Factoring Trinomials with Leading Coefficient Greater than 1

Factoring trinomials with a leading coefficient greater than 1 is a bit harder than factoring trinomials with a leading coefficient of 1 because the placement of factors and signs DOES matter here.

Let's go through the steps with an example!

$2x^2 - 3x - 5$

1) We first need to figure out what 2 factors multiply together to give us the first term in the trinomial ($2x^2$). These factors would be 2x * x. Write these factors in parentheses.

(2x)(x)

2) Look at the last term in the trinomial (-5). Figure out what 2 numbers multiply together to give us -5 (those numbers being 5 and -1 or -5 and 1). DO NOT put these factors in the parentheses yet since where they are put MATTERS.

3) Now you need to try factor combinations to get -7 as a sum. Create a table with the possible combinations to see which one satisfies this quadratic.

Factor 1 (multiplied by 2x)		Factor 2 (multiplied by x)		Sum
2x * -5	**+**	**x * 1**	**=**	**-9x**
2x * 5	**+**	**x * -1**	**=**	**9x**
2x * -1	**+**	**x * 5**	**=**	**3x**
2x * 1	**+**	**x * -5**	**=**	**-3x**

The combination we should use is the last one. Flip the number positions in the 2 binomials (so instead of 2x + 1 and x - 5, make it 2x - 5 and x + 1 so if you were to FOIL the binomials, you would get the correct trinomial).

(2x - 5) (x + 1)

Let's try a slightly harder problem!

$4x^2 + 4x - 3$

The factors that multiply together to get $4x^2$ are 4x and x as well as 2x and 2x. DO NOT put these factors into parentheses because we do not know yet what pair of factors we are using.

The numbers that multiply to get -3 is 1 and -3 or 3 and -1. Make a table with all of these combinations to see which add to 4.

Factor 1		Factor 2		Sum
x * 1	**+**	**4x * -3**	**=**	**-11x**
x * -1	**+**	**4x * 3**	**=**	**11x**
x * -3	**+**	**4x * 1**	**=**	**x**
x * 3	**+**	**4x * -1**	**=**	**-x**
2x * 1	**+**	**2x * -3**	**=**	**-4x**
2x *- 1	**+**	**2x * 3**	**=**	**4x**

The combination we can use is 2x * 1 and 2x * -3, since that is the ONLY combination that sums up to -4. Remember to switch the numbers and their signs to get:

(2x - 3) (2x + 1)

A small tip - If you are going through combinations and come up with a value that is not the b you want (numberwise), you do not need to do the combination where the factors switch signs (like above for x * 1 + 4x * -3, giving us -11, which numberwise is not 4, so you do not need to do x * -1 + 4x * 3, where the number's signs change because it does not give us -4).

Tips for Solving Problems:

1. Make sure you understand how to factor trinomials with a leading coefficient of 1! It is the easier form of factoring trinomials that will help you understand how to factor these kinds of trinomials.

2. Make sure to follow the tip on the last page about not having to do every single combination! If you have done a combination that does not add up to the middle value of the trinomial NUMBERWISE, you do not need to do the other combination with switched signs of the same factors.

3. Remember the step of factoring a GCF other than 1 if you can! This makes the factoring a lot easier since smaller leading coefficients are better to work with!