Simplifying Quadratic Expressions

Level 1 - Simplify fractional expressions with a quadratic in the numerator
Level 2 - Simplify expressions with a quadratic numerator and denominator
Level 3 - Simplify expressions by removing a common factor first

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Simplifying quadratic expressions usually involves canceling common factors in a rational expression. In order to do this we must first factor our expressions completely.
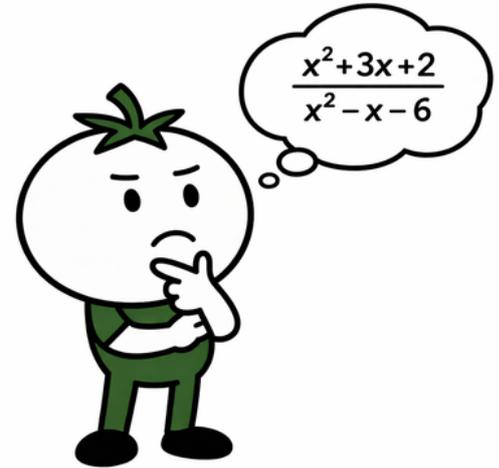
Key skills:

- Factoring out a GCF when all terms share a common factor
- Factoring quadratics (like $x^2 + 5x + 6$) into binomials
- Canceling common factors in the numerator and denominator

$$\frac{x^2+3x+2}{x^2-x-6}$$

Example #1	Example #2	Example #3
$\dfrac{x^2 + 5x}{x}$	$\dfrac{x^2 + 7x + 10}{x^2 + 5x}$	$\dfrac{4x^2 + 12x - 40}{2x^2 + 12x + 10}$
$\dfrac{\cancel{x}(x + 5)}{\cancel{x}}$ $\boxed{x + 5}$	$\dfrac{(x + 2)\cancel{(x + 5)}}{x\cancel{(x + 5)}}$ $\boxed{\dfrac{x + 2}{x}}$	$\dfrac{4(x^2 + 3x - 10)}{2(x^2 + 6x + 5)}$ $\dfrac{2\ \cancel{4}(x + 5)(x - 2)}{1\ \cancel{2}(x + 5)(x + 1)}$ $\boxed{\dfrac{2(x - 2)}{x + 1}}$

Remember:

- Factor everything before trying to cancel.
- Only cancel factors that appear in both the numerator and denominator.
- We can **only cancel factors**, not individual terms.