**LANGDON PARK SIXTH FORM**

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| **Subject: Mathematics** | **Year: Y13** | **Unit 4 Mechanics- Kinematics with Vectors and Calculus** |

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| ***What and Why*** “You have already met kinematics, the mathematics of motion, in year 12. There all the problems you looked at had constant acceleration. Since then you have developed your understanding of calculus- the mathematics of change- both differentiation and integration. In this unit we look at kinematics where acceleration is variable and you need to use calculus. This will be applied to problems in both 1D and also with vectors in 2D. This mathematics is crucial to more realistic modelling of the real world, and a vital foundation for anyone thinking of going on to do a degree in science or engineering.” |

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| **Key terms:**  Kinematics  Displacement  Distance  Velocity  Speed  Acceleration  Constant  Variable  Integrate  Differentiate  Rate of Change |  | **Key ideas**   * Recap and consolidate understanding of 1D kinematics and "suvat" constant acceleration equations in 1D from year 12 * Recap key ideas in both differential and integral calculus * Understand that in situations with variable acceleration you cannot use the constant acceleration equations but instead must use calculus * Understand the differential and integral relations between different kinematic quantities in situations of variable acceleration * Understand how kinematic situations can me modelled use all of the above mathematics * Understand how vectors, including canonical vectors I and j, can be used to describe situations in 2D * Understand how to deal with both constant acceleration and variable acceleration problems in 2d using vectors | **Applications and skills:**   * Be able to apply calculus to kinematic situations with variable acceleration, and be fluent in using differentiation and integration to move between different kinematic quantities * Be able to use initial or boundary conditions to find values of arbitrary constants when using integration to solve kinematic problems * Be able to deal confidently with using vectors, both column vectors and also canonical I and j vectors, in 2D problems * Be able to use constant acceleration vector equations to solve 2D kinematics problems * Be able to use calculus in 2D kinematics problems |

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| **Specification point** | **Pre-reading** | **Application and Assessment (date)** | **Independent learning** | **Extension – Cultural Capital and Reading** |
| Q1- Q5 | **Topics you should be confident in prior to unit:**  The material you learned in year 12 kinematics, especially velocity time graphs and the “suvat” constant acceleration equations. The material you have studied in year 12 and the start of year 13 on differentiation and integration | * End of unit assessment, which will also include selected year 12 material * 50% seen * 50% unseen * 90% pass needed or resit required. | Kerboodle Online Login  My Maths  Exam Solutions  Maths Genie | **VIDEOS:** Useful video on the history of mathematical understanding of projectiles  [**https://www.gresham.ac.uk/lectures-and-events/mathematics-war-peace**](https://www.gresham.ac.uk/lectures-and-events/mathematics-war-peace)  **Enrichment:** Useful collections of problems that will deepen your understanding of kinematics[**https://nrich.maths.org/9050**](https://nrich.maths.org/9050) |

**Pre-assessment content review**

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| I feel secure in | I need to focus on | My action plan |

**Pre-assessment skills review**

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| I feel secure in | I need to focus on | My action plan |

**Post-assessment review**

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| Weaknesses in content knowledge | Skills I need to focus on | My action plan |
| Retest / review – teacher and student comment | | |

**Revision planning**

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| Spec point | Notes complete | Revision materials | Past paper Qs | Timed conditions |
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