1 Simple Factoring (FIXED) $(f(x) = ax^2 + bx + c)$

IF $a = 1$, then the factoring is known as 'simple' because the procedure is quite straight forward. As such we call quadratics with $a = 1$ simple trinomials. So assume that we are working with a quadratic function with $a = 1$,

$$f(x) = x^2 + bx + c.$$

Step 1. Find the integers p, q such that,

$$p + q = b$$
$$p \cdot q = c.$$

Step 2. Factor the quadratic as follows,

$$f(x) = (x + q)(x + p).$$

2 Non-Simple Factoring (FIXED) $(f(x) = ax^2 + bx + c)$

If $a \neq 1$ then proceed with the following steps,

Step 1. IF b **and** c are divisible by a, then factor a out of the polynomial. Then apply simple factoring to the polynomial leftover and your done!

Step 2. ELSE, find the integers p, q such that,

$$p + q = b$$
$$p \cdot q = ac.$$

Step 3. Then ,

- Find the $\gcd(|a|, |p|)$, let that integer be t.
- Find the $\gcd(|q|, |c|)$, let that integer be k.

Step 4. IF $a \cdot q > 0$, then complete the factorization by writing,

$$f(x) = (tx + k)\left(\frac{a}{t}x + \frac{p}{t}\right).$$

Step 5. ELSE IF $a \cdot q < 0$, then complete the factorization by writing,

$$f(x) = (tx - k)\left(\frac{a}{t}x + \frac{p}{t}\right).$$