Equations & inequalities (AS)

B4 Solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation.

B5 Solve linear and quadratic inequalities in a single variable and interpret such inequalities graphically, including inequalities with brackets and fractions. Express solutions through correct use of 'and' and 'or', or through set notation. Represent linear and quadratic inequalities such as $y > x + 1$ and $y > ax^2 + bx + c$ graphically.

For a brief commentary on this content go to the MEI outline SoW.

Pre-requisites

- Transition to A level Maths: Essential Skills Within the Solving section see 'Linear equations', and in the Sketching section see 'Linear sketching'.
- GCSE: Knowledge of linear and quadratic inequalities.
- GCSE: Knowledge of simultaneous equations.

Common student errors

- Expressing inequalities incorrectly, such as if x is between -2 and -5 writing $-2 < x < -5$ rather than $-5 < x < -2$.
- Trying to combine two separate inequalities as a single expression, for example writing $x < -4$ and $x > 3$ as $-4 > x > 3$.
- Thinking that $(x - 4)(x + 2) > 0$ means $(x - 4) > 0$ and $(x + 2) > 0$.
- Believing that $(x + 3)^2 < 16$ has the same set of solutions as $(x + 3) < 4$.

Teaching it!

- A series of six videos designed to support students on this topic.
- Categorising quadratic inequalities: Venn diagram categorisation task.
- Point Collector: Lines: A Desmos Classroom activity helping students develop their knowledge of linear inequalities.
- Quadratic inequalities (student task): Casio, Desmos, GeoGebra.

Getting them thinking

- Change one coefficient in the equations $y = x^2 - 2x + 3,\ y = x + 2$ so that no value of x satisfies both.
- When $x = \frac{1}{3}$, $x^3 < x^2 < x < 1 - x < \frac{1}{x}$. What happens to the order of inequalities for other values of x? This GeoGebra file illustrates the problem.
- Prove that multiplying an inequality throughout by -1 is the same as reversing the sign.
- Prove that the product of the values of x satisfying both $y = x^2 + x - 2$ and $y = mx$ is -2 for every value of m.