Factoring: follow these steps for every problem

1. **Look to see if there is a GCF (greatest common factor):**

   Ex: $\quad 4x^2 - 10xy$

   $\quad\quad 2x\,(2x - 5y)$

2. **Look to see if the polynomial is the difference of 2 perfect squares:** $x^2 - y^2 = (x+y)(x-y)$

   Ex: $\quad 4x^2 - 25y^2$

   $\quad\quad (2x + 5y)\,(2x - 5y)$

3. **Look to see if the polynomial is the difference of 2 perfect cubes:** $x^3 - y^3 = (x-y)(x^2 + xy + y^2)$

   Ex: $\quad x^3 - 8$

   $\quad\quad (x - 2)\,(x^2 + 2x + 4)$

4. **Look to see if the polynomial is the sum of 2 perfect cubes:** $x^3 + y^3 = (x+y)(x^2 - xy + y^2)$

   Ex: $\quad 27y^3 + 64$

   $\quad\quad (3y + 4)\,(9y^2 - 12y + 16)$

5. **If trinomial, break into 2 binomials:**

   Ex: $\quad x^2 - 19x + 48$

   $(x\quad)(x\quad)$ Determine the front (first) terms;

   $(x -\quad)(x -\quad)$ Determine the SIGNS;

   Determine the back (last) terms — by listing the factors.

   Factors of 48: 1, 48; 2, 24; 3, 16; 4, 12; 6, 8

   $(x - 16)(x - 3)$ Find pair that adds to 19 $\Rightarrow$ 3 + 16 add to 19

6. **If the polynomial has 4 terms, use grouping:**

   Ex: $\underline{x^3 + 2x^2}\ \underline{-9x - 18}$ No GCF for all 4 terms

   Factor   Factor

   $x^2\,(x + 2) - 9\,(x + 2)$ *now factor GCF binomial

   $(x + 2)\,(x^2 - 9)$

   Difference of 2 perfect squares

   $(x + 2)(x + 3)(x - 3)$