Factoring when $a \neq 1$

ax^2+bx+c

Ex 1. $2x^2+5x-12$

Step 1: Find $a \cdot c$ and b

$a \cdot c = 2 \cdot -12 = -24$ (mult.) / $b = 5$ (add)

Step 2: What two numbers multiply to get $a \cdot c$ and add to get b?

$\cdot -24$ & $+5$ $\}$ -3 & 8

Step 3: Replace the original b with those answers from above.

$2x^2 - 3x + 8x - 12$

Step 4: Factor by grouping

$2x^2-3x+8x-12$

$x(2x-3)+4(2x-3)$

$\boxed{(2x-3)(x+4)}$

same outside

Step 5: Final answer

$(2x-3)(x+4)$

Ex 2. $3x^2-2x-8$ $\quad a \cdot c = -24$ mult. $\}$ -6 & 4, $b = -2$ add

$3x^2-6x+4x-8$

$3x(x-2)+4(x-2)$

$\boxed{(x-2)(3x+4)}$

same

	x	-2
3x	$3x^2$	$-6x$
4	$4x$	-8

$(3x+4)(x-2)$

Ex 3. $2x^2-9x-35$ $\quad a \cdot c = -70$, $b = -9$ $\}$ 5 & -14

$2x^2-14x+5x-35$

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

$\boxed{(x-7)(2x+5)}$

	x	-7
2x	$2x^2$	$-14x$
5	$5x$	-35

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

$a = 1$

→ $x^2 + 7x + 12 = (x+3)(x+4)$

add (+) mult. (×)

→ $x^2 - 6x + 8 = (x-4)(x-2)$

solving

$x^2 - 6x + 8 = 0$

factor! $(x-4)(x-2) = 0$

$x - 4 = 0$ $\quad$ $x - 2 = 0$

$\boxed{x = 4}$ $\quad$ $\boxed{x = 2}$