Mechanics
Checklist

Use this alongside our Walkthrough Guides to tick off the concepts you're confident with to plan your study and find areas of improvement!

Foundational Maths

- ◯ I can label a triangle using the terms **hypotenuse**, **adjacent** and **opposite**
- ◯ I can use trig to calculate an unknown side of a triangle
- ◯ I can describe what the arrow length indicates in a vector
- ◯ I can define the vertical and horizontal components of a vector diagram
- ◯ I can write values in scientific notation

Forces

- ◯ I can define a **force**
- ◯ I know Newton's 3 laws of motion and how it relates to forces
- ◯ I can explain the difference between **mass** and **weight**
- ◯ I can explain a **reaction force**
- ◯ I can define **friction force** and **tension**
- ◯ I can provide examples of fraction force and tension force
- ◯ I can explain **equilibrium** in relation to forces
- ◯ I can draw a force diagram, using correct labels
- ◯ I can define **net force** and **balanced forces** in relation to acceleration
- ◯ I can calculate force, mass, or acceleration using $F_{net} = ma$
- ◯ I can compare the effect of balanced and unbalanced forces on the direction, velocity and acceleration of an object

Kinematics

- ◯ I can state the symbol and unit of the following:
  - ◯ Velocity
  - ◯ Distance
  - ◯ Time
  - ◯ Acceleration
- ◯ I can calculate velocity, distance, time and acceleration using appropriate formulae
- ◯ I can identify and use the four kinematic equations to calculate distance, time, initial velocity and final velocity

Projectile Motion

- ◯ I can draw or describe the general path of projectile motion, describing the shape it forms
- ◯ I can link the motion of the projectile to the forces acting on it
- ◯ I understand that horizontal velocity stays the same during projectile motion
- ◯ I can describe the size of vertical and horizontal velocity components at the starting point, midpoint and endpoint of projectile motion
- ◯ I can explain why the vertical velocity changes throughout projectile motion
- ◯ I can calculate the initial vertical velocity, initial horizontal velocity and initial velocity of a projectile using either Pythagoras' or trig
- ◯ I can calculate the time it takes for the vertical velocity to become 0
- ◯ I can calculate the highest point of a projectile motion path
- ◯ I can calculate the total journey time from the vertical velocity
- ◯ I can calculate the total horizontal distance of projectile motion
- ◯ I can calculate the position of a projectile at any point of its motion

Circular Motion

- ◯ I can define **centripetal force**
- ◯ I can explain how an object can travel at a constant speed during its circular motion despite accelerating
- ◯ I can draw and label a diagram of circular motion, showing the direction of centripetal force and velocity
- ◯ I understand the velocity of an object is tangential (90°) to centripetal force
- ◯ I can calculate centripetal acceleration, velocity, or radius using $F_c = \frac{mv^2}{r}$

Torque

- ◯ I can define **torque**
- ◯ I can calculate the torque, force, or distance from the pivot point using the formula $\tau = Fd$
- ◯ I understand the concept of equilibrium, where upwards forces equal downwards forces, and clockwise torques equal anticlockwise torque
- ◯ I can explain the relationship between torque, the size of the force, and the distance from the pivot point
- ◯ I can calculate the force required to bring objects around pivot points to equilibrium
- ◯ I can use upwards or downwards forces and clockwise or anticlockwise torques to calculate the support forces in a real-world context, such as a bridge

Momentum

- ◯ I can state the units and symbols for:
  - ◯ Momentum
  - ◯ Time
  - ◯ Energy
  - ◯ Force
  - ◯ Acceleration due to gravity
  - ◯ Work
  - ◯ Power
- ◯ I can define momentum and calculate it using $p = mv$
- ◯ I understand that momentum is conserved during a collision
- ◯ I can calculate the total momentum before and after a collision
- ◯ I can describe the difference between an elastic and inelastic collision
- ◯ I can define **impulse** and calculate it
- ◯ I can discuss how the impulse equation is useful for investigating the damage from a collision

Energy

- ◯ I can calculate kinetic energy, mass, or velocity using the equation $E_k = ½mv^2$
- ◯ I can calculate gravitational potential energy, mass, or height using the equation $E_p = mg\Delta h$
- ◯ I can calculate the potential energy stored in a spring using $E_p = ½kx^2$
- ◯ I can explain **Hooke's Law**
- ◯ I understand why energy is lost when converted from potential to kinetic energy, and describe the type of energy that is lost
- ◯ I can define both **gravitational potential energy** and **kinetic energy**
- ◯ I can define **work**
- ◯ I can calculate work, force, or distance travelled using the equation $W = Fd$
- ◯ I can define **power**
- ◯ I can calculate power, work, and time using the equation $P = \frac{W}{t}$