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| **Year 2 pure unit 11: Integration** | **Road Map** |
| In this unit you will learn about pure maths. The aims are as follows:**LG1**: Knowledge**LG2**: Application**LG3**: Skills | Assessment Grades |  |  |
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| **Themes** | **Learning Goals/Outcomes/Content** |  |  |  |
| **11a. Integrating *xn* (including when *n* = –1), exponentials and trigonometric functions.** | be able to integrate expressions by inspection using the reverse of differentiation; |  |  |  |
| be able to integrate *xn* for all values of *n* and understand that the integral of $\frac{1}{x}$ is ln |*x*|; |  |  |  |
| be able to integrate expressions by inspection using the reverse of the chain rule (or function of a function); |  |  |  |
| be able to integrate trigonometric expressions; |  |  |  |
| be able to integrate expressions involving e*x*. |  |  |  |
| **11b. Using the reverse of differentiation and using trigonometric identities to manipulate integrals**  | recognise integrals of the form  = ln |f(*x*)| + *c*; |  |  |  |
| be able to use trigonometric identities to manipulate and simplify expressions to a form which can be integrated directly. |  |  |  |
| **11c. Integration by substitution**  | be able to integrate expressions using an appropriate substitution; |  |  |  |
| be able to select the correct substitution and justify their choices. |  |  |  |
| **11d. Integration by parts** | be able to integrate an expression using integration by parts; |  |  |  |
| be able to select the correct method for integration and justify their choices. |  |  |  |
| **11e. Use of partial fractions** | be able to integrate rational expressions by using partial fractions that are linear in the denominator; |  |  |  |
| be able to simplify the expression using laws of logarithms. |  |  |  |

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| **Themes** | **Learning Goals/Outcomes/Content** |  |  |  |

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| **11f. Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation)** | understand and be able to use integration as the limit of a sum; |  |  |  |
| understand the difference between an indefinite and definite integral and why we do not need + *c*; |  |  |  |
| be able to integrate polynomials and other functions to find definite integrals, and use these to find the areas of regions bounded by curves and/or lines; |  |  |  |
| be able to use a definite integral to find the area under a curve and the area between two curves. |  |  |  |
| **11g. The trapezium rule** | be able to use the trapezium rule to find an approximation to the area under a curve; |  |  |  |
| appreciate the trapezium rule is an approximation and realise when it gives an overestimate or underestimate. |  |  |  |
| **11h. Differential equations (including knowledge of the family of solution curves)** | be able to write a differential equation from a worded problem; |  |  |  |
| be able to use a differential equation as a model to solve a problem; |  |  |  |
| be able to solve a differential equation; |  |  |  |
| be able to substitute the initial conditions or otherwise into the equation to find + *c* and the general solution. |  |  |  |

**Links:**

LG1: You will learn how to integrate a range of different functions. You will learn how to use a definite integral to find the area under a curve and the area between two curves. You will learn how to carry out simple cases of integration by substitution and integration by parts. You will learn how to evaluate the analytical solution of simple first order differential equations with separable variables, including finding particular solutions. You will learn how to use numerical integration of functions including use of trapezium rule.

LG2: You will learn how to apply your knowledge from this and other units of work by using trigonometric identities to integrate higher order trigonometric functions, and to integrate by using partial fractions that are linear in the denominator.

LG3: You will be able to solve a variety of routine and non-routine problems, by combining several Mathematical skill sets. For example, you will be able to interpret the solution of a differential equation in the context of solving a problem, including identifying limitations of the solution including links to kinematics.