MRS. HORN – GEOMETRY

DISTANCE LEARNING – ASSIGNMENT #2

This packet is a review of factoring. It is very important that you attend class on Tuesday and Thursday to help you understand the material, as well as give you the chance to ask any questions.

PART ONE – FACTORING OUT THE "GCF"

- **GCF stands for "greatest common factor"**
- **You must look at ALL the terms in the expression and find out what they all have in common**
- **The GCF could be a number, a variable, or both**
- **You're asking yourself: "what is the BIGGEST number or variable that GOES INTO all terms in the expression?"**
- **When you factor out the GCF, you DIVIDE each term in the expression by your GCF.**
- **Factoring out the GCF should be the FIRST step attempted in every factoring problem.**

EXAMPLE 1:

What is the GCF of the expression?

$$2x^3 + 14x^2 + 22x$$

FIRST: Look at all the numbers. What is the largest number that goes in to each term?
ANSWER: 2

SECOND: Look at all the variables. Ask yourself what they all have in common.
ANSWER: They all have AT LEAST one "x"

Therefore, the GCF of this expression is: $2x$

EXAMPLE 2:

Factor the expression using the GCF.

$$2x^3 + 14x^2 + 22x$$

We established in example 1 that the GCF was $2x$

Show that you "took out" the 2x by placing it in front of parenthesis. The terms inside the parenthesis show what remains after you have divided all terms by 2x.

ANSWER: $2x(x^2 + 7x + 11)$

ASSIGNMENT: ***Fill in the table below. You must establish the GCF, if there is one, and then factor using the GCF, if possible.***

EXPRESSION	GCF?	FACTORED FORM
$6p^4 + 4p^3$	$2p^3$	$2p^3(3p + 2)$
$9x + 36$		
$63x^{12} - 35x^6$		
$14a + 21a^2 + 21a^3$		
$-28v^2 - 8v - 36$		
$9x^6 - 63x^3 - 90x^2$		

PART TWO – FACTORING COMPLETELY

- **We will be practicing factoring trinomial (an expression with 3 terms)**
- **There are TWO kinds of trinomials: one where the leading term is ONE, and one where the leading term is GREATER THAN ONE**
- **The whole idea of factoring is so that you find two expressions that will FOIL back to the original expression**
- **You should ALWAYS check if the expression has a GCF FIRST, and then try to factor the trinomial that remains.**
- **IMPORTANT VOCABULARY TO REMEMBER:**
  - **Standard form: an expression is written from "highest" exponent to "lowest"**
  - **Coefficient: the number in front of the variable**
  - **Constant: the number without a variable (the last term in an expression written in standard form)**
  - **Leading coefficient: the number in front of the "highest" variable, written first in the expression**
  - **Binomial: an expression with TWO terms**
  - **FOIL: used to multiply two binomials, stands for FIRST, OUTER, INNER, LAST**

EXAMPLE 1:

Factor the trinomial.

$$x^2 + 4x - 12$$

When factoring a trinomial, all your answers will be two binomials. You are basically trying to "fill in the blanks" of (_ +/- _)(_ +/- _).

FIRST: Check for a GCF.

In this problem, there is no number or variable that ALL THREE terms have in common.

SECOND: Establish the leading coefficient.

IN THIS CASE, IT IS 1 (the number in front of the x^2 term).

This means you can fill in the first "blank space" in each set of your factors

$$(x +/- \_)(x +/- \_)$$

THIRD: Look at the constant and the coefficient of the middle term.

The constant is -12, and the coefficient of the middle term is 4.

ASK YOURSELF: What two numbers MULTIPLY to -12, but also ADD to 4?

ANSWER: 6 and -2

This means you can fill in the second "blank space" in each set of your factors

$$(x + 6)(x - 2)$$

This is your answer!

To check your answer, you could FOIL this out.

$$x(x) - 2(x) + 6(x) + 6(-2)$$

$x^2 + 4x - 12$ ⟶ *This was your original trinomial, meaning you know your factors are correct!*

EXAMPLE 2:

Factor the expression.

$$2x^2 + 3x - 9$$

When factoring a trinomial, all your answers will be two binomials. You are basically trying to "fill in the blanks" of (_ +/- _)(_ +/- _).

FIRST: Check for a GCF.

In this problem, there is no number or variable that ALL THREE terms have in common.

SECOND: Establish the leading coefficient.

IN THIS CASE, IT IS 2 (the number in front of the x^2 term).

This means your process is a little different from example one. You will be using BOTH the factors of your first term and last term to fill in your binomials.

Factors of first term: 2x and x

Factors of last term: 3, -3

THIRD: You are now going to try to fill in your binomials, like we did in example 1, using this information.

ATTEMPT #1: $(2x + 3)(x - 3)$ – doesn't work, it will FOIL out to $2x^2 - 3x - 9$

Try switching the placement of the +3 and -3

ATTEMPT #2: $(2x - 3)(x + 3)$ – IT WORKS! It will FOIL to $2x^2 + 3x - 9$

This is your answer!

$(2x - 3)(x + 3)$

EXAMPLE 3:

Factor the trinomial.

$$5x^2 + 15x + 10$$

When factoring a trinomial, all your answers will be two binomials. You are basically trying to "fill in the blanks" of (_ +/- _)(_ +/- _).

FIRST: Check for a GCF.

In this problem, the number 5 goes into ALL THREE TERMS, therefore, we must factor out the GCF first.

$$5(x^2 + 3x + 2)$$

SECOND: We have to check if what remains inside the parenthesis is a trinomial that can be factored like either example 1 or 2. We look at the leading coefficient (of what is highlighted in green).

IN THIS CASE, IT IS 1 (the number in front of the x^2 term).

This means you can fill in the first "blank space" in each set of your factors

$$(x +/- \_)(x +/- \_)$$

THIRD: Look at the constant and the coefficient of the middle term.

The constant is 2, and the coefficient of the middle term is 3.

ASK YOURSELF: What two numbers MULTIPLY to 2, but also ADD to 3?

ANSWER: 1 and 2

This means you can fill in the second "blank space" in each set of your factors

$$(x + 1)(x + 2)$$

<u>This is your factorization!</u>

To check your answer, you could FOIL this out.

$$x(x) + 2(x) + 1(x) + 1(2)$$

$x^2 + 3x + 2$ ⟶ *This was your original trinomial, meaning you know your factors are correct!*

YOUR FINAL ANSWER MUST CONTAIN THIS FACORIZATION, AND THE ORIGINAL GCF YOU TOOK OUT.

$$5(x + 1)(x + 2)$$

ASSIGNMENT: ***Factor each trinomial completely. If the trinomial has a GCF, you must factor that out first, and then continue.***

1 $b^2 + 8b + 7$

2 $n^2 - 11n + 10$

3 $m^2 + m - 90$

4 $n^2 + 4n - 12$

5 $n^2 - 10n + 9$

6 $b^2 + 16b + 64$

7 $2k^2 + 22k + 60$

8 $a^2 - a - 90$

9 $p^2 + 11p + 10$

10 $5v^2 - 30v + 40$

11 $3n^2 - 8n + 4$

12 $5n^2 + 19n + 12$

13 $2v^2 + 11v + 5$

14 $2n^2 + 5n + 2$

15 $6n^2 + 5n - 6$

16 $16b^2 + 60b - 100$