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? Use $A^2 - B^2 = (A - B)(A + B)$ or $(A + B)(A - B)$
- Is it a sum of perfect cubes? Use $A^3 + B^3 = (A + B)(A^2 - AB + B^2)$
- Is it a difference of perfect cubes? Use $A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

### 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 $b$.
- Is it of the form $ax^2 + bx + c$? Use “Trial and Error” or “Factor by grouping”.
- Does the poly have 3 terms but not have an $x^2$ as the leading term? Then try to factor using a substitution.

### 4 terms in poly:
- Try the ‘typical’ factor by grouping. Group the first two terms and last two terms. Factor out the GCF of each pair and see if what is left inside the parenthesis is the same. If it is, continue with the process.
- If the ‘typical’ factor by grouping didn’t work, then try to use factor by grouping to get a difference of squares. Group the first 3 terms and see if it is a perfect square trinomial. If so, continue with process.

**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.