Factoring $ax^2 + bx + c$ by Grouping

1.) Be sure your equation is in the correct format.
   
   $4x^2 + 22x - 42$

2.) Factor out the Greatest Common Factor if possible.
   
   $2(2x^2 + 11x - 21)$

3.) Identify $A$, $B$, and $C$.
   
   $A = 2$ $B = 11$ $C = -21$

4.) Multiply $A \times C$.
   
   $2(-21) = -42$

5.) List the factors of $A \times C$.
   
   $-42$
   $1$ $42$
   $2$ $21$
   $3$ $14$
   $6$ $7$

6.) If $A \times C$ is positive, add the factors. If $A \times C$ is negative, subtract the factors.
   
   $-42$ (subtract)
   
   $1$ $42 = 41$
   $2$ $21 = 19$
   $3$ $14 = 11$
   $6$ $7 = 1$

7.) You are looking for your $B$ term once you add or subtract the factors.
   
   $3$ $14 = 11$

8.) Determine the signs of the factors (Be Careful!!!). If $A \times C$ is positive, then both the signs are the same as the sign of $B$. If $A \times C$ is negative, then the signs are opposite and the larger number will have the same sign as $B$.
   
   $-3$ $+14 = +11$

9.) Split your middle term.
   
   $2x^2 + 11x - 21$
   
   $2x^2 - 3x + 14x - 21$

10.) Pull out your common terms between your first two terms and your last two terms.
   
   $2x^2 - 3x + 14x - 21$
   
   $(2x - 3)(x + 7)$

   Your terms in the parentheses should be exactly the same at this point; if not, check your signs!

11.) Pull out the common terms and create a new set of parentheses with what you have left over.
   
   $x(2x - 3) + 7(2x - 3)$
   
   $(2x - 3)(x + 7)$

12.) Don’t forget to bring down your GCF!!
   
   $2(2x - 3)(x + 7)$
The Box Method for Factoring a Polynomial

EXAMPLE: $10x^2 + 11x - 6$

1st create a 2x2 box

2nd, in the top left corner put the first term and in the bottom right corner put the last term.

$$\begin{array}{cc}
10x^2 & \\
-6 & \\
\end{array}$$

3rd, multiply these two terms together to get $-60x^2$. Find two factors of $-60x^2$ that when added together they will give you the middle term $11x$. These are $15x$ and $-4x$. Put these into the open boxes.

$$\begin{array}{cc}
10x^2 & 15x \\
-4x & -6 \\
\end{array}$$

4th, factor the terms in each row and in each column.

$$\begin{array}{cc}
2x & 3 \\
5x & 10x^2 & 15x \\
-2 & -4x & -6 \\
\end{array}$$

5th, the sum of the factors for the columns and the sum of the factors for the rows are the polynomial’s factors: $(2x+3)(5x-2)$