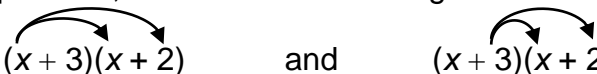


Polynomials: Binomial Multiplication Using FOIL— Explanation

One type of polynomial is a **binomial**. These polynomials contain **two terms**.
Examples are $x - 3$, $y + 4$, $m + 2n$, $3x^2 - 4y^3$, and $5x^2 + 7$

When a binomial is multiplied times a binomial, we have a problem that looks like this:
 $(x + 3)(x + 2) =$

With this type of problem, we can think of having two sets of distributions to do,



giving us four multiplications, each involving monomials.
 $(x)(x)$ and $(x)(2)$ and $(3)(x)$ and $(3)(2)$
 resulting in $x^2 + 2x + 3x + 6$.
 Combining like terms gives us our answer: $x^2 + 5x + 6$

To help us remember all these steps, we have the word “FOIL,” which stands for
First– **O**uter– **I**nnner – **L**ast.

If you multiply the terms in each of these positions, you will have all four products you will need.

Example 1

$(x + 3)(x + 7) =$	Using FOIL: $(x + 3)(x + 7)$ $(x + 3)(x + 7)$ $(x + 3)(x + 7)$ $(x + 3)(x + 7)$	First: $(x)(x)$ Outer: $(x)(7)$ Inner: $(3)(x)$ Last: $(3)(7)$
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Add the four products:

$$x^2 + 7x + 3x + 21$$

Answer: $x^2 + 10x + 21$ Adding like terms $7x$ and $3x$

Example 2

$(2x - y)(3x + 5y) =$				
FIRST	OUTER	INNER	LAST	
$(2x)(3x)$	$+$	$(2x)(5y)$	$+$	$(-y)(3x)$
$+$		$(-y)(5y)$		
$(6x^2)$	$+$	$(10xy)$	$+$	$(-3xy)$
		$+$		$(-5y^2)$
<div style="border: 1px solid black; display: inline-block; padding: 2px;"> LIKE TERMS </div>				
$6x^2 + 7xy - 5y^2$				

Add like terms

Example 3

$(3m + 4)(2m - 3n) =$				
FIRST	OUTER	INNER	LAST	
$6m^2$	$-$	$9mn$	$+$	$8m$
		$-$		$12n$

There are no like terms to add in this one!