

Factoring Part 2

Factoring terms in the form $x^2 + bx + c$ with a leading coefficient of 1.

You are going to factor a trinomial (three terms) into two binomials (two terms). At first it can be a little confusing, but practicing them is the only way to become comfortable with factoring. Let's look at some examples.

Factor: $x^2 + 10x + 16$

In order to factor this trinomial, I want to make a list of factors for 16 that when added or subtracted together give me the middle term of 10.

1, 16
2, 8
4, 4

$2 + 8 = 10$ and when multiplied give me 16

That information gives me the answer to factoring the problem. Write out two sets of parentheses. First we have to break up the x^2 into each of the parentheses and then add the factors of 16 we found above that equal 10 into each parenthesis.

$$(x + \quad)(x + \quad)$$

$$(x + 2)(x + 8)$$

We can check the answer by using FOIL to multiply it back. We should get the original trinomial that we started with.

Procedure:

1. List the factors of the last term.
2. Choose the factors that when added or subtracted give you the middle term.
3. Break up the x^2 term and put them in parentheses and put in the factors of the last term that gave you the middle term.
4. Always check your answers!

The only other thing we need to do is to be careful of the signs. Remember that you can add or subtract the factors to get the middle number.

$$y^2 + y - 30$$

Factors of 30:

1, 30

2, 15

3, 10

5, 6 $\Rightarrow 6 - 5 = 1$ (middle term)

$$(x + 6)(x - 5)$$

We listed the factors of 30 and found that the factor pair of 5, 6 would give us the middle term of 1 if we subtracted them. That means that one term is a +6 and the other term is -5. Now we just put the parentheses together.

Don't forget to check your work. A simple sign mistake can make your answer wrong.

$$x^2 - 8x + 16$$

Factors of 16:

1, 16

2, 8

4, 4 $\Rightarrow -4 - 4 = -8$ (middle term)

$$(x - 4)(x - 4)$$

$$y^2 - 3y + 2$$

Factors of 2:

1, 2 $\Rightarrow -1 - 2 = -3$ (middle term)

$$(y - 1)(y - 2)$$

$$5x^2 - 5x - 60$$

$$GCF = 5$$

$$5(x^2 - x - 12)$$

Factors of 12:

1, 12

2, 6

3, 4 $\Rightarrow -4 + 3 = -1$ (middle term)

$$5(x - 4)(x + 3)$$

In this problem, although it seems more complicated, we were able to remove the GCF from the trinomial. The GCF was 5. We divided each term by 5 and it gave us a "new" problem to factor following the rules above. You must remember to keep the 5 with the problem or you will not be able to check your answer.

$$x^2 + 6x - 36$$

Factors of 36:

1, 36

2, 18

3, 12

4, 9

6, 6

We have a problem here. None of the factors of 36 when added or subtracted will give you the middle term of 6.

What we have here is a trinomial that is "not factorable" or "prime". Those are your answers to the problem: not factorable or prime. Your instructor will tell you which one they want you to use, although both are correct.

Practice, practice, practice! It's the only way to get really good at factoring! Factoring will be used in all algebra classes from here on out.