FACTORING A QUADRATIC TRINOMIAL BY GROUPING
THE AC METHOD

A great method for factoring quadratic trinomials whose leading coefficient is not 1 is called factoring by grouping. This works quite nicely without having to *try* different numbers, especially if you find the factors in step 3 logically. If you can not find the factor in step three that work, then the polynomial is prime.

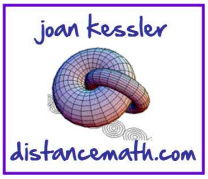
$$ax^2 + bx + c$$

Example:

1	Given:	$5x^2 + 11x + 2$
2	Find the product *ac*:	$(5)(2) = 10$
3	Think of two factors of 10 that add up to 11:	1 and 10
4	Write the $11x$ as the sum of $1x$ and $10x$:	$5x^2 + 1x + 10x + 2$
5	Group the two pairs of terms:	$(5x^2 + 1x) + (10x + 2)$
6	Remove common factors from each group:	$x(5x + 1) + 2(5x + 1)$
7	Notice that the two quantities in parentheses are now identical. That means we can factor out a common factor of $(5x + 1)$:	$(5x + 1)(x + 2)$

Example:

1	Given:	$4x^2 + 7x - 15$
2	Find the product *ac*:	$(4)(-15) = -60$
3	Think of two factors of -60 that add up to 7:	-5 and 12
4	Write the $7x$ as the sum of $-5x$ and $12x$:	$4x^2 - 5x + 12x - 15$
5	Group the two pairs of terms:	$(4x^2 - 5x) + (12x - 15)$
6	Remove common factors from each group:	$x(4x - 5) + 3(4x - 5)$
7	Notice that the two quantities in parentheses are now identical. That means we can factor out a common factor of $(4x - 5)$:	$(4x - 5)(x + 3)$



Try the following:

1. $2x^2 - 7x - 15$

2. $6x^2 + 25x + 21$

1. $2x^2 - 7x - 15$

$2 \times 15 = 30$
Find 2 numbers that multiply to 30
and subtract to 7. Signs are different since 15 is negative.
Do it logically so you don't miss any.
1 and 30 no
2 and 15 no
3 and 10 yes
The bigger number, 10, gets the sign of the middle which is -.
It doesn't matter which goes first when you UNFOIL
$2x^2 - 10x + 3x - 15$
Now factor by grouping.
Split down the middle
$2x(x - 5) + 3(x - 5)$
$(x - 5)(2x + 3)$

2. $6x^2 + 25x + 21$

$6 \times 21 = 126$
Find 2 numbers that multiply to 126
and add to 25. Signs are same, and both +.
Do it logically, so you don't miss any.
1 and 126 no
2 and sixty something no
3 and forty something no
You don't have to actually divide until you get close
4, doesn't go in
5, doesn't go in
6 and 21, not yet but closer
7 and 18 Tadah! yes
BTW, if you can't determine the numbers that work, then the quadratic is prime.
Both positive
UNFOIL
$6x^2 + 7x + 18x + 21$
Now factor by grouping.
$x(6x + 7) + 3(6x + 7)$ If this step doesn't work, you made a mistake
$(x + 3)(6x + 7)$

Note: It looks long because I wrote out the steps which were thinking steps. You don't have to write those.