

Quick Notes on Factoring Trinomials – First coefficient is not 1

Factor $6x^2 + 11x + 3$

Take the first and last numbers, multiply them, and find all of its factor pairs.

$$\begin{array}{r} 18 \\ 1 \quad 18 \\ 2 \quad 9 \\ 3 \quad 6 \end{array}$$

$$6x^2 + 2x + 9x + 3$$

Using the pair that adds together to get the middle term, re-write the middle term.

$$2x(3x + 1) + 9x + 3$$

Now, factor **just the first two terms**.

$$2x(3x + 1) + 3(3x + 1)$$

Then, factor **just the last two terms**. Note, a nice way to know that you're doing it right is that the two sets of parentheses match.

$$(3x + 1)(2x + 3) \quad \text{Done.}$$

Finally, each term has a $(3x + 1)$ in it. Factor that out.

Try another: Factor $10x^2 - 17x + 3$

Take the first and last numbers, multiply them, and find all of its factor pairs.

$$\begin{array}{r} 30 \\ 1 \quad 30 \\ 2 \quad 15 \\ 3 \quad 10 \\ 5 \quad 6 \end{array}$$

$$10x^2 - 2x - 15x + 3$$

Using the pair that adds together to get the middle term, re-write the middle term, you'll need negative signs so that it matches. BTW, it doesn't matter what order you use them in.

$$2x(5x - 1) - 15x + 3$$

Now, factor **just the first two terms**.

$$2x(5x - 1) - 3(5x - 1)$$

Then, factor **just the last two terms**. You'll have to be careful with the signs. Notice that factoring out a -5 is the only way to make sure that the two sets of parentheses match.

$$(5x - 1)(2x - 3) \quad \text{Done.}$$

Finally, each term has a $(5x - 1)$ in it. Factor that out.

Try another: Factor $2x^2 + 5x - 12$

Take the first and last numbers, multiply them, and find all of its factor pairs. Don't worry about the negative at this point.

$$\begin{array}{r} 24 \\ 1 \quad 24 \\ 2 \quad 12 \\ 3 \quad 8 \\ 4 \quad 6 \end{array}$$

$$2x^2 - 3x + 8x - 12$$

$$x(2x - 3) + 8x - 12$$

$$x(2x - 3) + 4(2x - 3)$$

$$(2x - 3)(x + 4) \text{ Done.}$$

Since the last number is negative, look for a pair that subtracts to get 5. Use those numbers, with negative signs to make them combine correctly, to rewrite the middle term.

Now, factor **just the first two terms**.

Then, factor **just the last two terms**. Again, be careful with the signs.

Finally, each term has a $(2x - 3)$ in it. Factor that out.

One last thing. If you start into one of these, and you can't find a pair of factors that meets the criteria, what do you do? Well, first make sure you've found all of the pairs, and that you're adding or subtracting correctly ;-). If everything checks out and you still don't have a pair that works, then the trinomial is simply not factorable. Write '*not factorable*' and quit worrying about it.

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