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.
  
  \[
  A^2 + 2AB + B^2 = (A+B)^2 \\
  A^2 - 2AB + B^2 = (A - B)^2
  \]

- Is it of the form \( x^2 + bx + c \)?
  
  \[
  x^2 + bx + c = (x )(x )
  \]
  
  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.