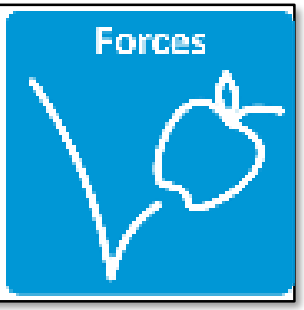
Knowledge Organiser Big idea:

P5c – Motion – Newton's Laws



I have already learned:

KS3:

In Y7 you have already covered the idea that forces can be balanced or unbalanced. If forces are unbalanced on an object, there is a resultant force acting upon it. If there is a resultant force on an object it will change speed or direction.

You also learned that this change of speed or direction on an object is called acceleration and you learned one way in which to calculate this.

Y10:

You will have recently finished P5a and P5b which covered the different types of forces and what they are called. You developed your skills on representing motion in graph form – including an object being stationary, moving at a constant velocity and accelerating.

This topic links to:

Y12 Forces and motion builds upon the principles of forces learned at GCSE.

Why study this topic?

Newton's Laws helps us understand why different objects behave in different ways. His second law explains why it is easier to hit a tennis ball at 100 mph compared to a bowling ball. His third law explains how birds can fly and speedboats can reach high speeds.

Possible careers involving Newton's laws are…

Mechanical engineering, astronaut, civil engineering, architecture, mechanic, vehicle crash test engineer, construction, carpentry, aeronautical engineering (designing planes and rockets), teaching.

AQA P5c Newton's Laws
Combined Higher

Required Practical for this topic:
F = ma

Newton's Laws	Newton's 1st Law	If an object experiences zero resultant force it does not accelerate
	Newton's 2nd law	The resultant force equals the mass × acceleration
	The greater the resultant force	The greater the acceleration
	The greater the mass	The smaller the acceleration for a given force
	Inertia	The tendency not to accelerate
	Forces	Occur in pairs of the same type
	Newton's 3rd law	If object A exerts a force on object B, then object B exerts a force of equal magnitude and opposite direction on object A
	When brakes are applied	Friction does work
	When brakes are applied	The kinetic energy store of the wheels decreases and the thermal energy store of the brakes increases.
Force (*N*) = mass (*kg*) x acceleration (m/s^2) (F = m × a)		

Momentum and collisions	Thinking distance	The distance travelled as the driver reacts
	Human reaction time	Typical values range from 0.2 s to 0.9 s.
	Braking distance	The distance travelled as the driver applies the brakes
	Stopping distance	Thinking distance + Braking distance
	Braking distance increases with	Higher speed, higher mass, poor weather, poor vehicle conditions
	Thinking distance increases with	Higher speed, drink, drugs, distractions
	Momentum unit	Kilogram metres per second (kgm/s)
	Closed system	A group of objects with no external forces acting on them
	Principle of conservation of momentum	For any interaction in a closed system the total momentum before and afterwards is equal.
Momentum = mass × velocity (p = mv)		