

## Using the FOIL Method to Multiply Binomials

**Author/Creation:** Eric Neill, September 2010.

**Summary:** Learn to use the FOIL method to multiply binomials.

**Learning Objectives:** To describe the FOIL method. To apply FOIL to binomial multiplication.

*Using the FOIL Method to Multiply Binomials* assumes that the reader has a basic understanding of the order of operations and of multiplying, adding, and subtracting numbers, both with and without variables. In addition, an understanding of positive and negative numbers is required. (The Academic Center has some handouts on these issues if you're not familiar with these topics. See <http://www.uhv.edu/ac/mathsci/>)

Let's talk about FOIL. FOIL stands for **F**irst, **O**uter, **I**nner, **L**ast. FOIL refers to the order in which you multiply the terms in binomials. This method only works for two binomials (two polynomials of exactly two terms each).

Let's use an example to explain how FOIL works:  $(x-7)(3x+4)$

- 1) **First** – First, we need to multiply the first terms (the first term in each binomial). In this case, the first terms are  $x$  and  $3x$ .  $x * 3x = 3x^2$ . We need to note the sign (positive or negative) of each of the multiplications (first, outer, inner, and last). The sign for this one is positive. Since this is the first multiplication, we simply write it. Our answer for this step is  $3x^2$ .
- 2) **Outer** – In the second step, we'll deal with the **Outer two terms**. Think of the two binomials as a single entity. The outer terms are the two terms furthest from the center. In this case, these two terms are  $x$  and  $4$ . We multiply these to get  $4x$ . Since both  $4$  and  $x$  are positive, our answer is positive. That means that we ADD these to the answer. Our answer so far is  $3x^2 + 4x$ .
- 3) **Inner** – In the third step, we deal with the **Inner two terms**. Again, think of the two binomials as a single entity. We want the two terms closest to the middle. In this case, that's  $-7$  and  $3x$ . Multiplying those, we get  $-21x$ . Since our answer is negative, we SUBTRACT that from our answer. Our answer so far is  $3x^2 + 4x - 21x$ .
- 4) **Last** – Next, we deal with the **Last two terms** in each binomial. In this case, that's  $-7$  and  $4$ . Multiplying these, we get  $-28$ . That number is negative, so we again subtract that from our answer. Our answer so far is  $3x^2 + 4x - 21x - 28$ .
- 5) Step 5 is the last step, and it simply involves combining the two middle terms. Notice that we have  $4x - 21x$ . These can be combined since both contain an  $x$ , but the  $x$ 's do not have any exponents. In this case,  $4x - 21x = -17x$ . As such, we replace those two middle terms with  $-17x$ . Our final answer is  $3x^2 - 17x - 28$ .

**And that's it! You just multiplied two binomials using the FOIL method!**



Visit us on the web at [www.uhv.edu/ac](http://www.uhv.edu/ac)

Email at [tutor@uhv.edu](mailto:tutor@uhv.edu) University West, room 129 (361) 570-4288

Now, you try some!

- 1)  $(4x-3)(7x+6)$
- 2)  $(6x-5)(x+2)$
- 3)  $(x+2)(x+5)$
- 4)  $(x-5)(x-6)$
- 5)  $(x-4)(x+8)$

Answers:

- 1)  $28x^2 + 3x - 18$
- 2)  $6x^2 + 7x - 10$
- 3)  $x^2 + 7x + 10$
- 4)  $x^2 - 11x + 30$
- 5)  $x^2 + 4x - 32$



Visit us on the web at [www.uhv.edu/ac](http://www.uhv.edu/ac)

Email at [tutor@uhv.edu](mailto:tutor@uhv.edu) University West, room 129 (361) 570-4288