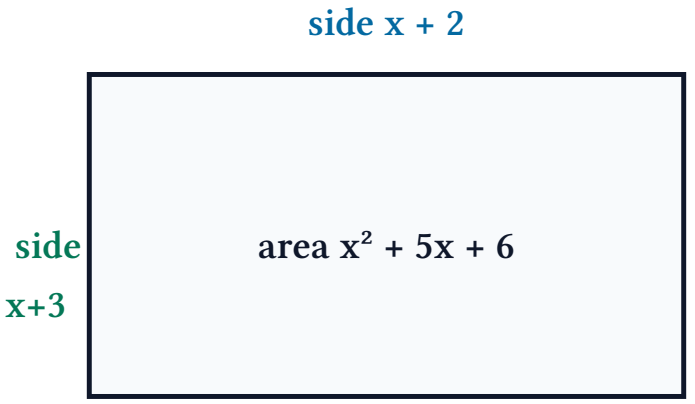
Mathematics 10C

Unit AN: Algebra and number

Factoring polynomials

Factoring trinomials

- The area $x^2 + 5x + 6$ came from sides $x + 2$ and $x + 3$.
- Factoring hunts for those sides.



Factors read from the sides: $(x + 2)(x + 3)$

Shared factors and rectangles

- The binomial $6x^2 + 9x$ has a common factor $3x$.
- The trinomial $x^2 + 5x + 6$ factors as a rectangle of binomial sides.

Key terms

common factor

A factor shared by every term of a polynomial, written outside the brackets. (3x)

factored form

A polynomial written as a product of polynomials. (3x(2x + 3))

difference of squares

A binomial whose terms are squares separated by subtraction, the trinomial case with middle coefficient 0. (x^2 - 16)

trinomial

A polynomial with three terms, factored here by a pair of numbers. (x^2 + 5x + 6)

A common factor first

- The terms $6x^2$ and $9x$ share $3x$.
- The factored form is $3x(2x + 3)$.

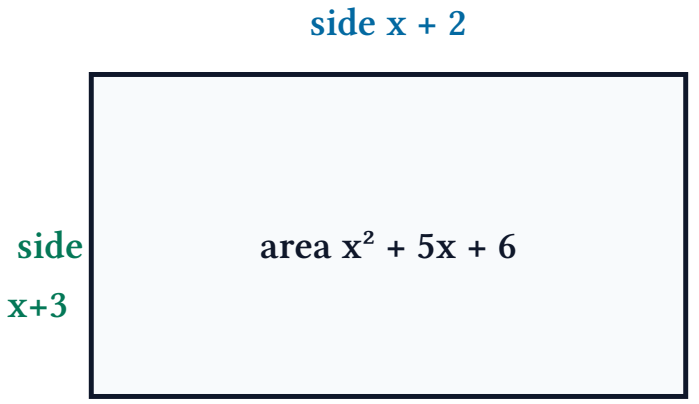
Factor $6x^2 + 9x$

GCF: $3x$

$3x(2x + 3)$

Two numbers for $x^2 + 5x + 6$

- The pair needs sum 5 and product 6.
- The numbers 2 and 3 work, because $2 + 3 = 5$ and $2 \times 3 = 6$.
- The factors are $(x + 2)(x + 3)$.



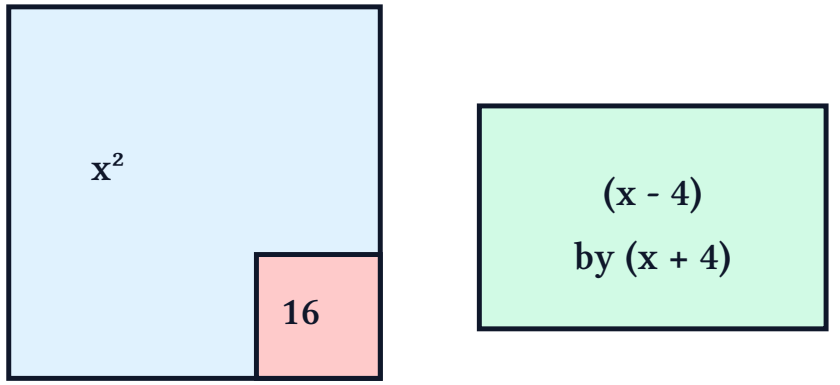
Factors read from the sides: $(x + 2)(x + 3)$

Checking by multiplication

- The product $(x + 2)(x + 3)$ is $x^2 + 3x + 2x + 6$.
- The like terms make $x^2 + 5x + 6$.

A difference of squares

- The polynomial $x^2 - 16$ is $x^2 + 0x - 16$.
- The pair -4 and 4 has sum 0 and product -16.
- The factors are $(x - 4)(x + 4)$.



$x^2 - 16$ equals that rectangle

A pair that fails

- The claim uses $(x + 1)(x + 6)$ for $x^2 + 5x + 6$.
- The sum $1 + 6$ is 7, and the product is 6.
- The expansion is $x^2 + 7x + 6$, a different middle term.

Check $(x + 1)(x + 6)$

Sum: $1 + 6 = 7$

Need sum 5 for $x^2 + 5x + 6$

Use factors with product 6 and sum 5

$2 \times 3 = 6$, $2 + 3 = 5$: $(x + 2)(x + 3)$

Factoring $x^2 - 9$

- The middle coefficient is 0.
- The pair -3 and 3 has product -9.
- The factors are $(x - 3)(x + 3)$.

Quick check

- The polynomial $4x^2 - 10x$ factors as $2x(2x - 5)$.
- The polynomial $x^2 - 16$ factors as $(x - 4)(x + 4)$.

Checking a factorization

- The factors of $x^2 + 5x + 6$ are $(x + 2)(x + 3)$.
- Multiplying those sides returns the trinomial.