Mechanics 1 Key Skills Checklist

How confident are you with each topic? $\surd$ *confident* – *not very sure* × *very unsure*

Chapter 1: Mathematical modelling in mechanics	
Identify and take into account assumptions made when modelling something as a *particle* or *rigid body*.	
Use words such as *rough*, *smooth*, *light* and *inelastic* where appropriate, and interpret problems using these assumptions.	
Critically evaluate any solution to a problem by considering assumptions and simplifications made, and suggest how a mathematical model might be refined.	

Chapter 2: Kinematics in one dimension	
Calculate velocity from a displacement-time graph.	
Calculate acceleration from a velocity-time graph.	
Calculate displacement from a velocity-time graph.	
Recall and correctly apply the 5 SUVAT equations, including using the correct sign to indicate direction for vector quantities (acceleration, velocity and displacement).	
Apply appropriate SUVAT equations to problems involving gravity, and solve the resulting quadratic equations these problems often generate.	

Chapter 3: Kinematics in two dimensions	
Describe a position or a velocity in two dimensions by using either column vectors or *i* and *j* notation.	
Resolve forces or velocities in a given direction to generate vectors.	
Calculate the magnitude and direction (angle) of a vector.	
Add and subtract vectors, and multiply or divide a vector by a scalar.	
Apply SUVAT equations in two dimensions, either by using vectors or dealing with the two perpendicular directions (eg horizontal & vertical, or east & north) separately.	

Chapter 4: Forces	
Understand and use the concept of force as a vector.	
Identify and label diagrams with common forces such as *weight*, *normal reaction*, *tension* and *friction*.	
Resolve forces in two perpendicular directions (eg horizontal & vertical or parallel with & perpendicular to a slope).	
Combine forces by resolving and/or writing in vector form.	
Understand and apply the concept of equilibrium of forces.	
Use the inequality $F_r \leq \mu R$ appropriately, and understand the conditions of limiting equilibrium under which $F_r = \mu R$.	

Chapter 5: Newton's laws of motion	
Recall and apply Newton's first law regarding equilibrium of forces.	
Recall and use Newton's second law, $F = ma$, to solve problems where forces are not in equilibrium.	
Recall and take into account Newton's third law regarding reaction forces, and identify situations where forces in a given direction are in equilibrium even when the overall resultant forces are not.	

Chapter 6: Connected particles	
Understand how tension acts equally throughout a string/rope.	
Use equal tension and equal acceleration of connected particles to construct and solve simultaneous equations by examining particles separately.	
Choose suitable directions to resolve forces in when dealing with particles on an inclined plane in order to effectively tackle problems.	

Chapter 7: Projectiles	
Describe the motion of a particle moving under gravity using vectors.	
Apply SUVAT equations appropriately, either in vector form or separately for horizontal and vertical motion, to deal with projectile problems.	
Deal with problems by solving quadratic equations where appropriate.	
Either solve problems by constructing vector equations or deal with horizontal and vertical motion separately, linking the two with the common variable, time.	
Deal with varying height by choosing suitable values for displacement in the vertical equations.	

Chapter 8: Momentum	
Understand the idea of momentum as a measure of movement, and how it is related to, but not the same as, kinetic energy.	
Apply the law of Conservation of Momentum to collisions to find unknown values.	
Apply momentum techniques to problems where velocity is given as a vector.	