FACTORISING QUADRATICS

⊟ Objectives

- To factorise quadratics of the form $ax^2 + bx + c$, where $a \neq 1$
- To factorise quadratics using the difference of two squares.

▷ Examples

2.1e. Factorise

(a)　$4x^2 - 16x + 15$

$(4x - 10)(4x - 6)$

$(2x - 5)(2x - 3)$

$$\begin{aligned} & AC \\ & \downarrow \\ -10 \times -6 &= 60 \\ -10 + -6 &= -16 \\ & \uparrow \\ & B \end{aligned}$$

(b)　$8x^2 - 10x - 3$

$(8x - 12)(8x + 2)$

$(2x - 3)(4x + 1)$

$$\begin{aligned} -12 \times 2 &= -24 \\ -12 + 2 &= -10 \end{aligned}$$

2.1p. Factorise

(a)　$4x^2 + 13x - 12$

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(b)　$12x^2 + 16x - 3$

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💡 **TOP TIP**

- Check for a **common factor** in all terms before factorising.

2.2e. Factorise fully $4x^2 - 2x - 12$

$4x^2 - 2x - 12 = 2(2x^2 - x - 6)$

$2(2x - 4)(2x + 3)$

$2(x - 2)(2x + 3)$

$$\begin{aligned} -4 \times 3 &= -12 \\ -4 + 3 &= -1 \end{aligned}$$

2.2p. Factorise fully $9x^2 + 21x - 18$

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2.3e. Factorise $15 + 2x - x^2$

$15 + 2x - x^2 = -(x^2 - 2x - 15)$

$ = -(x - 5)(x + 3)$

$ = (5 - x)(x + 3)$

2.3p. Factorise $28 + 3x - x^2$

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🔑 **Key Fact**

- $(x+a)(x-a) = x^2 - a^2$ ← This is sometimes called the 'difference of two squares'.

▷ **Examples**

2.4e. Factorise

(a) $x^2 - 4$

$$x^2 - 4 = (x + 2)(x - 2)$$

To use the difference of two squares:

- No linear (x) term.
- One term is negative.

(b) $16 - x^2$

$$16 - x^2 = (4 + x)(4 - x)$$

2.4p. Factorise

(a) $9 - x^2$

(b) $x^2 - 36$

2.5e. Factorise

(a) $81x^2 - 25$

$$81x^2 - 25 = (9x + 5)(9x - 5)$$

(b) $\dfrac{1}{25} - 4x^2$.

$$\frac{1}{25} - 4x^2 = \left(\frac{1}{5} + 2x\right)\left(\frac{1}{5} - 2x\right)$$

(c) $x^2 - 7$.

$$x^2 - 7 = \left(x + \sqrt{7}\right)\left(x - \sqrt{7}\right)$$

2.5p. Factorise

(a) $16x^2 - 49$

(b) $64 - \dfrac{1}{4}x^2$.

(c) $3 - x^2$.