Scheme of Learning: Year 10 Autumn Term

Topic Sequence: Developing Algebra

3	4
Equations and Inequalities	Simultaneous Equations

Topic Overview:

Students now move on to the solution of simultaneous equations by both algebraic and graphical methods. The method of substitution will be dealt with before elimination, considering the substitution of a known value and then an expression. With elimination, all types of equations will be considered, covering simple addition and subtraction up to complex pairs where both equations need adjustment. Links will be made to graphs and forming the equations will be explored as well as solving them. The Higher strand will include the solution of a pair of simultaneous equations where one is quadratic, again dealing with factorisation only at this stage.

Learning Sequence:

Determine whether a given (x, y) is a solution to a pair of linear simultaneous equations: Students may need practice substituting (including with negative numbers) before attempting this small step. Use of formulae for area and perimeter can be interleaved here. Students then substitute values into equations to work out whether or not they have a possible solution. They understand that there is one possible solution when two equations are given in terms of two variables.

Solve a pair of linear simultaneous equations by substituting a known variable: Before starting, students need to review solving equations. Modelling substitution and solving equations is key. There is opportunity to interleave aspects of measure (e.g. $P = 2l + 2w$). Using bar models to begin with will support algebraic thinking. The students go onto realise that there may be more than one way of finding a solution if presented with two related equations.

Solve a pair of linear simultaneous equations by substituting an expression: This small step introduces the idea of substituting one equation into a second equation and is split into two parts. Double-sided counters could be used so that students can physically make the substitution. Students might then use pictorial representations before attempting the abstract substitution. At this stage, students are not rearranging in order to make the substitution.

Solve a pair of linear simultaneous equations using graphs: Students learn that the intersection point of two straight lines represents the solution to a pair of linear equations, comparing graphical and algebraic methods. It's important that teachers emphasise that it is the value of x and the value of y that give the solution, rather than the coordinate.

Solve a pair of linear simultaneous equations by adding or subtracting equations: By considering the simplification of expressions, students understand how to make zero using addition or subtraction. They build on this to solve simultaneous equations involving negative or non-integer solutions. They progress to consider which equation is more efficient when substituting to find the second solution. It's also important to consider equations where it might be easier to rearrange before adding.

Use a given equation to derive related fact: (R) This small step ensures that student understand that equivalent equations have the same solutions

Solve a pair of linear simultaneous equations by adjusting one or both equation: Bar models are a good way of demonstrating why equal coefficients of one of the variables is necessary when we are solving by elimination. Teachers will also discuss whether to make the coefficients of x the same, y the same, and whether it matters. When both equations need adjusting, students will realise that it doesn't matter which variable they focus on when making coefficients the same, but should consider which variable is easier (for example, avoiding negatives)..

Form a pair of linear simultaneous equations from given information: Students will help them to formulate the algebraic equations. Students often get confused about forming equations involving 'more than' or 'doubling', placing the addition/multiplication on the wrong side of the equation. This will need exploring by testing values. Students must give final answers in the context of the question

Determine whether a co-ordinate is a solution to both a linear and quadratic equation (H): Students will need to recognise linear and quadratic equations and its important to make the link between coordinates that are on both curve and line and the solution to the simultaneous equations

Solve a pair of simultaneous equations (one linear, one quadratic) using graphs: (H) Students make the link the at the solution is represented by the intersection point.

Solve a pair of simultaneous equations (one linear, one quadratic) algebraically(H): Students need to recap factorising and solving quadratics and consider simultaneous equations where both are in the form y = . Students also consider expanding perfect squares and are encouraged to think whether it is easier to rearrange a linear equation first, or whether they can make a direct substitution.

Solve a pair of simultaneous equations with a third unknown (H):

Sequence of Learning:

1	Determine whether a given (x, y) is a solution to a pair of linear sim. eqs
2	Solve a pair of linear sim. equations by substituting a known variable
3	Solve a pair of linear sim. equations by substituting an expression
4	Solve a pair of linear simultaneous equations using graphs
5	Solve a pair of linear sim. equations by adding or subtracting equations
6	Use a given equation to derive related facts (R)
7	Solve a pair of linear sim. equations by adjusting one or both equations
8	Form a pair of linear simultaneous equations from given information
9	Is a co-ordinate a solution to both a linear and a quadratic equation
10	Solve a pair of simultaneous equations using graphs
12	Solve a pair of simultaneous equations algebraically
13	Solve with a third unknown

Topic Resources:

Knowledge Maps:	Solving Linear Equations Linear Graphs Multiples, Primes, Factors Notation and manipulation Simultaneous equations

Assessment:

Knowledge:	2x 20 mark end of topic assessment
Application of Knowledge:	Termly summative assessment

Supportive Reading:

Any supported reading listed here	Sparx Maths www.sparxmaths.co.uk
	Corbett Maths : www.corbettmaths.com
	AQA Revision Guide