Factorising Trinomials

Recall FOIL:

Using FOIL we can multiply out two brackets.

$$(x+3)(x+2) \rightarrow x^2+2x+3x+6 \rightarrow x^2+5x+6$$

Now suppose we want to start with x^2+5x+6 and put it back into two brackets.
This is another application of factorising. We will discover the reason why we want to do this shortly.

METHOD:

Thinking back to the above example, x^2+5x+6

the **first term** in each bracket must have been $(x\quad)(x\quad)$ since it multiplied out to x^2

the **last terms** multiplied out to get $+6$,
so the only possibilities are: 1 and 6 or 2 and 3 and the signs must be $+,+$ or $-,-$

The $5x$ comes from adding or subtracting the two middle terms.

So possible brackets could be : $(x\quad 2)(x\quad 3)$ or $(x\quad 1)(x\quad 6)$

The signs have to be the same $+,+$ or $-,-$ which gives us the possibilities of:
$(x+2)(x+3)$ or $(x-2)(x-3)$ or $(x+1)(x+6)$ or $(x-1)(x-6)$

Now only **one** of these will give us the two middle terms: $+2x$ and $+3x$ combining to give $5x$

and that is: $(x+2)(x+3)$ Now check to see if it works:

$x^2+5x+6 \rightarrow (x+2)(x+3) \rightarrow x^2+5x+6$ We always check it to see if it works.

x^2+5x+6 is called a **tri**nomial. **TRI** because there are **three** terms.

This operation is known as factorising a trinomial.

STEPS:

1. Look for first term
2. Look for possible factors for last term
3. Look for a combination that will add or subtract to give middle term
   (there may be more than one possibility for this).
4. Choose the signs in the bracket $(\ +/-\ )(\ +/-\ )$ so that
   a) The sign of the last term is correct.
   This tells you if the signs are the SAME: $++$ or $--$ or OPPOSITE: $+-$ or $-+$
   b) When you combine the inner and outer terms you get the middle term.