Name _____
Date _____
Professor Abel

Elementary Algebra
Class #20

Factoring – Section 6.1

Everything you have ever wanted to know about factoring, but were afraid to ask.

Section 1. Greatest Common Factor – Monomials.

1. Signs: 99% Positive
2. Coefficients: GCF Numerical Coefficient
3. Variables: Smallest Exponent Common Base
4. Practice: Find the Greatest Common Factors for the Following Monomial Expressions:

   a. $xy;\ x^2y^2;\ x^3y$ — xy

   b. $18y^2;\ 15y^3;\ 27y^5$ — $3y^2$

   c. $-20x^2;\ 12x;\ 40x^3$ — $4x$

Section 2. Factoring a Monomial from a Polynomial.

Characteristics of a GCF for a Monomial and ~~another Monomial~~ Polynomial:

1. 99% GCF Positive 1% Lead Term Negative
2. GCF → Numerical Coefficients
3. Small Exponent unless Constant
4. The GCF must be the GCF for all terms.

   a. $\frac{6x}{6} + \frac{18}{6}$ — $6(x+3)$

   b. $15x - 20$ — $5(3x-4)$

   c. $6y^2 + 9y^5$ — $3y^2(2+3y^3)$

   d. $\frac{-12p^3}{-4p} - \frac{24p^2}{-4p} + \frac{8p}{-4p}$ — $-4p(3p^2+6p-2)$

   e. $\frac{35x^2}{5} - \frac{25x}{5} + \frac{5}{5}$ — $5(7x^2-5x+1)$

Section 3. Factoring a Common Polynomial (binomial) Expression:

6. From this Point On: the common binomial factor is known as: Key

a. $x(5x-7)+2(5x-7)$ $(5x-7)(x+2)$

b. $4x(3x-5)-7(3x-5)$ $(3x-5)(4x-7)$

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

Factoring – Section 6.2

Section 1. Factoring a 4-Term Polynomial by Grouping.

7. Factor and Take Notes of Each Step: $ax+ay+bx+by$

$a(x+y)+b(x+y)$

$(x+y)(a+b)$

Factor $x^2+3x+4x+12$ by grouping:

$x(x+3)+4(x+3)$

$(x+3)(x+4)$

Factor $15x^2+12x+10x+8$ by grouping:

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

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

Influence of the Sign of the Third Term!!!

Factor $(6x^2 + 3x) - 2x - 1$ by grouping:

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

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

Factor $(5x^2 - 10x) - 2x + 4$ by grouping:

$5x(x-2) - 2(x-2)$

$(x-2)(5x-2)$

$(6x^2 - 18x) - 5x + 15$

Factor ~~$5x^2 - 10x - 2x + 4$~~ by grouping:

$6x(x-3) - 5(x-3)$

$(x-3)(6x-5)$

Homework Section:

Section	Page(s)	Problems
6.1	350	21 → 97 Odd
6.2	356	7 → 57 Odd
6.5	383	13 → 35 Odd

Name _____
Date _____

MTH 098 - Introduction to Algebra
Class #20

Factoring - Hour #2

Quality - Accuracy - Transfer - 100%

Section 1. Perfect Squares:

1. **Identify Perfect Squares that are Whole Numbers:**

a. 16 4

b. 25 5

c. 9 3

d. 169 13

e. 144 12

Memorize

Calculator

2. **Identify Perfect Squares that are Decimals:**

a. .25 .5

b. ~~16.9~~ 1.69 1.3

c. .0049 .07

d. 2.25 1.5

e. .000625 .025

1. Non Zero Digits Perfect
2. # of Decimal Places - Even
3. Root Decimal Places are Cut in 1/2.

1.2 × 1.2 = 24 + 12 = 144

3. **Identify Perfect Squares that are Fractions:**

a. $\frac{1}{25}$ $\frac{1}{5}$

b. $\frac{1}{49}$ $\frac{1}{7}$

c. $\frac{16}{81}$ $\frac{4}{9}$

d. $\frac{9}{16}$ $\frac{3}{4}$

e. $\frac{144}{225}$ $\frac{12}{15} = \frac{4}{5}$

Numerator and denominator are Perfect Squares

4. **Identify Perfect Squares that are Variables:**

a. $25x^2$ $5x$

b. $49y^2$ $7y$

c. $81a^2b^6$ $9ab^3$

d. $144x^4y^8z^{10}$ $12x^2y^4z^5$

e. $225a^{16}$ $15a^8$

Coefficients - Squares

Exponents - Even

Root → Cut all exponents in 1/2

$(x^9)^2 = x^{2a}$

Section 2. F.O.I.L.: Multiplication of the "Sum and Difference" of Two Numbers.

5. F.O.I.L. Is there a Pattern?

a. $(x+7)(x-7)$ $x^2 - 7x + 7x - 49$ $x^2 - 49$

b. $(a-3)(a+3)$ $a^2 + 3a - 3a - 9$ $a2 - 9$

c. $(2x+7)(2x-7)$ $4x^2 - 14x + 14x - 49$ $4x^2 - 49$

d. $(5+c)(5-c)$ $25 - 5c + 5c - c2$ $25 - c2$

e. $(8x+3)(8x-3)$ $64x^2 - 24x + 24x - 9$ $64x^2 - 9$

6. Describe Each Outcome: Inside & Outside Terms Add Out.

Square of Firsts Minus Square of Lasts

This result is known as: Diff of 2 Squares D.O.T.S.

7. More: Use the Shortcut. Use and be able to recognize the Pattern.

a. $(c+d)(c-d)$ $c^2 - d^2$

b. $(r^3+s^3)(r^3-s^3)$ $r^6 - s^6$

c. $(7-20c)(7+20c)$ $49 - 400c^2$

d. $(.5+.9x)(.5-.9x)$ $.25 - .81x^2$

e. $(\frac{3}{4}c+\frac{2}{3})(\frac{3}{4}c-\frac{2}{3})$ $\frac{9}{16}c^2 - \frac{4}{9}$

Section 3. Reverse F.O.I.L.: Factoring's First Steps.

8. Step 1: Recognizing and Factoring the Difference of Two Squares. FACTOR the following:

1. $5x^2 - 125$ $5(x^2-25)$ $5(x+5)(x-5)$

2. $x^2 - 100$ $(x+10)(x-10)$

3. $ax^2 - 49a$ $a(x^2-49)$ $a(x+7)(x-7)$

4. $2n^2 - 162$ $2(n^2-81)$ $2(n+9)(n-9)$

5. $n^4 - 16$ Sum Diff $(n^2+4)(n^2-4)$ $= (n^2+4)(n+2)(n-2)$

6. $25x^2 - 36$ $(5x+6)(5x-6)$

7. $100x^2 - 9y^2$ $(10x+3y)(10x-3y)$

8. $\frac{4}{9}y^2 - \frac{1}{16}$ $\left(\frac{2}{3}y+\frac{1}{4}\right)\left(\frac{2}{3}y-\frac{1}{4}\right)$

9. $\frac{25}{81}c^2 - \frac{121}{144}d^2$ $\left(\frac{5}{9}c+\frac{11}{12}d\right)\left(\frac{5}{9}c-\frac{11}{12}d\right)$

10. $.25a^2 - .36b^2$ $(.5a+.6b)(.5a-.6b)$