Name _____ Class _____ Date 15/05/2018

Balanced and Unbalanced Forces

Maths Skills

$$Weight = Mass \times Acceleration\ due\ to\ Gravity$$

$$Mass = \frac{Weight}{Acceleration\ due\ to\ Gravity}$$

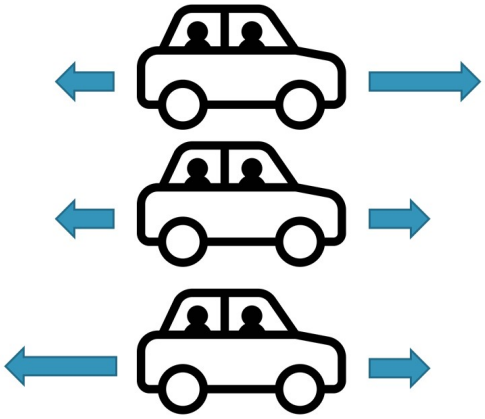
What are balanced forces?

When the forces acting on an object are the same size but in opposite directions we say that they are **balanced**. You can think of balanced forces like two teams in a tug of war. If each team pulls with the same force the rope doesn't move. The forces cancel out. The object is in **equilibrium**.

What are unbalanced forces?

The forces acting on this rocket-powered car are **unbalanced**. They are not the same size so they do not cancel out.

The **driving force** from the engine is much, much bigger than the **resistive forces** from air resistance and friction.



Driving force > Resistive Force = Car moves FORWARDS

Driving force = Resistive Force = Car stays MOTIONLESS

Driving force < Resistive Force = Car moves BACKWARDS

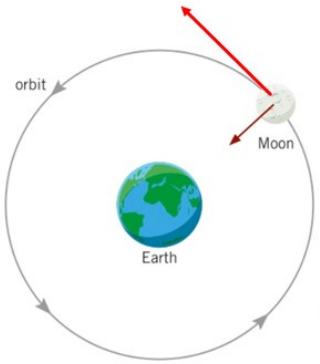
< means LESS than **= means EQUAL to** **> means GREATER than**

Three stages of falling

When an object is dropped, we can identify three stages before it hits the ground:

1. At the start, the object accelerates downwards because of its weight. There is no air resistance. There is a resultant force acting downwards.
2. As it gains speed, the object's weight stays the same, but the air resistance on it increases. There is a resultant force acting downwards.
3. Eventually, the object's weight is balanced by the air resistance. There is no resultant force and the object reaches a steady speed, called the **terminal velocity**.

There is a difference between SPEED and VELOCITY but for our purposes here we can just use the word SPEED.



The force of gravity keeps the Moon in orbit.

How do unbalanced forces change direction?

Isaac Newton worked out that the Earth exerts a force on the Moon. The force of gravity acting on the Moon keeps the Moon in orbit around the Earth. It is this same force that acts on an apple and pulls it to the ground. It changes the *direction* of motion, not the speed.

Newton's first law: An object at rest remains at rest, or if in motion, remains in motion at a constant velocity unless acted on by a net external force.