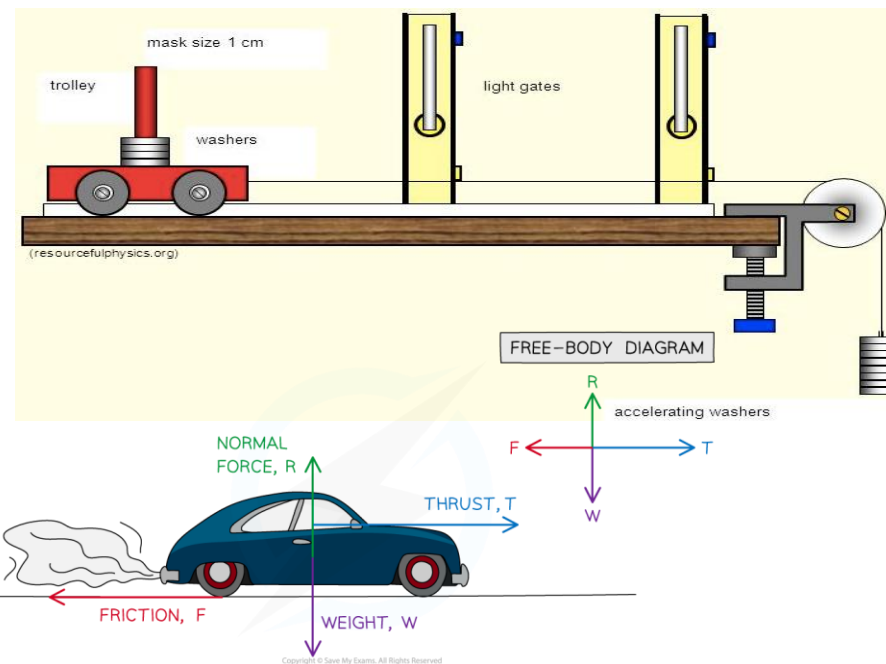


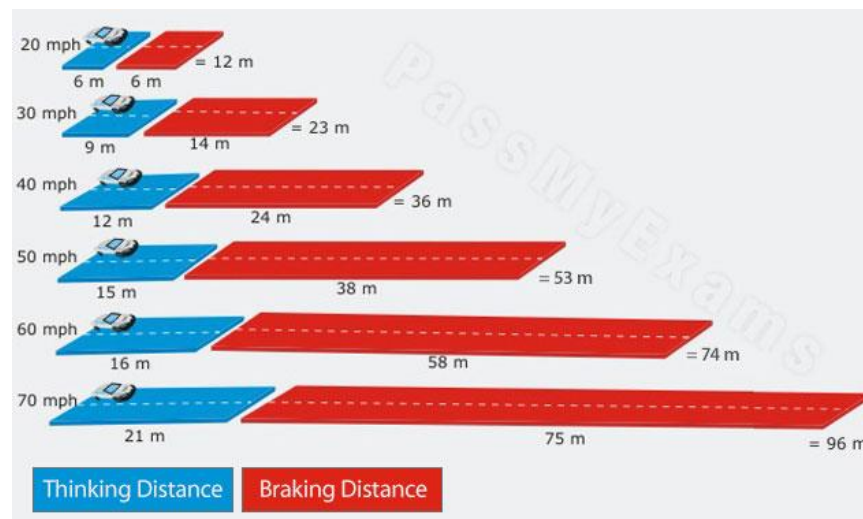
- 1 A **resultant** force is the **sum** of all the **forces** acting on an object.
- 2 A **free body diagram** represents all of the forces acting on one object and the forces are represented as arrows, the **size of the arrow** represents the **size of the force** and the direction of the arrow represents 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). $W = m \times g$
- 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). $F = m \times a$



- 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).**
 $P = m \times v$
- 19 **Momentum is conserved** (this means **total momentum before** = **total momentum after**). This applies when we look at momentum in collisions.



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| 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). $E = f \times d$ |
| 10 | The energy stored in a moving object is called kinetic energy. |
| 11 | Kinetic energy (J) = $\frac{1}{2} \times \text{mass (kg)} \times \text{velocity}^2 \text{ (m/s)}$
$KE = \frac{1}{2} \times m \times v^2$ |
| 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). |



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