

Elementary algebra
Class notes
Multiplying Special Binomials (section 12.4)

We will learn shortcuts to multiply things like $(x + 3)^2$ and $(x - 3)(x + 3)$. They will be particularly useful when we start to factor.

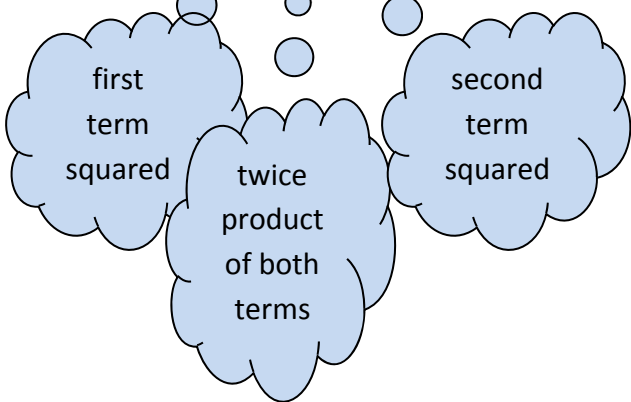
Recall FOIL. For practice, FOIL out the product $(5x - 6)(x + 2)$. In the end, combine like terms to get your final answer.

If the signs confuse you, try writing it as $(\underline{5x} + \underline{-6})(\underline{x} + \underline{2})$.

What about $(a + b)^2$ or $(a - b)^2$? These are things like $(x + 3)^2$ or $(3x - 2)^2$. How would you multiply $(x + 3)^2$?

We know $(x + 3)^2$ is really just $(x + 3)(x + 3)$. FOIL that out to see if you simplified it correctly.

Notice $(x + 3)^2 = x^2 + 6x + 9$ when FOILED. (Did you get that middle term?) Let's look more closely at this.



Look at these other examples.

$$(x + 5)^2 = (x + 5)(x + 5) = x^2 + 10x + 25$$

$$(x + 7)^2 = (x + 7)(x + 7) = x^2 + 14x + 49$$

$$(x - 10)^2 = (x - 10)(x - 10) = x^2 - 20x + 100$$

$$(3x + 2)^2 = (3x + 2)(3x + 2) = 9x^2 + 12x + 4$$

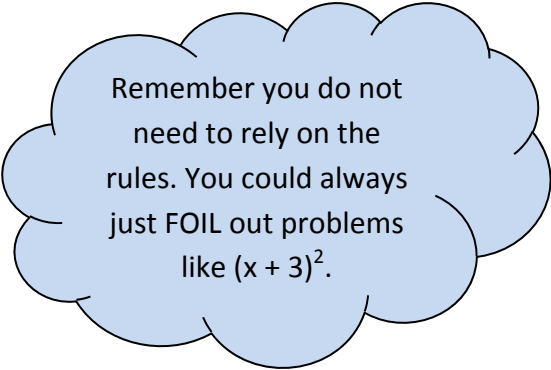
There is a pattern here we can write as a rule.

We could write this as a general rule. ○ ○ ○

$$(a + b)^2 = a^2 + 2ab + b^2$$

Also, when we have subtraction inside the parentheses, we have this rule.

$$(a - b)^2 = a^2 - 2ab + b^2$$



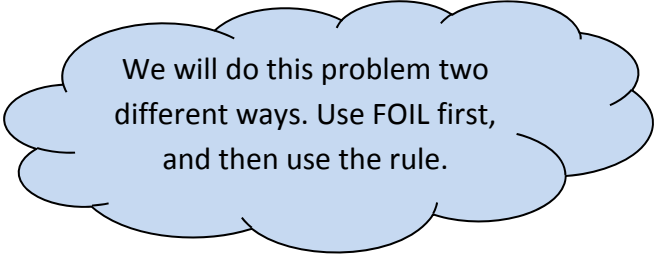
Remember you do not need to rely on the rules. You could always just FOIL out problems like $(x + 3)^2$.

expl 1: Multiply. ○ ○ ○

$$(7x - 3)^2$$

Method 1: Use FOIL.

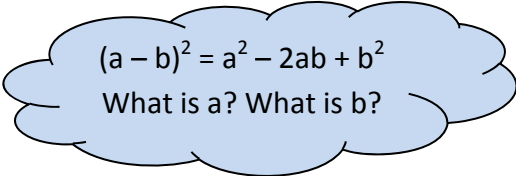
$$(7x - 3)(7x - 3)$$



We will do this problem two different ways. Use FOIL first, and then use the rule.

Method 2: Use the rule. ○ ○ ○

$$(7x - 3)^2$$



$(a - b)^2 = a^2 - 2ab + b^2$
What is a? What is b?

expl 2: Multiply.
 $(x + 12)^2$



FOIL or use the rule.
Your choice!

expl 3: Multiply.
 $(5a + 2)^2$



$(a + b)^2 = a^2 + 2ab + b^2$
What is a? What is b?

expl 4: Multiply.
 $(x - 5)(x + 5)$



FOIL this one out. Then
make up your own rule for
 $(a - b)(a + b)$.

$(a - b)(a + b) = ???$

expl 5: Multiply.
 $(3x - 2)(3x + 2)$



Use your new rule
when you can.

expl 6: Multiply.

$$(5x - 1.3)(5x + 1.3)$$

expl 7: Multiply.

$$\left(\frac{1}{3}a^2 - 7\right)\left(\frac{1}{3}a^2 + 7\right)$$

expl 8: Find the area of the shaded region.

