

The a,b,c Method

Earlier examples of factoring trinomials involved trinomials where the coefficient of the 'squared' term was equal to 1. These were simple because the first terms in the binomial factors will be x . If the coefficient of the 'squared' term is not equal to 1, the problem becomes a little more involved.

The a,b,c method of factoring trinomials is an easy to use recipe to determine the rational binomial factors of a trinomial which is in the standard form, $ax^2 + bx + c$. Follow these steps:

1. Factor out any monomials if possible.
2. Get the trinomial into standard form $ax^2 + bx + c$.
3. Determine the values of a, b, c and the product of ac .
4. Write $(\quad) \cdot (\quad) = ac$ (replace with the actual product.)
5. Write $(\quad) + (\quad) = b$ (replace with the actual value of b , the coefficient of x .)
6. Determine the numbers that satisfy both 3 and 4 above and write those values in the parentheses.
 - This step shows you how to break up the middle term bx into $___x + ___x$
7. Write the trinomial again, this time, using the broken up version of bx .
 - $ax^2 + ___x + ___x + c$ (replace the blanks with the numbers found above.)
8. Use the grouping method on the two pairs of terms and obtain the final result.

Example Factor $6x^2 + 7x + 2$ into the product of two binomials.

Step 1 and step 2 are already done.

Step 3 is to find the values of a, b, c . These are the coefficients of the three terms. $a = 6, b = 7, c = 2$, and $ac = 12$.

Steps 4 and 5 says write the parentheses

$$(\quad) \cdot (\quad) = 12$$

$$(\quad) + (\quad) = 7$$

Step 6 is to determine what same two numbers go into the parentheses in each equation.

$$(3) \cdot (4) = 12$$

$$(3) + (4) = 7$$

Step 7 is to write the original trinomial using the broken up version of the middle term.

$$6x^2 + 3x + 4x + 2$$

Step 8 is to use the grouping method of factoring these four terms

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

or

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

$6x^2 + 7x + 2$ factors to be $(3x + 2)(2x + 1)$.

Example Factor $14x^2 - 20 - 27x$ into the product of two binomials.

Step 1: Already done.

Step 2: Put the trinomial into standard form $ax^2 + bx + c$.

$$14x^2 - 27x - 20$$

Step 3: $a = 14$

$$b = -27$$

$$c = -20$$

$$ac = -280$$

Step 4 and 5:

$$(\quad) \cdot (\quad) = -280$$

$$(\quad) + (\quad) = -27$$

Step 6:

$$(-35) \cdot (8) = -280$$

$$(-35) + (8) = -27$$

To get the two numbers you may have to just divide -280 by several guesses and try them out in the two equations. Once you have both equations satisfied you are ready for step 7.

Step 7: Rewrite the original trinomial using the broken up version:

$$14x^2 - 35x + 8x - 20$$

Step 8: Use the grouping method to find the binomial factors:

$$7x(2x - 5) + 4(2x - 5)$$

or

$$(7x + 4)(2x - 5)$$

Therefore, $14x^2 - 27x - 20 = (7x + 4)(2x - 5)$.