Multiply Binomials (FOIL)

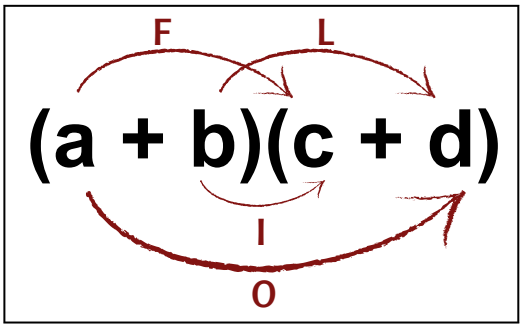
Level 1 - Multiply two binomials which contain the same variable
Level 2 - Multiply two binomials which use multiple variables
Level 3 - Multiply binomials containing fractions

When multiplying two binomials (expressions with two terms), we use a method called **FOIL**.

This is an extension of the distributive property. Instead of multiplying one term through the brackets, we need to multiply both terms in the leading binomial through the terms of the second binomial.

FOIL stands for:

F – First (multiply the first terms in each binomial)
O – Outer (multiply the outer terms)
I – Inner (multiply the inner terms)
L – Last (multiply the last terms in each binomial)



Finally, we combine any like terms.

This method works for all binomials, even when there are different variables or fractions.

Example #1 $(x+4)(x+2)$	**Example #2** $(x+2y)(2x+y)$	**Example #3** $\left(\frac{1}{2}x+1\right)\left(x-\frac{3}{4}\right)$
First: $x \times x = x^2$ *Outer*: $x \times 2 = 2x$ *Inner*: $4 \times x = 4x$ *Last*: $4 \times 2 = 8$ *Now combine like terms*: $x^2 + 2x + 4x + 8$ $x^2 + 6x + 8$	*First*: $2x \times x = 2x^2$ *Outer*: $x \times y = xy$ *Inner*: $2y \times 2x = 4xy$ *Last*: $2y \times y = 2y^2$ *Now combine like terms*: $2x^2 + xy + 4xy + 2y^2$ $2x^2 + 5xy + 2y^2$	*First*: $\frac{1}{2}x \times x = \frac{1}{2}x^2$ *Outer*: $\frac{1}{2}x \times \left(-\frac{3}{4}\right) = -\frac{3}{8}x$ *Inner*: $1 \times x = x$ *Last*: $1 \times \left(-\frac{3}{4}\right) = -\frac{3}{4}$ *Now combine like terms*: $\frac{1}{2}x^2 - \frac{3}{8}x + x - \frac{3}{4}$ $\frac{1}{2}x^2 + \frac{5}{8}x - \frac{3}{4}$

Remember:

- Always write out all four parts of FOIL before combining terms.
- Be careful with negative signs and fractions—write them out clearly.
- Combine like terms after multiplying; don't try to skip steps.