C3 Factoring

Factors

Factor: a number that divides another number without a remainder.

Example: List all the factors of the following numbers:

24 36

What factors do 24 and 36 have in common?

What is the greatest common factor of 24 and 36?

Greatest Common Factor:
greatest factor that two or more numbers have in common.

Equivalent Fractions

Reducing Fractions to Lowest Terms

Reduce the following fractions to lowest terms. (Board Work)

$a) \frac{25}{100} =$

$b) \frac{24}{36} =$

$c) \frac{48}{84} =$

$d) \frac{81}{216} =$

Equivalent Fractions

Reducing Fractions to Lowest Terms

Reducing fractions may be done in one step if you know the GCF.

or

If the numbers are larger, repeated division may be useful.

Example: GCF Repeated Division

$b) \frac{24}{36}$

Block Method (GCF Strategy)

The Block Method helps us to see the connection between GCF and repeated division.

$c) \frac{48}{84} =$

$d) \frac{81}{216} =$

GCF Practice

Mini-Board Problems:

a) Determine the GCF of 60 and 210.

b) Determine the GCF of 84 and 112.

C3 Factoring Polynomials Asgn #1: 1-3

Polynomial GCF - Prime Factorization Strategy

Determine the Prime Factorization for each of the following:

$12x^2y^3$ $18xy^2$

What is the GCF of the two monomials above?

Polynomial GCF - Block Method Strategy

Determine the GCF of $12x^2y^3$ and $18xy^2$

The prime factorization strategy and the block method strategy help in finding a solution but with practice you will eventually be able to quickly see the GCF by inspection.

Practice (Polynomial GCF)

Determine the GCF of each set of monomials.

$a)\ 5k^2 \text{ and } 15k$

$b)\ 4s \text{ and } 14s$

$c)\ 48s^3 \text{ and } 12$

$d)\ 3x^2 \text{ and } 6x^4 \text{ and } 9x^3$

Polynomial Factoring - GCF First

Factoring: to factor an expression means to write the expression as a product of factors. e.g. $20 = 4 \cdot 5$

When asked to factor a polynomial the first strategy to try is to factor out a **Greatest Common Factor**

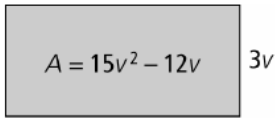
Example: Factor the following.
Sketch a rectangle to show the polynomial area and dimensions.
Use grid multiplication to check the answer.

$a)\quad 5x + 15$

$b)\quad 9x^3 - 12x^2 + 6x$

Practice (Board Work)

A rectangle has an area of $15v^2 - 12v$ square units. The width of the rectangle is $3v$ units. What is the length of the rectangle?



Factor the following.
Sketch a rectangle to show the polynomial area and dimensions.
Use grid multiplication to check the answer.

$a)\quad 3y^2 - 5y \qquad b)\quad 6a^3b - 18ab^2 \qquad c)\quad w^2x + w^2y - w^2z$

C3 Factoring Polynomials Asgn #1: 4

Warm Up

Factor the following. Check your answer using Grid Multiplication.

$a)\ 16r^2 - 12r \qquad b)\ 2x^2 + 5x + 2$

When given a polynomial in the form $ax^2 + bx + c$
algebra tiles help us to factor.

Factoring Concretely & Pictorially

To factor a trinomial using algebra tiles:

- gather all the algebra tiles needed to represent the trinomial.
- use the algebra tiles to make a rectangle using the rules of algebra tiles.
- the factors will be the dimensions of the rectangle.

Rules of Algebra Tiles:

1. All sides must match up with another side of equal length. (No T-intersections)

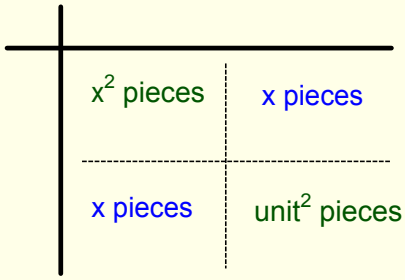
Practice: Factor $2x^2 + 5x + 2$ using algebra tiles. (Mini Boards)

Draw a few different solutions on the board to intro need for Standard Form.

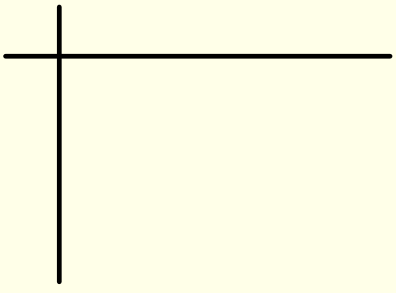
Standard Form for Algebra Tiles

Standard Form:

Using standard form makes it easier to come up with the rectangle sketch and will allow us to more easily compare answers and see any patterns.



Example

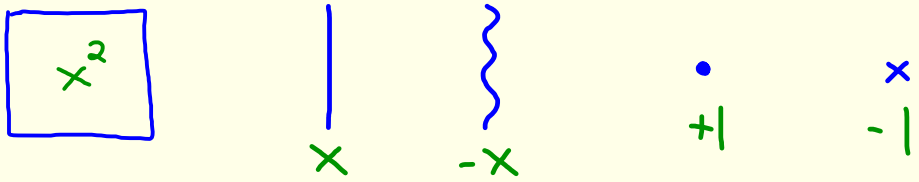


Practice: *Rectangles and Algebra Tiles Chart #1*

Use algebra tiles to complete the **first column** of the chart by using the polynomial pieces to make a rectangle in standard form.

Debrief - Rectangles and Algebra Tiles #1

1. Pictorial Notation.



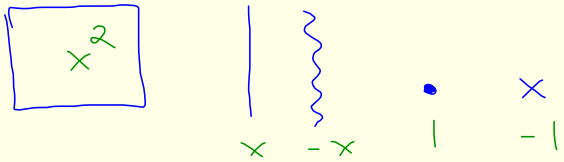
2. Example: Show grid and dimensions using first rectangle from *Chart #1*.

Polynomial	Sketch of Rectangle	Grid	Dimensions (factors)
$2x^2+5x+2$			

3. Practice: - Finish the sketch, grid, and dimensions of *Chart #1*.
- *Rectangles and Algebra Tiles Chart #2*

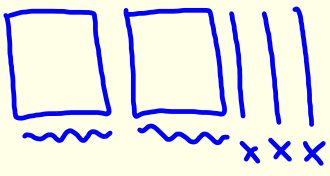
Don't Be So Negative!

So far we've only dealt with positive polynomials.
The same principles apply when dealing with negatives.

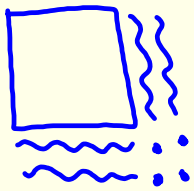


Example:
What grid and polynomial equation do each of the following rectangle sketches represent?

a)



b)



Factoring w/ Negatives Practice

Factor $2x^2 + 7x - 4$ (Board Work)

Factoring w/ Negatives Examples

1. Factor $3x^2 + 7x - 6$

2. Factor $2x^2 - 13x + 15$

Practice: Rectangles & Algebra Tiles Chart #3
C3 - Factoring Concretely & Pictorially Assignment #1,2

GCF First & Factor Fully

Try: Factor $4x^2 - 18x - 10$ (Student solutions?? - discuss GCF first!)

GCF First - Factoring Practice (Board Work)

Fully Factor the following: Remember GCF FIRST!!!!

$a)$ $4x^2 + 22x - 12$

$b)$ $6x^3 + 21x^2 + 9x$

C3 - Factoring Concretely & Pictorially Assignment #3

Factoring w/ Two Variables

Try: Factor $2x^2+7x+3$

Try: Factor $2x^2+7xy+3y^2$

Once you think you have solved both, show me and then work on the following assignment:

C3 Factoring Concretely & Pictorially Assignment #4-6

Discover Factoring Symbolically

Search for patterns (Think - Pair - Share)

Students write solutions (grid) to previous assignment ?'s on the board.
What patterns do you notice in all the solutions? Similarities? Differences?

Patterns:

Standard Form Row GCF Cross Product

Factoring Symbolically Examples

The patterns in the grid help us factor more efficiently.

Example: Factor $2x^2+11x+12$

Factoring Symbolically Examples

Example: Factor $3x^2+17x-28$

Factoring Symbolically Practice (Board Work)

Fully factor the following:

a) $x^2 + 7x + 12$ b) $6c^2 - 13c - 5$ c) $21x^2 + 8x - 4$

C3 Factoring Symbolically Assignment #1 - 3

Warm Up Problems

1. If possible, identify two integers with the given product and sum.

a) Product = 12 Sum = 8

b) Product = -4 Sum = -3

c) Product = 15 Sum = -3

d) Product = 24 Sum = -11

e) Product = -42 Sum = 19

f) Product = 12 Sum = -10

2. Multiply the following.

a) (x + 5)(x + 2)

b) (x + 4)(x - 3)

Factor by Inspection

If you understand the patterns involved in multiplying and factoring you can often just look at a polynomial and factor it.

Example:

$a)\ x^2+6x+8$

$b)\ x^2-14x+49$

$c)\ x^2+2x-120$

$d)\ 3x^2+11x+6$

Practice: C3 Factoring Symbolically Assignment **#4**, 5, 6

Special Trinomials

Factor a difference of squares polynomial

Factor a perfect square trinomial

Warm Up Problem (Board Work)

The area of a certain shape can be represented by the expression $x^2 + 6x + 9$.

a) Identify a possible shape and write expressions for the possible dimensions of this shape.

b) Suppose you have a second figure in the same shape as the shape from a) except that its area can be represented by the expression $4x^2 + 24x + 36$.

Explain how you can use mental math to determine the dimensions of the second figure.

Perfect Square Trinomials

A perfect square trinomial is a trinomial that has two identical factors.

Factor each trinomial, if possible:

a) $x^2 - 24x + 144$

b) $4y^2 + 12y + 9$

Practice: Perfect Square Trinomials

Which value of c will make each trinomial a perfect square trinomial.

$y^2 + 8y + c$ $x^2 - 6x + c$ $b^2 - 14b + c$

Investigate: Difference of Squares

Use grid multiplication to multiply the following:

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

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

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

Investigate: Difference of Squares

Factor the following:

$x^2 - 49$ $y^2 - 36$ $9x^2 - 100$

Practice

Factor each trinomial, if possible:

$49a^2 - 25$

$125x^2 - 45y^2$

$9p^2q^2 - 25$

Difference of Squares - Geometric Proof

1. Cut out an 8 x 8 square of graph paper. Label the sides x.

2. Cut out a smaller square from the corner of the 8 x 8 square. Label the sides of the smaller square y.

3. Make one cut to the irregular shape that remains, so that you can rearrange it to make a rectangle. What are the dimensions of the rectangle you made?

4. How does this prove that $x^2 - y^2 = (x + y)(x - y)$?

Difference of Squares - Geometric Proof

How does this prove that $x^2 - y^2 = (x + y)(x - y)$?

Practice

Text pg. 99: 1, 2ad, 3bc, 5-7, 10, 13

Attachments

M10C Divisibility Rules.docx