Completing the Square

Given an expression in the form $ax^2 + bx + c$ where $a \neq 0$, this is the step-by-step process for completing the square to write the expression in vertex form. $f(x) = \pm a(x-h)^2 + k$

Description	**Algebra**
	$ax^2 + bx + c$
1. Group variable terms away from the constant. (To build squares)	$(ax^2 + bx) + c$
2. Factor 'a' out of the two terms in the parentheses. (Dividing pieces equally into the square)	$a(x^2 + \frac{b}{a}x) + c$
3. Add $\left(\frac{1}{2} \bullet \frac{b}{a}\right)^2$ inside the parentheses, but this means keeping it the same by subtracting $a \bullet \left(\frac{b}{2a}\right)^2$ from the constant. (Completing the square by MOVING units from "extra" group to squares)	$a\left(x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2\right) + c - a\left(\frac{b}{2a}\right)^2$
4. Rewrite the expression in vertex form. (How many perfect squares with equal dimensions & ADJUSTMENT to area)	$a\left(x + \frac{b}{2a}\right)^2 + \left(c - a\left(\frac{b}{2a}\right)^2\right)$

Example: Complete the square to write in vertex form.

$A(x) = (3x^2 + 12x) + 17$

$= 3(x^2 + 4x + 2^2) + 17 - 3(4)$

$= 3(x+2)^2 + 17 - 12$

$= 3(x+2)^2 + 5$

Three squares w/dimensions of (x+2) with 5 units EXTRA.