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| **UNIT 16: A****lgebra: quadratic equations and graphs** |

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**SPECIFICATION REFERENCES**

A4 simplify and manipulate algebraic expressions by: … expanding products of two binomials; factorising quadratic expressions of the form *x*2 + *bx* + *c*, including the difference of two squares; …

A11 identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically

A12 recognise, sketch and interpret graphs of … quadratic functions; …

A14 plot and interpret graphs (including reciprocal graphs) and graphs of non-standard functions in real contexts to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration

A18 solve quadratic equations algebraically by factorising; find approximate solutions using a graph

**PRIOR KNOWLEDGE**

Students should be able to square negative numbers.

Students should be able to substitute into formulae.

Students should be able to plot points on a coordinate grid.

Students should be able to expand single brackets and collect ‘like’ terms.

**KEYWORDS**

Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket

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| **16a. Quadratic equations: expanding and factorising**  (A4, A11, A18) | **Teaching time**  4–6 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Define a ‘quadratic’ expression;
* Multiply together two algebraic expressions with brackets;
* Square a linear expression, e.g. (*x* + 1)2;
* Factorise quadratic expressions of the form *x*2 + *bx* + *c*;
* Factorise a quadratic expression *x*2 – *a*2 using the difference of two squares;
* Solve quadratic equations by factorising;
* Find the roots of a quadratic function algebraically.

**POSSIBLE SUCCESS CRITERIA**

Solve 3*x*2 + 4 = 100.

Expand (*x* + 2)(*x* + 6).

Factorise *x*2 + 7*x* + 10.

Solve *x*2 + 7*x* + 10 = 0.

Solve (*x* – 3)(*x* + 4)= 0.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Visual proof of the difference of two squares.

**COMMON MISCONCEPTIONS**

*x* terms can sometimes be ‘collected’ with *x*2.

**NOTES**

This unit can be extended by including quadratics where *a* ≠ 1.

Emphasise the fact that *x*2 and *x* are different ‘types’ of term – illustrate this with numbers.