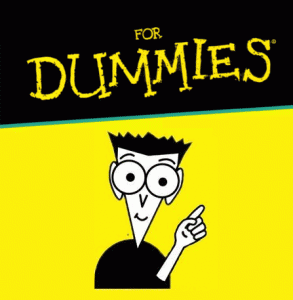
Factoring and Solving Equations in Algebra 2  


By: Jonathan Quang

Factoring the GCF

Factoring the GCF or greatest common factor out of an expression is similar to doing the reverse of the distributive property.

1)Among the terms of the expression, look for the largest number and/or variable that can be divided among all the terms of the equation.

For example: *12x­6+ 4x4+ 8x8*  
It seems like the coefficients of each term can be divided by *4*.

When the same variables with exponents are divided, the result is the subtraction of the exponents. This means *x*4 is the largest variable that can be factored out.

Together, the greatest common factor is *4x4*.

2) Divide each term of the expression by the GCF.

*4x4* results in *3x2+1+2x4.*

3) Place parentheses around the expression and place the GCF next to the expression

*4x4(3x2+1+2x4)*

Make sure to double check if you have factored completely. If not, simply take out another factor, divide it by all the terms in the parentheses, and multiply what you thought was the GCF by the factor.

Factoring The Difference of Two Perfect Squares

When x-a is multiplied by x + a, the result is x2 -a + a - a2, which simplifies to x2 - a2

Knowing this fact you can take an expression that is the difference of two perfect and squares and find its factors.

1) Example: *16x4- 4x2*

First, make sure the variables and coefficients are perfect squares and the exponents are even and not 0 unless you do not mind having a square root in your answer or fractional exponents.

2) Square root each term.

The square root of *16x4 is 4x2* and the square root of *4x2is 2x.*

3) In parentheses, write the first factor's square root plus the second factor's square root and in another pair of parentheses,

write the first factor's square root minus the second factor's square root.

*(4x2+ 2x)( 4x2- 2x)*

Make sure that when you factor the difference of perfect squares you do not make the careless mistake of factoring the sum of squares.

Factoring Perfect Trinomials

Notice that *(x+y)2 = x2 + 2xy +y2* and *(x-y)2 = x2 - 2xy +y2*.

This means that given a trinomial, if the first and third term are positive, there is a chance that the trinomial is a binomial squared.

If the square root of the first term multiplied by the square root of the third term multiplied by 2 is equivalent to the second term, then the trinomial is definitely the square of a binomial.

Example: *16x2 - 24x + 9*

1) Get the square root of the first and third term.

They are *4x and 3* respectively.

2) Check if the product of two and the first and second square roots is equivalent to the second term.

*(4x)(3)(2)=24x*

If this check is true, move onto the next step

3)The binomial should be written as the first square root plus the second square root if the second term was positive or the first square root minus the second square root if the second term was negative, squared.

The second term in the trinomial *16x2 - 24x + 9* is negative.  
Therefore the answer is (4x+3)2

Factoring Trinomials

In the form of x2+bx+c, a trinomial is sometimes the product of two different binomials. This means that you will have to guess and check two different numbers whose products equals c and whose sum equals b.

Example: *x2 - x - 6*

1) Think about pairs of factors of -6.

There is *1 \* -6, 1 \* -6, 2 \* -3, and -2 \* 3.*

2) Out of these pairs of factors, is any pair whose sum is the coefficient of the second term?

*The coefficient of the second term is -1.   
2 + (-3) = -1.*

3) Write out the product of binomials.  
*(x+2)(x-3)*

Sometimes there will be a coefficient attached to the first term of the trinomial, which results in *ax2+bx+c*. What you want to do first is see if there is a GCF that can be factored out. Then, if there is still a coefficient attached to the first term, the guessing and checking becomes much more complicated.

Example. *12x2+34x - 28*

1) Check for a GCF and factor it out if possible.  
  
The GCF here is 2, it should be factored out.

*2(6x2+ 17x - 14)*

2) Pick out pairs of products equivalent to c and the first term

Products of -14: *1 \* -14, -1 \*14, 7 \* -2, -7 \* 2*Products of 6 :*1x \* 6x, 6x \* 1x, 2x\*3x, 3x\*2x*

3) The rule is that one factor from a product pair of -14 multiplied by one factor from the product pair of 6 is one of the addends that makes up the sum of b. The other product of factors is the other addend.

*7 \* 3x + -2 \* 2x = 17x*

4) Write out the binomials. Each binomial must contain one variable and one of the constants and they must not have been multiplied by each other when you checked if the sum of the products was the second term of the trinomial.

*(3x-2)(2x+7)*

Factor By Grouping

Factoring *ax2+bx+c* trinomials by grouping involves a little bit of guess and check as well.

First, multiply the first and the third term, and ask yourself what factors of this product have a sum that is equal to the second term.

The equation is then rewritten as (*ax2+factor1) + (factor2 +c)*.

Then ask yourself, what common factor is shared by both groups and factor them out. The expression can then be rewritten as grouped factors.

Example: 5x2 + 18x + 9.

1) What factors of the product 5x2 and 9 have a sum of 18x.   
Product is 45x2. The sum and products of 3x and 15x are 18x and 45x2. The equation is now (5x2 + 3x)+ (15x + 9).

2) The common factor shared by both groups is 5x+3

*(x)(5x+3) + (3)(5x+3)*