Factorising quadratics

A LEVEL LINKS
Scheme of work: 1a. Algebraic expressions – basic algebraic manipulation, indices and surds

Example 1   Factorise $x^2 + 3x - 10$

$b = 3$, $ac = -10$ So $x^2 + 3x - 10 = x^2 + 5x - 2x - 10$ $\qquad\qquad\qquad = x(x + 5) - 2(x + 5)$ $\qquad\qquad\qquad = (x + 5)(x - 2)$	**1** Work out the two factors of $ac = -10$ which add to give $b = 3$ (5 and −2) **2** Rewrite the b term ($3x$) using these two factors **3** Factorise the first two terms and the last two terms **4** $(x + 5)$ is a factor of both terms

Example 2   Factorise $6x^2 - 11x - 10$

$b = -11$, $ac = -60$ So $6x^2 - 11x - 10 = 6x^2 - 15x + 4x - 10$ $\qquad\qquad\qquad = 3x(2x - 5) + 2(2x - 5)$ $\qquad\qquad\qquad = (2x - 5)(3x + 2)$	**1** Work out the two factors of $ac = -60$ which add to give $b = -11$ (−15 and 4) **2** Rewrite the b term ($-11x$) using these two factors **3** Factorise the first two terms and the last two terms **4** $(2x - 5)$ is a factor of both terms

Example 3   Factorise $4x^2 - 25y^2$

$4x^2 - 25y^2 = (2x + 5y)(2x - 5y)$	This is the difference of two squares as the two terms can be written as $(2x)^2$ and $(5y)^2$

Practice questions

1 Factorise

    a $x^2 + 7x + 12$ **b** $x^2 + 5x - 14$

    c $x^2 - 11x + 30$ **d** $x^2 - 5x - 24$

    e $x^2 - 7x - 18$ **f** $x^2 + x - 20$

    g $x^2 - 3x - 40$ **h** $x^2 + 3x - 28$

2 Factorise fully

    a $y^2 - 100$ **b** $36x^2 - 49y^2$

    c $4x^2 - 81y^2$ **d** $18a^2 - 200b^2c^2$

3 Factorise fully

    a $2x^2 + x - 3$ **b** $6x^2 + 17x + 5$

    c $2x^2 + 7x + 3$ **d** $9x^2 - 15x + 4$

    e $10x^2 + 21x + 9$ **f** $12x^2 - 38x + 20$

Answers

1   **a** $(x + 3)(x + 4)$ **b** $(x + 7)(x - 2)$

    c $(x - 5)(x - 6)$ **d** $(x - 8)(x + 3)$

    e $(x - 9)(x + 2)$ **f** $(x + 5)(x - 4)$

    g $(x - 8)(x + 5)$ **h** $(x + 7)(x - 4)$

2   **a** $(y - 10)(y + 10)$ **b** $(6x - 7y)(6x + 7y)$

    c $(2x - 9y)(2x + 9y)$ **d** $2(3a - 10bc)(3a + 10bc)$

3   **a** $(x - 1)(2x + 3)$ **b** $(3x + 1)(2x + 5)$

    c $(2x + 1)(x + 3)$ **d** $(3x - 1)(3x - 4)$

    e $(5x + 3)(2x + 3)$ **f** $2(3x - 2)(2x - 5)$