Y12 Pure Chapter 3—Equations and Inequalities

What do I need to be able to do?

By the end of this chapter you should be able to:

- Solve linear simultaneous equations using elimination or substitution
- Solve simultaneous equations: one linear and one quadratic
- Interpret algebraic solutions of equations graphically
- Solve linear and quadratic inequalities
- Interpret inequalities graphically
- Represent linear and quadratic inequalities graphically

Y12 – Chapter 3 Equations and inequalities

Key words:

- Simultaneous equations – Two or more equations that share variables
- Equation – a mathematical statement containing an equals sign, to show that two expressions are equal. An equation will have a finite set of solutions
- Inequality – An inequality compares two values, showing if one is less than, greater than, or simply not equal to another value

Solving simultaneous equations

Method	Explanation	Works for
Elimination	Make the coefficients of one of the unknowns the same. (whichever seems easier) ▯ Add or subtract the equations to eliminate one unknown ▯ Solve the new equation to find the first unknown. ▯ Substitute back into one of the original equations to find the other unknown.	Linear simultaneous equations
Substitution	Rearrange one of the equations (if necessary) to make either x or y the subject. ▯ Substitute into the other equation. ▯ Solve the new equation to find x or y. ▯ Substitute back into your rearranged equation to find the value of the other letter. *If after substituting you get a quadratic equation you can use the discriminant to determine the number of solutions	Linear only and one linear and one quadratic simultaneous equations
Graphically	On the same set of axes draw the graphs of both simultaneous equations The points of intersection will give you the solutions	Linear only and one linear and one quadratic simultaneous equations

Linear inequalities

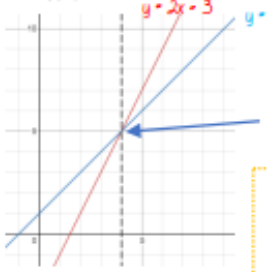
We solve linear inequalities the same way we would solve equations, except you get a range of solutions instead of one particular solution.

Eg Solve the inequality $2x - 3 > x + 1$ and sketch the outcome on a graph.

$2x - 3 > x + 1$

$2x > x + 4$

$x > 4$



This is the point where $2x-3$ becomes greater than $x+1$

Remember! If you multiply or divide an inequality by a negative number you have to reverse the inequality sign

Quadratic inequalities

To solve a quadratic inequality: always do a quick sketch (you will need to know the shape and the roots) then look for the appropriate part of the graph (ie. <0 (below the x-axis) or >0 (above the x-axis) depending on what you are looking for).

Eg Solve the inequality $x^2 + 4x + 3 \leq 0$

$x^2 + 4x + 3 = 0$

$(x + 3)(x + 1) = 0$

$x = -3$ or $x = -1$ ← These are the roots

We want the graph to be ≤ 0 so we want to describe the x values that represent the part of the curve under the x axis which we can see is $-1 \leq x \leq 3$