to forces acting on **two separate objects**.
16	Momentum is a measure of how difficult it is to stop an object that is moving.
17	Only objects that are moving have momentum. Objects that are **not moving** have a **momentum of zero**.
18	**Momentum (kg m/s) = mass (kg) x velocity (m/s).** **P = m x v**
19	**Momentum is conserved** (this means **total momentum before = total momentum after**). This applies when we look at momentum in collisions.

Knowledge Organiser: Physics, CP2b

Jesus grew in wisdom and stature" Luke 2:52

1	The **stopping distance** of a vehicle = the **thinking distance** + the **braking distance**.
2	The **thinking distance** is the distance the vehicle travels during the time it takes for the driver to react.
3	Factors that can **increase** the **thinking distance** are things that can increase the drivers reaction time such as being under the influence of **alcohol, drugs** or **tiredness**.
4	Most people have a typical reaction time of 0.25s
5	The braking distance is the distance the car travels during the time it takes for the vehicle to come to a complete stop once the driver has applied the brakes.
6	Factors that can **increase** the **braking distance** are things that can effect the vehicle itself. Examples of this include the **condition of the road surface, condition of the brakes** and the **mass** of the vehicle.
7	The speed the vehicle is travelling at can effect both the thinking and the braking distance. The faster the speed of the vehicle, the further it will travel in a given time.
8	The energy transferred by a force acting over a distance is called **work done**.
9	**Work done** (J) = **force** (N) x **distance** (m). **E = f x d**
10	The energy stored in a moving object is called kinetic energy.
11	**Kinetic energy** (J) = ½ x **mass** (kg) x **velocity²** (m/s) **KE = ½ X m x v²**
12	The **braking distance** of a vehicle depends on its kinetic energy and so it depends on the square of its velocity. This means that if the **velocity doubles**, the **braking distance** is multiplied by 2^2 which is 4 (**quadrupled**).





13	The **force** in a road collision depends on the **rate of change of momentum**. This can be shown as **F = (mv – mu) ÷ t**
14	Crumple zones and air bags increase the time taken for the momentum of the driver to decrease which produces a smaller impact force.