

Algebra 1 - Factoring Polynomials - Lesson

Common Core A-SSE.A.2, A-SSE.B.3a, A-APR.B.3 · maths-pdf.fr/en/

Factoring writes a polynomial as a product of simpler polynomials. First factor out the greatest common factor. For $x^2 + bx + c$, find two numbers that multiply to c and add to b . Special patterns include the difference of squares and perfect square trinomials. Factored form reveals the zeros of a polynomial.

Algebra 1 · Common Core State Standards: **A-SSE.A.2, A-SSE.B.3a, A-APR.B.3**

Key facts

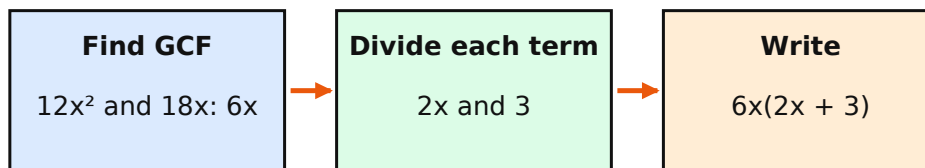
- Factor out the greatest common factor (GCF) first.
- For $x^2 + bx + c$, find two numbers with product c and sum b .
- Difference of squares: $a^2 - b^2 = (a + b)(a - b)$.
- Perfect square trinomials: $a^2 \pm 2ab + b^2 = (a \pm b)^2$.
- If a product is zero, one of its factors is zero, so factored form shows the zeros.

What does it mean to factor a polynomial?

To **factor** a polynomial means to write it as a product of simpler polynomials. Factoring undoes multiplication, so you can always check by multiplying the factors back together.

How do you factor out the greatest common factor?

Find the **greatest common factor** (GCF) of all the terms, divide each term by it, and write the GCF outside parentheses.



Factor out the greatest common factor first.

Always look for a GCF first. It makes every later step simpler.

How do you factor a trinomial $x^2 + bx + c$?

Find two numbers whose product is c and whose sum is b .

Factor pairs of 12	Sum
1 and 12	13
2 and 6	8
3 and 4	7

For $x^2+7x+12$, find the pair with product 12 and sum 7: 3 and 4.

	x	4
x	x^2	$4x$
3	$3x$	12

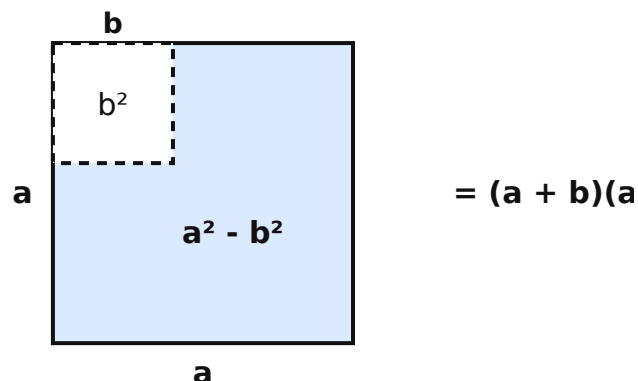
$x^2+7x+12=(x+3)(x+4)$: the cells $4x$ and $3x$ add to the middle term $7x$.

1. List the factor pairs of the constant c .
2. Choose the pair that adds to b .
3. Write $(x+p)(x+q)$ and check with FOIL.

Example: Factor $x^2+7x+12$. The pair with product 12 and sum 7 is 3 and 4, so $x^2+7x+12=(x+3)(x+4)$.

Special factoring patterns

Difference of squares: $a^2-b^2=(a+b)(a-b)$. Perfect square trinomials: $a^2+2ab+b^2=(a+b)^2$ and $a^2-2ab+b^2=(a-b)^2$.



The difference of squares $a^2-b^2=(a+b)(a-b)$.

How do you factor when the leading coefficient is not 1?

For $2x^2+7x+3$, multiply $2 \cdot 3$ to get 6, then find two numbers with product 6 and sum 7, which

are 1 and 6. Split the middle term: $2x^2+x+6x+3$. Group and factor:
 $x(2x+1)+3(2x+1)=(2x+1)(x+3)$.

Why does factoring help?

If a product is 0, one of the factors must be 0. So the zeros of $(x-7)(x+2)$ are 7 and -2 . Factoring also reveals the structure of an expression, such as seeing x^4-16 as a difference of squares.

Questions about factoring polynomials

What is the first step in factoring?

Look for a greatest common factor of all the terms. Factor it out before trying any other method.

How do you factor $x^2 + 7x + 12$?

Find two numbers that multiply to 12 and add to 7, which are 3 and 4. Then $x^2 + 7x + 12 = (x + 3)(x + 4)$.

What is a difference of squares?

It is an expression $a^2 - b^2$ that factors as $(a + b)(a - b)$. For example $x^2 - 49 = (x - 7)(x + 7)$.

How can you check a factorization?

Multiply the factors back together using FOIL or the distributive property. The result should match the original polynomial.

How does factoring help find zeros?

A product is zero only if a factor is zero. Setting each factor equal to 0 gives the zeros. For $(x - 7)(x + 2)$ the zeros are 7 and -2 .