|  |  |
| --- | --- |
| **UNIT 15: Quadratics, expanding more than two brackets, sketching graphs, graphs of circles, cubes and quadratics** | **Teaching time**6-8 hours |

[Return to Overview](#HOverview)

**SPECIFICATION REFERENCES**

N8 Calculate exactly with … **surds** …

A4 simplify and manipulate algebraic expressions … by: expanding products of two **or more** binomials

A11 identify and interpret roots, intercepts, turning points of quadratic functions graphically; … **identify turning points by completing the square**

A12 recognise, sketch and interpret graphs of … quadratic functions, simple cubic functions …

A18 solve quadratic equations (**including those that require rearrangement)** …; find approximate solutions using a graph

A19 solve two simultaneous equations in two variables (linear/linear **or linear/quadratic**) algebraically; find approximate solutions using a graph

A20 **find approximate solutions to equations numerically using iteration**

A21 … derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution.

A22 solve linear inequalities in one or **two** variable**(s), and quadratic inequalities in one variable**; represent the solution set on a number line, **using set notation and on a graph**

R16 … **work with general iterative processes**

**PRIOR KNOWLEDGE**

Students should be able to solve quadratics and linear equations.

Students should be able to solve simultaneous equations algebraically.

**KEYWORDS**

Sketch, estimate, quadratic, cubic, function, factorising, simultaneous equation, graphical, algebraic

**OBJECTIVES**

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

* Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots, *y*-intercept and turning point by completing the square;
* Be able to identify from a graph if a quadratic equation has any real roots;
* Find approximate solutions to quadratic equations using a graph;
* Expand the product of more than two linear expressions;
* Sketch a graph of a quadratic function and a linear function, identifying intersection points;
* Sketch graphs of simple cubic functions, given as three linear expressions;
* Solve simultaneous equations graphically:
* find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach;
* find graphically the intersection points of a given straight line with a circle;
* solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem;
* Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values;
* Represent the solution set for inequalities using set notation, i.e. curly brackets and ‘is an element of’ notation;
* for problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets, i.e. solution of *x*² – 3*x* – 10 < 0 as {*x*: –3 < *x* < 5};
* Solve linear inequalities in two variables graphically;
* Show the solution set of several inequalities in two variables on a graph;
* Use iteration with simple converging sequences.

**POSSIBLE SUCCESS CRITERIA**

Expand *x*(*x* – 1)(*x* + 2).

Expand (*x* – 1)3.

Expand (*x* + 1)(*x* + 2)(*x* – 1).

Sketch *y* = (*x* + 1)2(*x* – 2).

Interpret a pair of simultaneous equations as a pair of straight lines and their solution as the point of intersection.

Be able to state the solution set of *x*² – 3*x* – 10 < 0 as {*x*: *x* < -3}  {*x*: *x* > 5}.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Match equations to their graphs and to real-life scenarios.

“Show that”-type questions will allow students to show a logical and clear chain of reasoning.

**COMMON MISCONCEPTIONS**

When estimating values from a graph, it is important that students understand it is an ‘estimate’.

It is important to stress that when expanding quadratics, the *x* terms are also collected together.

Quadratics involving negatives sometimes cause numerical errors.

**NOTES**

The extent of algebraic iteration required needs to be confirmed.

You may want to extend the students to include expansions of more than three linear expressions.

Practise expanding ‘double brackets’ with all combinations of positives and negatives.

Set notation is a new topic.