

A Formula to Factor Quadratic Trinomials

Consider a quadratic trinomial in x :

$$ax^2 + bx + c \quad \text{where } a, b, \text{ and } c \text{ are constants.}$$

This trinomial can always be factored into two binomials:

$$\left(2ax + b - \sqrt{b^2 - 4ac}\right)\left(2ax + b + \sqrt{b^2 - 4ac}\right)$$

Important Usage Note: after completing the formula, you may need to factor out & cancel any common numbers in each binomial to get the final answer.

An Example: Factor $5x^2 + 8x + 3$

By the formula above, we get:

$$(10x + 6)(10x + 10) \quad \text{Verify this on your own!}$$

However, these two binomials are not factors of $5x^2 + 8x + 3$!

Thus, we need to factor out common numbers in each binomial:

$$2(5x + 3) \quad 10(x + 1)$$

Canceling out the 2 and 10 , we arrive at the correct set of factors:

$$(5x + 3)(x + 1) \quad \text{done!}$$

Check: multiply $(5x + 3)$ by $(x + 1)$ to verify that they equal $5x^2 + 8x + 3$.

How did I come up with this formula? I derived this formula for factoring from the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$