MASTER PRODUCT METHOD OF FACTORING QUADRATIC TRINOMIALS

\[ ax^2 + bx + c \quad \text{or} \quad ax^2 + bxy + cy^2 \]

1. Multiply \( ac \).

2. Find two integer factors, \( p \) and \( q \), so that

\[ ac = pq \quad \text{and} \quad p + q = b \]

3. If such factors can be found, rewrite the middle term as a sum:

\[ \text{** } ax^2 + bx + c = ax^2 + px + qx + c \]

4. Group

\[ (ax^2 + px) + (qx + c) \]

5. Factor by grouping.

\[ \text{** } \]

If the split of the middle term is not possible then the trinomial is called prime with respect to integers (it still can be factorable.)
Example 1.

\[x^2 + x - 6\]

\[a = 1, \ b = 1, \ c = -6 \quad ac = (1)(-6) = -6 = (3) \times (-2)\]

\[b = 1 = (3) + (-2)\]

\[x^2 + 3x - 2x - 6 =\]

\[(x^2 + 3x) + (-2x - 6) =\]

\[x(x + 3) - 2(x + 3) =\]

\[(x + 3)(x - 2)\]

Example 2.

\[6x^2 - 11x + 4\]

\[a = 6, \ b = -11, \ c = 4 \quad ac = (6)(4) = 24 = (-3) \times (-8)\]

\[b = -11 = (-3) + (-8)\]

\[6x^2 - 3x - 8x + 4 =\]

\[(6x^2 - 3x) + (-8x + 4) =\]

\[3x(2x - 1) - 4(2x - 1) =\]

\[(2x - 1)(3x - 4)\]