

General Strategy for Factoring Polynomials Completely

To **factor completely** any given polynomial follow these steps:

Step 1: Look for a GCF. If there is a GCF, factor it out.

Step 2: Look at the number of terms in the polynomial. This determines how you should factor the poly.

2 terms in poly:

- Is it a sum of perfect squares? $A^2 + B^2$ then poly is Prime
- Is it a difference of perfect squares? $A^2 - B^2$ then poly factors as $(A + B)(A - B)$ or $(A - B)(A + B)$
either order for factors is ok

3 terms in poly:

- Is it a perfect-square trinomial? Use the appropriate formula listed below.

$$A^2 + 2AB + B^2 = (A+B)(A+B) = (A+B)^2$$

$$A^2 - 2AB + B^2 = (A - B)(A - B) = (A - B)^2$$

- Is it of the form $x^2 + bx + c$?
 $x^2 + bx + c = (x \quad)(x \quad)$

Find 2 numbers that *multiply to c* and *add to b*.
If no such numbers exist, the poly is prime.

- Is it of the form $ax^2 + bx + c$?
Use Trial and Error OR Factor by grouping.

4 terms in poly: Try factor by grouping.

Step 3: Look at each factor. Can it be factored further? The poly is factored completely when none of the factors can be factored further.

Step 4: Check your factorization by multiplying. The product of all the factors should be the *original* polynomial.