**Factoring Polynomials**

Type 1 : Removing the Greatest Common Factor(GCF)

Finding the Greatest Common Factor(GCF) is the process of identifying the numbers and variables that a group of terms have in common – in other words, what do they share ?

Example: Factor 

 **Step 1** : Factor each term completely.

 

 **Step 2** : Find all factors that are common (same) in each term.

 

 The common factors are: 

 Therefore the GCF is 

 **Step 3** : Pull out the GCF and then divide each term by it.

 

GCF

Divide each

Term by GCF

 **Step 4** : Perform the division by simplifying each term.

 



Type 2 : Factoring Binomials: Difference of Two Squares

Example : Factor 

Check to see if the binomial is a difference. Remember that difference indicates a

 subtraction operation. Each term in the binomial must be a perfect square.

  is a “perfect square” because it equals 

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**Step 1** : Find the square root of each term.

 

Term #1 is the square root of the first term  and term #2 is the

 square root of the second term 

**Step 2** : Rewrite your binomial as 

 

**Step 3** : Factor into two binomials – one plus and one minus

 

 

Example: 

 Check: It is a difference and 

 

Note : A binomial in the form  **cannot** be factored

 because it’s a sum not a difference

Type 3 : Trinomials in the form  (Coefficient for

 is 1)

To factor trinomials in this form we must find 2 factors of c with a sum equal to b.

The trinomial x2 + bx + c factors to

 (x + one factor of c)(x + other factor of c)

Remember the two factors of c must have a sum equal to b

Example: Factor 

Find 2 factors of +15 with a sum of +8

The factors of 15 are

 

Therefore  factors to 

Example: 

Find 2 factors of -24 with a sum of -2

The factors of -24 are:

-1 x 24 -1 + 24 = 23

1 x -24 1 + -24 = -23

-2 x 12 -2 + 12 = 10

2 x -12 2 + -12 = -10

-3 x 8 -3 + 8 = 5

3 x -8 3 + -8 = -5

-4 x 6 -4 + 6 = 2

4 x -6 4 + -6 = -2

The 2 factors we are looking for are 4 and -6

Therefore x2 – 2x – 24 factors to (x + 4)(x – 6)

Note : If you cannot find 2 factors of c with a sum of b then the trinomial cannot

be factored or we say it’s ***prime***.

Example: 

 Type 4 : Trinomials in the form 

(Coefficient for is greater than 1)

In trinomials where a > 1 we **cannot** find 2 factors of c with a sum of b. These trinomials are factored by a method known as decomposition.

Example: 

**Step 1** : Find the product of the a coefficient and c coefficient.

 

 

 **Step 2** : Find 2 factors of your product with a sum equal to b

 In this case we are finding 2 factors of 24 with a sum of 11 .

 The factors we are looking for are 3 and 8. Using these factors

 we are going to rewrite  to equal 

 

 

**Step 3** : Group the first 2 terms and the last 2 terms and remove a common

 factor from each group.

 

 **Step 4** : After you do this you should have a common binomial factor. Now we

 can write our 2 factors.

 

Multiply 3 and -2 to get -6. Two factors of -6 with a sum of -5 are -6 and +1.

Example: 

 

 



Group and remove the GCF for each group

Type 5 : Perfect Squared Trinomials

A perfect squared trinomial written in the form  or

 and when factored the two binomial factors are the same.

Take note that

1. The first and last terms are perfect squares.

2. The coefficient of the middle term is twice the square root of the first term

 multiplied by the squared root of the last term.

When we factor perfect squared trinomials we get





 Example 

 

Example 

 

Type 6 : Trinomials with two Variables

These trinomials are factored the same way as trinomials in the form x2 + bx + c

and ax2 + bx + c but each binomial factor will have a variable in each term.

Example: 

Find 2 factors of 3 with a sum of 4

The two factors will be in the form  where **?** is replaced with the two factors of 3 with a sum of 4.



Example: 

Factors are in the form

(? a + ? b)(? a + ? b) because a > 1

 

Find 2 factors of 6 with a sum of -7

Group and remove the GCF for each group

 