Factorisation - Lesson 11

Factorising Quadratic Trinomials (All Types)

LI

- Factorise expressions of the form $a x^2 + b x + c$.

SC

- Factorise, + and – numbers.

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A Quadratic Trinomial is an expression of the form :

$$ax^2 + bx + c$$

quadratic (x^2) term x term constant term

with none of a, b and c equal to 0

Want to write this as :

Example 1

Factorise $x^2 + 7x + 12$.

Find two numbers that :

- multiply to give $+12$.
- add to give $+7$.

$12 = 1 \times 12$

$12 = 2 \times 6$

$12 = 3 \times 4$

$\boxed{+ \; + \text{ gives 2 plus signs in brackets}}$

Only 1 possibility :

$(x + \quad)(x + \quad)$

$$\boxed{(x + 3)(x + 4)}$$

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Example 2

Factorise $x^2 - 9x + 18$.

Find two numbers that :

- multiply to give $+18$.
- add to give -9.

$18 = 1 \times 18$

$18 = 2 \times 9$

$18 = 3 \times 6$

$\boxed{- \; + \text{ gives 2 minus signs in brackets}}$

Only 1 possibility :

$(x - \quad)(x - \quad)$

$$\boxed{(x - 3)(x - 6)}$$

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Example 3

Factorise $x^2 + 5x - 24$.

Find two numbers that :

- multiply to give -24.
- add to give $+5$.

$24 = 1 \times 24$

$24 = 2 \times 12$

$24 = 3 \times 8$

$24 = 4 \times 6$

$$-3 + 8 = 5$$

$$\boxed{(x - 3)(x + 8)}$$

Example 4

Factorise $x^2 - 2x - 24$.

Find two numbers that :

- multiply to give -24.
- add to give -2.

$24 = 1 \times 24$

$24 = 2 \times 12$

$24 = 3 \times 8$

$24 = 4 \times 6$

$$-6 + 4 = -2$$

$$\boxed{(x - 6)(x + 4)}$$

Example 5

Factorise $4x^2 - 12x - 7$.

Try possibilities :

$(4x - \quad)(x + \quad)$

$(4x - \quad)(x + \quad)$

$(2x - \quad)(2x + \quad)$

$(2x - \quad)(2x + \quad)$

$$\boxed{(2x - 7)(2x + 1)}$$

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Factorise these quadratic trinomials :

1) $x^2 + x - 6$

2) $x^2 - 3x - 28$

3) $x^2 + 14x - 15$

4) $x^2 - 6x - 16$

5) $x^2 + 2x - 15$

6) $x^2 - x - 56$

7) $x^2 + 7x - 18$

8) $x^2 - 2x - 80$

9) $2x^2 + 5x - 12$

10) $3x^2 - x - 14$

11) $4x^2 + 17x - 15$

12) $4x^2 - 12x - 27$

13) $5x^2 + 6x - 11$

14) $6x^2 - 7x - 90$

15) $8x^2 + 34x - 19$

16) $9x^2 - 36x - 13$

Answers

1) $x^2 + x - 6$ $(x - 2)(x + 3)$

2) $x^2 - 3x - 28$ $(x - 7)(x + 4)$

3) $x^2 + 14x - 15$ $(x - 1)(x + 15)$

4) $x^2 - 6x - 16$ $(x - 8)(x + 2)$

5) $x^2 + 2x - 15$ $(x - 3)(x + 5)$

6) $x^2 - x - 56$ $(x - 8)(x + 7)$

7) $x^2 + 7x - 18$ $(x - 2)(x + 9)$

8) $x^2 - 2x - 80$ $(x - 10)(x + 8)$

9) $2x^2 + 5x - 12$ $(2x - 3)(x + 4)$

10) $3x^2 - x - 14$ $(3x - 7)(x + 2)$

11) $4x^2 + 17x - 15$ $(4x - 3)(x + 5)$

12) $4x^2 - 12x - 27$ $(2x - 9)(2x + 3)$

13) $5x^2 + 6x - 11$ $(x - 1)(5x + 11)$

14) $6x^2 - 7x - 90$ $(2x - 9)(3x + 10)$

15) $8x^2 + 34x - 19$ $(2x - 1)(4x + 19)$

16) $9x^2 - 36x - 13$ $(3x - 13)(3x + 1)$