

A-9 Factoring Algebraic Expressions

Factoring is the opposite of expanding.

expanding \longrightarrow

$$2x(3x - 5) = 6x^2 - 10x$$

\longleftarrow factoring

Type	Example	Comment
<p>Common Factoring $ab + ac = a(b + c)$</p> <p>Factor out the largest common factor of each term.</p>	$10x^4 - 8x^3 + 6x^5$ $= 2x^3(5x - 4 + 3x^2)$	Each term has a common factor of $2x^3$.
<p>Factoring Trinomials $ax^2 + bx + c$, when $a = 1$</p> <p>Write as the product of two binomials. Determine two numbers whose sum is b and whose product is c.</p>	$x^2 + 4x - 21$ $= (x + 7)(x - 3)$	$(-21) = 7(-3)$ and $4 = 7 + (-3)$
<p>Factoring Trinomials $ax^2 + bx + c$, when $a \neq 1$</p> <p>Look for a common factor. If none exists, use decomposition and write as the product of two binomials. Check by expanding and simplifying.</p>	$3x^2 + 4x - 4$ $= 3x^2 - 2x + 6x - 4$ $= (3x^2 - 2x) + (6x - 4)$ $= x(3x - 2) + 2(3x - 2)$ $= (3x - 2)(x + 2)$ <p>Check:</p> $(3x)(x) + (3x)(2)$ $+ (-2)(x) + (-2)(2)$ $= 3x^2 + 6x - 2x - 4$ $= 3x^2 + 4x - 4$	<p>Multiply: $3(-4) = -12$</p> <p>Find two numbers whose product is -12 and whose sum is 4. In this case, the numbers are 6 and -2. Using these numbers, decompose the x-term. Group the terms and factor out the common factors.</p>

Practising

1. Factor each expression.

a) $4 - 8x$

b) $6x^2 - 5x$

2. Factor each expression.

a) $x^2 - x - 6$

b) $x^2 + 7x + 10$

c) $3m^2n^3 - 9m^3n^4$

d) $28x^2 - 14xy$

c) $x^2 - 9x + 20$

d) $3y^2 + 18y + 24$

3. Factor.

a) $6y^2 - y - 2$

b) $12x^2 + x - 1$

c) $5a^2 + 7a - 6$

d) $12x^2 - 18x - 12$