## My mathematical journey

**What do I need to remember from before?**

Adding and subtracting expressions (A2)

Multiplying and dividing expressions (A3)

Factorising expressions (A3)

Simplifying fractions (NP7)

Rearranging formulae (A5)

**What will I learn about in this unit?**

Rules of indices: multiplication, division and exponentiation

Multiplying multiple brackets

Factorising quadratics

Simplifying algebraic fractions

Rearranging more complex formulae

**Where does this lead?**

Quadratic graphs and equations (A12, A14)

Working with all types of non-linear functions (A15)

Operating with algebraic fractions (A17)

Algebraic proof by deduction (A17)

A-Level mathematics

## Key words and symbols: what I need to say and write accurately

| Word | Explanation |
|---|---|
| polynomial | an expression containing only numbers and non-negative powers of $x$.<br>e.g. $12x+7$, $12+56x-x^2$, $12+56x-x^2+11x^3$. |
| binomial | an expression with two terms. e.g. $x-1$, $5x+6$ ,$12x^2+7x$. |
| $\equiv$ | "is identical to". Used to show an identity – when two expressions are identical for every value of $x$, perhaps just written in a different way.<br>e.g. $x^2+5x+6 \equiv (x+3)(x+2)$ or $5x-3x \equiv 2x$ |

| Types of polynomial | General expanded form | Example (expanded and factorised) |
|---|---|---|
| Constant, $x^0$, no brackets | $a$ | $5$ |
| Linear, $x^1$, up to one bracket | $ax+b$ | $4x+10 \equiv 2(2x+5)$ |
| Quadratic, $x^2$, up to two brackets | $ax^2+bx+c$ | $2x^2+7x+3 \equiv (2x+1)(x+3)$ |
| Cubic, $x^3$, up to three brackets | $ax^3+bx^2+cx+d$ | $x^3+3x^2-6x-8 \equiv (x+1)(x-2)(x+4)$ |

## Fingertip facts: what I need to learn by heart

### The index laws

1. When we multiply powers with the same base, we can add their exponents. $x^7 \cdot x^3 = x^{10}$
2. When we divide powers with the same base, we can subtract their exponents. $\frac{x^7}{x^3} = x^4$
3. When we find a power of a power, we can multiply the exponents together. $(x^2)^3 = x^6$

### Factorising a quadratic, $ax^2+bx+c$

Look for two numbers whose sum is $b$ and whose product is $ac$.

e.g. $x^2-4x-12 \equiv (x-6)(x+2)$

| × | $x$ | |
|---|---|---|
| $x$ | $x^2$ | |
| | | $-12$ |

| × | $x$ | |
|---|---|---|
| $x$ | $x^2$ | $2x$ |
| | $-6x$ | $-12$ |

| × | $x$ | $2$ |
|---|---|---|
| $x$ | $x^2$ | $2x$ |
| $-6$ | $-6x$ | $-12$ |

Sum of these coefficients is $-4$.
Product is $-12$.

e.g. $2x^2-x-10 \equiv (2x-5)(x+2)$

| × | | |
|---|---|---|
| | $2x^2$ | |
| | | $-10$ |

| × | | |
|---|---|---|
| | $2x^2$ | $4x$ |
| | $-5x$ | $-10$ |

| × | $x$ | $2$ |
|---|---|---|
| $2x$ | $2x^2$ | $4x$ |
| $-5$ | $-5x$ | $-10$ |

Sum of these coefficients is $-1$.
Product is $-20$.

**Difference of two squares** e.g. $x^2-9 \equiv (x-3)(x+3)$ or $16x^2-49 \equiv (4x-7)(4x+7)$