# Mechanics 1 Key Skills Checklist

*How confident are you with each topic?*   √ *confident*    − *not very sure*    ✗ *very unsure*

| Chapter 1: Mathematical modelling in mechanics | |
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| 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 | |
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| 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 | |
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| 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 | |
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| 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 | |
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| 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 | |
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| 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 | |
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| 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 | |
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| 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. | |