CCM1B - Unit 3: Polynomials and Factoring Name: _____

Objectives:

Enduring Understandings

By the end of this unit, students will understand that . . .

- A second degree polynomial is a quadratic.
- Factoring is a tool used to reveal the zeros of a quadratic function and zeros (also called x intercepts or roots) are solutions to the corresponding quadratic function.

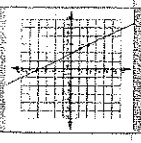
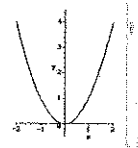
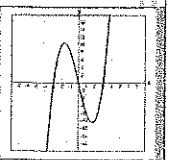
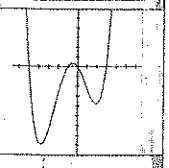
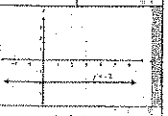
Date	Day	Lesson	Assignment
Tues 2/19	1	Polynomial Basics Addition/Subtraction of Polynomials	
Wed 2/20	2	Multiplying Polynomials	
Thurs 2/21	3	Practice Multiplying Polynomials **Unit 3 Quiz**	
Fri 2/22	4	**Benchmarks**	
Mon 2/25	5	Factoring a GCF Factor by grouping	
Tues 2/26	6	Factor using x-box method	
Wed 2/27	7	Factor special case polynomials Factoring practice	
Thurs 2/28		Review Day	
Fri 3/1		**Unit 3 Test**	

Homework Grade:

Polynomials

A polynomial is an expression made up of a monomial or the sum or difference of monomials.

A polynomial can be named based on its number of terms and its degree.

Polynomial	Degree	Name Using Degree	Number of Terms	Name Using Number of Terms	Graph
$3x + 2$					
$a^2 - 3a + 5$					
$6z^3$					
$2x^4 + 2x - 4$					
7					
$2x^2y^2 - 3xy$					NA

Day 1 Notes

Note: To name a polynomial by degree, only use the degree of the term which has the largest degree.

For $a^2b+ab^4+b^2$, the 1st term has a degree of 3, the 2nd term has a degree of 5 and the 3rd term has a degree of 2. Since the *largest degree of all the monomials in this polynomial* is 5, it is a 5th degree trinomial.

Adding and Subtracting Polynomials

Standard Form of a Polynomial: the degrees of its monomial terms decrease from left to right.

Write each polynomial in standard form based its degree.

a. $5 - 2x$

b. $3x^4 - 4 + 2x^2$

You try:

1) $6x^2 + 7 - 9x^4$

2) $3y - 4 - y^3$

3) $8 + 7v - 11v$

Day1 Notes

Adding Polynomials

Think: Combine Like Terms

Simplify: $(4x^2 + 6x + 7) + (2x^2 - 9x + 1)$

Vertically	Horizontally

Do you like the vertical or horizontal method for adding? Try your method of choice with these two problems.

1) $(12m^2 + 4) + (8m^2 + 5)$

2) $(2p^3 + 6p^2 + 10p) + (9p^3 + 11p^2 + 3p)$

Day 1 Notes

Subtracting Polynomials

Simplify: $(2x^3 + 5x^2 - 3x) - (x^3 - 8x^2 + 11)$

What property do you need to use first?

Vertically	Horizontally

Do you like the vertical or horizontal method for subtracting? Try your method of choice with these two problems.

1) $(v^3 + 6v^2 - v) - (9v^3 - 7v^2 + 3v)$

2) $(4x^2 + 5x + 1) - (6x^2 + x + 8)$

Day 1 Notes

Application

1) The perimeter of triangular park is $18x + 5$. If two of the sides of the measure $5x - 1$ and $3x + 8$, what is the missing length? Draw a picture first.

2) The perimeter of a trapezoid is $49a - 6$. Three sides have the following lengths: $9a$, $4a - 2$, and $15a + 5$. What is the length of the fourth side? Draw a picture first.

Day 1 Homework

HS Common Core Math 1
Unit 6, Lesson 1

Name_____
Date _____

1. Is $2x^2 + 3x - 7$ a monomial, binomial, or trinomial _____

2. What is the degree of the monomial $12m^3n^2$? _____

3. Find the degree of the polynomial: $3x^2y^3 - 9xy^2 + 15x^2y^2$ _____

4. Name the polynomial based on its degree and number of terms: $4x - 3x^2$ _____

Add or Subtract. Put your answer in standard form. Put your answer in the space provided.

5. $(3k - 8) + (7k + 12)$ _____

6. $(4x^2 + x + 3) + (5x^2 + 9x - 2)$ _____

7. $(7b^2 - 5b + 3) - (b^2 + 8b - 6)$ _____

Application. Put your answer in standard form. Put your answer in the space provided.

8. Suppose the perimeter of a triangle is given by $P = 13x + 5y$, and two of its sides have lengths of $2x + y$ and $8x + 4y$. What is the length of the third side?

_____

9. Error Analysis: Describe and correct the error in finding the difference of the polynomials.

$(4x^2 - x + 3) - (3x^2 - 8x - 9)$

$4x^2 - x + 3 - 3x^2 - 8x - 9$

$4x^2 - 3x^2 - x - 8x + 3 - 9$

$x^2 - 9x - 6$

Warm Up – Day 2

Simplify each expression using the distributive property.

1) (2) (2x – 3)

2) (4a) (4a + 1)

3) (– 9) (m + 9)

4) (3d) (2d – 6)

Name _____ Date _____

Math Reasoning Day 2 Opening Activity

Rectangular Multiplication

To find the product of $2x + 4$ and $3x + 5$, Luana drew a rectangle to represent the problem. She divided it into four parts and labeled the sides:

	$2x$	4
$3x$		
5		

Then she calculated the area of each part and added the areas to get the area of the original rectangle

	$2x$	4
$3x$	$6x^2$	$12x$
5	$10x$	20

$(2x + 4)(3x + 5) = 6x^2 + 12x + 10x + 20$

$= 6x^2 + 22x + 20$

Complete the diagram. Then write the problem and the product that it illustrates.

1.

	$2x$	5
	$8x^2$	
3	$6x$	

_____

_____

2.

	$3x$	-7
$2x$	$6x^2$	
	$-12x$	

_____

_____

3.

		5
$5x$	$15x^2$	
3	$9x$	

_____

_____

4.

	$2x$	
$2x$	$4x^2$	
-4		-16

_____

_____

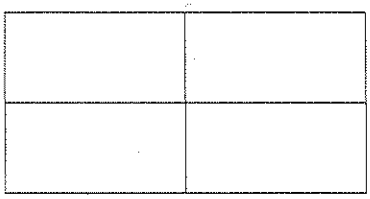
Day 2 Notes

Multiplying Binomials

You can use either the box method or distributive property

Simplify: $(2x + 3)(x + 4)$

Box Method



Distributive Property

Try both methods:

1) $(6h - 7)(2h + 3)$

2) $(9a - 8)(7a + 4)$

3) $(3x - 5)(2x + 7)$

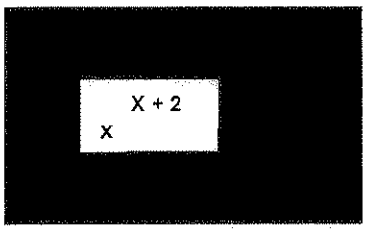
4) $(3x + 4)(2x + 5)$

5) $(3x - 4)(2x + 5)$

6) $(3x)(2x^2 + 9x - 5)$

Application (start with a picture if there is not one):

7) Find the area of the shaded region:



3x + 1

2x + 5

8) You are painting a rectangular wall with length $5x^2$ ft. and wide 12x ft. There is a rectangular door that measures x ft. by 2x ft. that will not be painted. What is the area of the wall that is to be painted?

Day 2
Practice

Choose your method of choice (box or distributive property to simply)

1) $(x + 8)(x + 4)$

2) $(x + 9)(x - 3)$

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

4) $(x - 11)(x + 3)$

5) $(x + 10)(x + 8)$

6) $(x + 10)(x - 8)$

7) $(x - 10)(x - 8)$

8) $(2x + 3)(3x - 4)$

9) $(9x - 6)(5x + 1)$

10) $(b)(-4b^2 + 6b - 5)$

Note: use the graphing calculator to check your answer (see Discovering Quadratics with Graphing Calculators)

Day 2 Notes/ Practice

Multiplying Special Cases: What are special cases?

A) The Square of a Binomial:

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

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

The square of a binomial is the square of the first term plus twice the product of the two terms plus the square of the last term.
SQUARE – DOUBLE – SQUARE

B) The Difference of Squares

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

The product of the sum and difference of the same two terms is the difference of their squares.

If you have trouble recognizing special cases, it's ok because the box or distributive property (FOIL) works all the time.

The Square of a Binomial Practice:

1) $(x + 7)^2$ 2) $(4k - 3)^2$ 3) $(t + 6)^2$ 4) $(9c - 8)^2$

The Difference of Squares Practice:

5) $(d + 8)(d - 8)$ 6) $(2c - 4)(2c + 4)$ 7) $(t - 3f)(t + 3f)$

Application (start with a picture if there is not one):
8) A flat, square roof needs a square patch in the corner to seal a leak. The side length of the roof is $(x + 12)$ ft. and the side length of the patch is x ft. What is the area of the good part of the roof that doesn't need to be patched?

Day 2 Homework Name_____

Multiplying Polynomials

Simplify each product. Write answers in standard form.

1. $(x + 3)(2x - 5)$

2. $(3w + 4)(2w - 1)$

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

4. $(a - 6)(a + 6)$

5. $(k - 4)(3k - 4)$

6. $(5x + 7)^2$

7. $(2x - 5)^2$

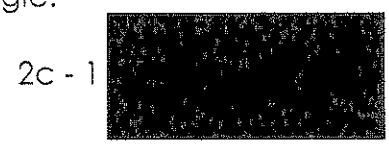
8. $(3x + 4)(3x - 4)$

9. $(d + 9)(d - 11)$

10. $(2x)(x - 4)$

11. $(3x + 1)(-2x)$

12. Find the area of the following rectangle.



(9)

Guidelines for Adding, Subtracting, and Multiplying Polynomials

Adding Polynomials

Parentheses do not change the problem. Combine like terms – variable(s) must be raised to the same power – if so, combine coefficients. Exponents do not change.

- Examples -

$(2x^2 - 4x + 4) + (-2x^2 - 5x + 4) =$

$(7x^3 + 6x^2 - 2x) + (9x^2 - 4x + 3) =$

Subtracting Polynomials

All signs for each term must be switched in the set of parentheses that follow the subtraction sign. Then follow the rules for adding polynomials.

- Examples -

$(2x^2 - 4x + 4) - (-2x^2 - 5x + 4) =$

$(7x^3 + 6x^2 - 2x) - (9x^2 - 4x + 3) =$

Multiplying Polynomials

When multiplying two polynomials, you are just using the distributive property multiple times. When multiplying two binomials, this is called the FOIL method. We also used the box method.

- Examples -

$(4x + 4)(5x + 4) =$

$(4x - 5)(3x + 7) =$

Warm Up Day 3

On a sheet of notebook paper, summarize in your own words the process for adding, subtracting, and multiplying polynomials. Create an example for each type and find each answer. What are some special cases of multiplying two binomials? Write an example of each and find the answers using the short cut.

01

Day 3 Review Sheet/HW

Algebra 1B– Polynomial Practice (9.1-9.4) Name_____

Find the degree of each polynomial.

1. $5a-2b^2+1$ _____ 2. $4x^3-2x$ _____ 3. $x+3x^4-21x^2+x^3$ _____ 4. $24xy-xy^3+x^2$ _____

5. $n^3+m^2-n^2m^2$ _____ 6. $8x^2-2x^8$ _____ 7. $10n^2p^2+4ab^3-5c^3d^2$ _____

Write each polynomial in STANDARD FORM (powers of "x" should be descending).

8. $5+2x^2+x^4+3x^3$ 9. $3x-1+2x^2$ 10. $9x^2+2+x^3-x$ 11. $-3+3x^3-x^2+4x$

_____ _____ _____ _____

12. $7y^5x+2y^4-y^2x^2-3x^3$ 13. $x+3x^3-17+x^2$ 14. $5p+p^3x^2+px-2px^3$

_____ _____ _____

Find each sum or difference.

15. $(5x^2-x-7)+(2x^2+3x+4)$ 16. $(7x^2+x+1)-(3x^2-4x-3)$ 17. $(15c+8d)-13d$

_____ _____ _____

18. $(2x^2-5x)+(7x-3x^2)$ 19. $(6a-5)-(8a^2+2a-7)$ 20. $(n^2-n+5)-(2n+5)$

_____ _____ _____

Find each product. Simplify. Write answers in STANDARD FORM.

21. $6ac(2a^2+3ac)$ 22. $-3np^2(2n-4p)$ 23. $5x(x^2-7x+3)+2x(2+11x-2x^2)$

_____ _____ _____

24. $(x+2)(x-5)$ 25. $(a+b)(2a-3b)$ 26. $(5x-3y)(x-2y)$

_____ _____ _____

27. $(2x+3)(x^2+3x-6)$ 28. $(2x-1)(x^2+3x+5)$ 29. $(9a^2-12a+4)(3a+2)$

_____ _____ _____

30. $(2x-3)(2x+3)$ 31. $(3n+4)^2$ 32. $(2c+5)(2c-5)$ 33. $(7n-5)^2$

_____ _____ _____ _____

Day 4 HW

Do You Agree??? - Polynomials -

Name _____

Agree/Disagree

1. $5a^2b$ is a polynomial.

Reasons to agree or disagree:

Agree/Disagree

2. The degree of the polynomial $4x^2 - 2$ is 2.

Reasons to agree or disagree:

Agree/Disagree

3. $2x \cdot 4x = 8x$

Reasons to agree or disagree:

Agree/Disagree

4. $(2x^2 - 4x + 3) - (3x - 4) = 2x^2 - 7x + 7$

Reasons to agree or disagree:

Day 4 HW

Do You Agree??? - Polynomials -

Name _____

CD

Agree/Disagree

5. The product of $(x+3)$ and $(x-8)$ is $x^2 + 5x - 24$.

Reasons to agree or disagree:

Agree/Disagree

6. $(2x+9)(x-3) = 2x^2 + 3x - 27$

Reasons to agree or disagree:

Agree/Disagree

7. The product of two linear binomials will yield a trinomial.

Reasons to agree or disagree:

Agree/Disagree

8. The product of $(2x + 3)$ and $(2x - 3)$ will have three terms.

Reasons to agree or disagree:

Day 5

Introduction to Factoring

List All of the Factors for each number.

1) 36 _____

2) 21 _____

3) 78 _____

4) 69 _____

5) 65 _____

6) 66 _____

7) 22 _____

Find the Greatest Common Factor for each number pair.

1) 10 , 4 _____

2) 3 , 40 _____

3) 40 , 12 _____

4) 20 , 5 _____

5) 8 , 12 _____

Day 5

Factoring

The greatest common factor, or GCF, is the largest factor the terms have in common. Factoring a polynomial reverses the multiplication process. To find the GCF, list all the prime factors of each term and then circle or underline the factors common to ALL terms.

Example 1: What is the GCF of $12x^3 + 18x^2 - 15x$?

A) Find the GCF of the coefficients and the variables

$12x^3$: $2 * 2 * \underline{3} * \underline{x} * x * x$

$18x^2$: $2 * \underline{3} * 3 * \underline{x} * x$

$15x$: $\underline{3} * 5 * \underline{x}$

So, the GCF is **3x**

C) The factors that are not in common will remain inside the parentheses

$3x\ (4x^2 + 6x - 5)$

Note: When finding the GCF of the variables, find the least power of each variable.

For example: $x^5y - x^3y^2 + x^2y^4$
x^2 is the least power of x
y is the least power of y
GCF is $\mathbf{x^2y}$
Final factored answer is $x^2y\ (x^3 - xy + y^3)$

Factor the following polynomials by giving the GCF first and then give the final factored answer:

1) $4x^3 + 12x^2 - 8x$

2) $5v^5 + 10v^3$

3) $6m^3 - 12m^2 - 24m$

4) $8x^2 - 12x$

5) $5d^3 + 10d$

6) $3x^3 - 12x^2 + 15x$

Day5

Factoring by Grouping

These will have four terms!

$$3xy-15x+4y-20$$

Divide by two groups

$$3xy-15x \quad | \quad +4y-20$$

Factor out GCF's

$$3x(y-5) \quad | \quad +4(y-5)$$

Write what they have the same and write what's left

$$\underline{3x}(y-5) \quad | \quad \underline{+4}(y-5)$$

$$(y-5)\underline{(3x+4)}$$

TRY: $14a^3+49a^2-8a-28$ $xa-2x-6a+12$

Day5 HW

Factor by Grouping

In Exercises 1–6, find the greatest common factor of the three terms.

1. $4x^2, 8x, 6$ **2.** $9x^3, 6x^2, 5x$ **3.** $8x^3, 12x^2, 4x$

4. $40x^3, 80x, 30x^2$ **5.** $18y^3, 12xy^2, 30x^2y$ **6.** $5x^2y, 9xy^2, xy$

In Exercises 7–15, factor out the greatest common monomial factor.

7. $10x - 15$ **8.** $9 - 12x$ **9.** $26x^2 - 2$

10. $4x^2 + 8$ **11.** $-9x - 3x^2$ **12.** $16x^2 - 8x$

13. $16x^2 + 8x - 12$ **14.** $27x^3 + 9x^2 + 3x$ **15.** $15x^4 - 10x^3 - 5x^2$

Factor each completely.

1) $8r^3 - 64r^2 + r - 8$

2) $12p^3 - 21p^2 + 28p - 49$

3) $12x^3 + 2x^2 - 30x - 5$

4) $6v^3 - 16v^2 + 21v - 56$

5) $63n^3 + 54n^2 - 105n - 90$

6) $21k^3 - 84k^2 + 15k - 60$

7) $25v^3 + 5v^2 + 30v + 6$

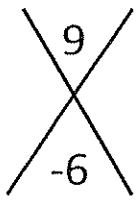
8) $105n^3 + 175n^2 - 75n - 125$

Day 6

Sum & Product Puzzle: Set 1

In each diagram below, write the two numbers on the sides of the "X" that are *multiplied* together to get the top number of the "X," but *added* together to get the bottom number of the "X."

1.



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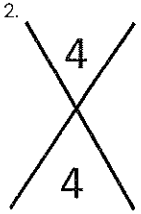

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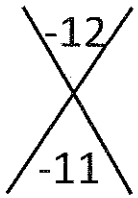

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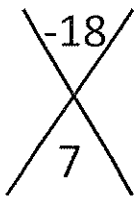

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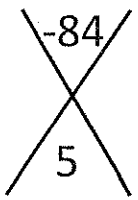

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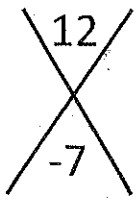

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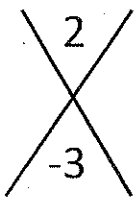

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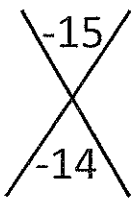

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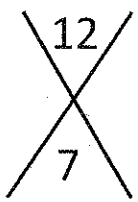
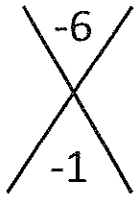


Day 6

Sum & Product Puzzle: Set 2

In each diagram below, write the two numbers on the sides of the "X" that are *multiplied* together to get the top number of the "X," but *added* together to get the bottom number of the "X."

1.



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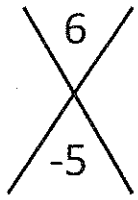
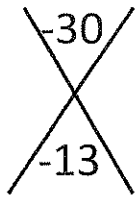


3.



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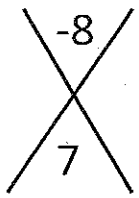

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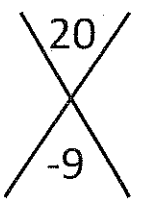

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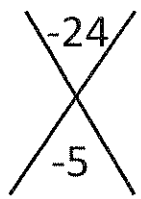

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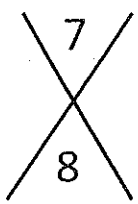

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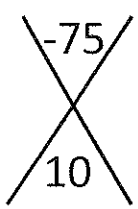

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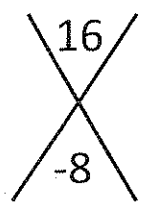
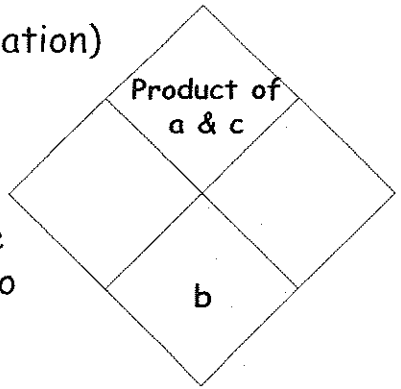


X- Box Slide1

Trinomial (Quadratic Equation)

$ax^2 + bx + c$

Fill the 2 empty sides with 2 numbers that are factors of 'a·c' and add to give you 'b'.

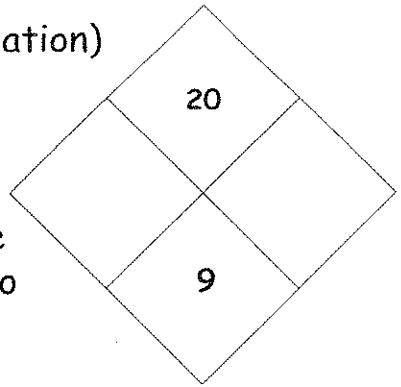


X- Box Slide 2

Trinomial (Quadratic Equation)

$x^2 + 9x + 20$

Fill the 2 empty sides with 2 numbers that are factors of 'a·c' and add to give you 'b'.

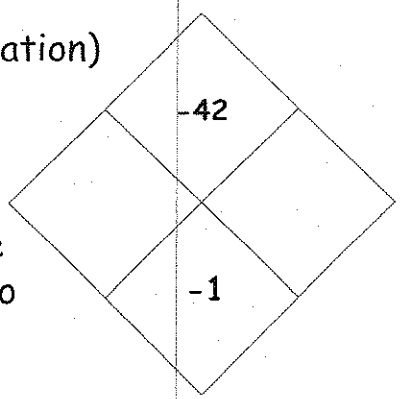


X- Box Slide 3

Trinomial (Quadratic Equation)

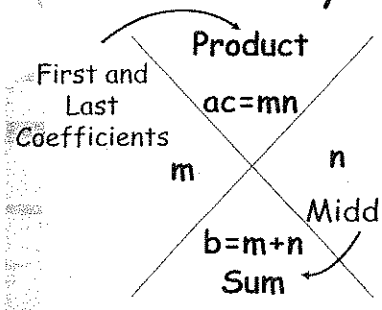
$2x^2 - x - 21$

Fill the 2 empty sides with 2 numbers that are factors of 'a·c' and add to give you 'b'.



Factor the x-box way Slide4

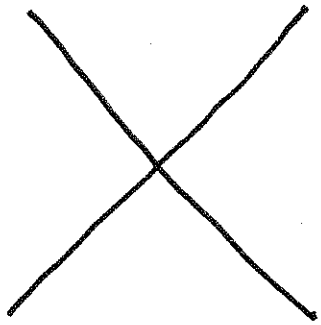
$y = ax^2 + bx + c$

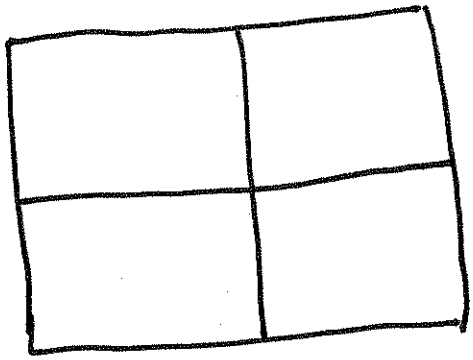


	Base 1	Base 2
GCF	1st Term	Factor n
Height	Factor m	Last term

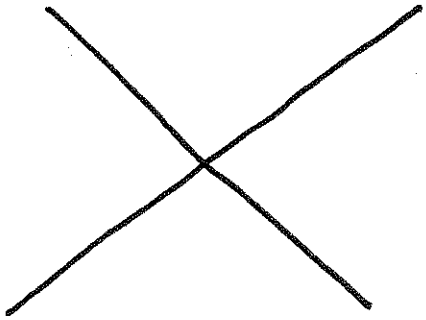
Factor the x-box way NOTES

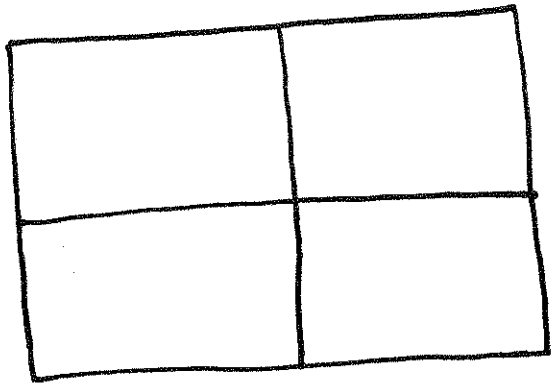
Example: Factor $x^2-3x-10$





Example: Factor $3x^2-13x-10$





X-box factoring practice

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

2. $x^2 - 9x + 20$

3. $2x^2 - 5x - 7$

4. $15x^2 + 7x - 2$

(20)

Day 6 HW

Factoring when leading coefficient is equal to 1

Factor each completely.

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) $m^2 + 2m - 24$

8) $x^2 - 4x + 24$

9) $k^2 - 13k + 40$

10) $a^2 + 11a + 18$

11) $n^2 - n - 56$

12) $n^2 - 5n + 6$

OBJECTIVE 3–o: To factor trinomials of the form $ax^2 + bx + c$, where a is a positive integer greater than 1.

WHAT DID MRS. ZLING SAY WHEN MR. ZLING SAID HE WAS GOING MOUNTAIN CLIMBING IN THE HIMALAYAS?

Factor each trinomial below. Find both factors in the rectangle below and cross out each box containing a factor. You will cross out **two** boxes for each exercise. When you finish, print the letters from the remaining boxes in the squares at the bottom of the page.

1. $6x^2 + 19x + 3$
2. $5x^2 - 9x - 2$
3. $9x^2 + 15x + 4$
4. $7x^2 + x - 8$
5. $2x^2 - 21x + 40$
6. $15m^2 + 19m + 6$
7. $8m^2 - 5m - 3$
8. $4m^2 - 17m + 18$
9. $14m^2 + 17m - 22$
10. $3m^2 - m - 30$

TH $(4m - 9)$	AT $(3x + 1)$	PA $(m - 2)$	DO $(m - 3)$	NE $(2x - 5)$	XT $(3m - 10)$	CK $(14m - 11)$	YO $(2m - 3)$	UR $(5x + 1)$
UP $(6x + 1)$	UW $(15m + 1)$	IN $(x + 3)$	PL $(m + 2)$	AN $(x + 4)$	DA $(5m + 3)$	RE $(x - 2)$	MA $(3m + 2)$	TT $(9x + 2)$
CO $(7x + 8)$	LD $(3x + 4)$	IB $(7x + 2)$	ER $(8m + 3)$	AJ $(m + 3)$	ET $(7m + 2)$	ON $(x - 8)$	HI $(m - 1)$	GH $(x - 1)$

Day 7

Factoring

Always look for a Greatest Common Factor FIRST!!!

2 TERMS

Difference of Two Squares

$a^2 - b^2 = (\quad)(\quad)$

OR

Use the box method with a middle term of zero

FIRST

Find what you are squaring to give each perfect square. $64x^2 - 9$

$(\quad)^2 - (\quad)^2$

THEN

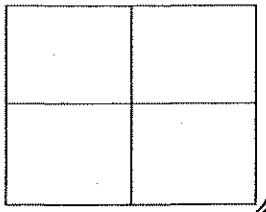
Write the factored answer:

3 TERMS

Box Method:

Put the 1st term in the left top corner and the last term in the bottom right corner:

$2x^2 + 3x - 5$



THEN

Multiply the first and last term, find the pair of factors whose sum is the middle term, and then put the terms in the box.

THEN

Factor out the GCF from each row (left) and column (up)

THEN

Write the factored answer:

4 TERMS

Grouping

Group the first two and last two terms and factor out the GCF from each pair.

$\underbrace{2x^3 - 8x^2}\ + \underbrace{3x - 12}$

THEN

Factor out the common binomial.

Day 4 +18

1. If *nothing* can be done to the original expression, then it is *PRIME.* **2.** Check to see if any of your final answers *will factor further* (i.e. can you do more than one method?). **3. Check** your answer by multiplying.

Day 7/8

Algebra 1B Name: _____

9.5 – 9.8 Review

Factor each polynomial by removing the GCF.

1. $5a^2 - 15$
2. $8ax + 56a$
3. $14x^2y^3 - 21xy^2$

Factor by grouping.

4. $8x^4 - 8x^3 - 3x + 3$
5. $x^3 + 3x^2 + 9x + 27$
6. $3x^3 + 9x^2 + 2x + 6$

Factor each trinomial: $x^2 + bx + c$

7. $x^2 - 9x + 14$
8. $x^2 + 8x + 12$
9. $m^2 - 4mn - 21n^2$

Factor each trinomial: $ax^2 + bx + c$

10. $6c^2 + 7c + 2$
11. $3h^2 + 2h - 16$
12. $8m^2 - 10m + 3$

Factor each difference of squares.

13. $25x^2 - 9$
14. $m^2 - 144$
15. $4b^2 - 121$

Factor <u>completely</u>.

16. $8x^3 - 32x$
17. $54x^3 - 45x^2 + 9x$
18. $21v^2 - 70v + 49$
19. $9c^3 - 12c^2 + 18c - 24$
20. $2x^3 - 72x$
21. $3x^2 - 3x - 60$
22. $14x^3 - 7x^2 + 8x - 4$
23. $12x^3 - 8x^2 + 3x - 2$
24. $3x^2 - 6xy + 2x - 4y$
25. $n^2 - n - 6$
26. $y^2 - 16y - 17$
27. $x^2 + 3x - 40$
28. $2n^2 + 15n + 7$
29. $3y^2 + 7y - 6$
30. $3x^2 - x - 4$