

Factoring GCF - A - Squares Notes/Homework

Name

Date

Greatest Common Factor
Factor out GCF GCF (leftovers)

$$\begin{array}{l} 15x + 35 \\ \underline{5 \cdot 3x} + \underline{5 \cdot 7} \\ 5(3x + 7) \end{array}$$

$$\begin{array}{l} -5 - x \\ -1 \cdot 5 + -1 \cdot x \\ -1(5 + x) \\ -1(x + 5) \end{array}$$

can factor out -1 to change signs

$$14 - 7x$$

$$\begin{array}{l} 55p^2 - 11p^4 + 44p^5 \\ \underline{11 \cdot 5p \cdot p} - \underline{11 \cdot p \cdot p \cdot p \cdot p} + \underline{11 \cdot 4p \cdot p \cdot p \cdot p \cdot p} \\ 11p^2(5 - p^2 + 4p^3) \end{array}$$

$$14x^3 - 42x^5 - 49x^4$$

$$30mn^2 + m^2n - 6n$$

$$3x^2 - 4x = 0$$

$$\begin{array}{l} 27x^3 - 108x = 0 \\ \underline{3 \cdot 9x \cdot x \cdot x} - \underline{3 \cdot 9 \cdot 4x} = 0 \end{array}$$

$$45s^3 - 18s^2 = 0$$

$$27x(x^2 - 4) = 0$$

$$\begin{array}{l} \frac{27x}{27} = 0 \quad x^2 - 4 = 0 \\ \frac{27x}{27} \quad \frac{27}{27} \quad \sqrt{x^2 - 4} \\ x = 0 \quad x = \pm 2 \end{array}$$

undo x^2 with $\pm \sqrt{\quad}$

the highest exponent determines # of roots

Factor by Grouping

$$\begin{array}{l} 12ax + 3xz + 4ay + yz \\ 3x(4a + z) + y(4a + z) \\ (4a + z)(3x + y) \end{array}$$

- 1) break up into pairs
- 2) Factor GCF out of each pair
- 3) Factor out GCF

$$4m^2 + 4mn + 3mn + 3n^2$$

$$\begin{array}{l} 14y^3 - 28y^2 + 3y + 6 \\ 14y^2(y - 2) + 3(y + 2) \end{array}$$

Factor Rewrite

$$\begin{array}{l} 14y^3 - 28y^2 - 3y + 6 \\ 14y^2(y - 2) - 3(y - 2) \\ (y - 2)(14y^2 - 3) \end{array}$$

not same not factorable by grouping

Factor by Grouping and Solve

$$\begin{array}{l} 6y^2 - 4y + 3y - 2 = 0 \\ 2y(3y - 2) + 1(3y - 2) = 0 \\ (3y - 2)(2y + 1) = 0 \end{array}$$

$$\begin{array}{l} 3y - 2 = 0 \quad 2y + 1 = 0 \\ +2 \quad +2 \quad -1 \quad -1 \\ \frac{3y}{3} = \frac{2}{3} \quad \frac{2y}{2} = -\frac{1}{2} \\ y = \frac{2}{3} \quad y = -\frac{1}{2} \end{array}$$

Sometimes you need to factor out 1 or -1

$$12a^4 + 3A^2 - 8A^2 = 2$$

Factoring GCF - A - Squares Notes/Homework

Name

Date

Factor out GCF
 Greatest Common Factor
 GCF · (leftovers)

$$\begin{array}{r} 15x + 35 \\ \underline{5 \cdot 3 \cdot x + 5 \cdot 7} \\ 5(3x + 7) \end{array}$$

$$\begin{array}{r} -5 - x \\ \underline{-1 \cdot 5 + -1 \cdot x} \\ -1(5 + x) \\ -1(x + 5) \end{array}$$

can factor out -1 to change signs

$$14 - 7x$$

$$55p^2 - 11p^4 + 44p^5$$

$$14x^3 - 42x^5 - 49x^4$$

$$30mn^2 + m^2n - 6n$$

$$3x^2 - 4x = 0$$

Degree determines # of roots

$$27x^3 - 108x = 0$$

$$\begin{array}{r} 3 \cdot 9 \cdot x \cdot x \cdot x - 3 \cdot 9 \cdot 4 \cdot x \\ 27x(x^2 - 4) = 0 \end{array}$$

$$45s^3 - 18s^2 = 0$$

$$\begin{array}{r} 27x = 0 \\ \underline{27 \quad 27} \\ x = 0 \end{array} \quad \begin{array}{r} x^2 - 4 = 0 \\ \sqrt{x^2 - 4} \\ x = \pm 2 \end{array}$$

Factor by Grouping

$$\begin{array}{r} 12ax + 3xz + 4ay + yz \\ \underline{3x(4a+z) + y(4a+z)} \\ (4a+z)(3x+y) \end{array}$$

1) break up into pairs
 2) Fact GCF from each pair
 3) Pull out GCF factor again (leftovers)

$$4m^2 + 4mn + 3mn + 3n^2$$

$$\begin{array}{r} 14y^3 - 28y^2 + 3y + 6 \\ \underline{14(y)(y^2) - 14(2)(y)(y)} \\ 14y^2(y-2) + 3(y+2) \end{array}$$

Rewrite $14y^3 - 28y^2 - 3y + 6$

Factor by Grouping and Solve

$$\begin{array}{r} 6y^2 - 4y + 3y - 2 = 0 \\ \underline{2y(3y-2) + 1(3y-2)} \\ (3y-2)(2y+1) = 0 \\ 3y-2=0 \quad 2y+1=0 \\ \begin{array}{r} +2 \\ 3y = +2 \\ y = \frac{2}{3} \end{array} \quad \begin{array}{r} -1 \\ 2y = -1 \\ y = -\frac{1}{2} \end{array} \end{array}$$

Sometimes you must factor out a 1 or -1

$$\begin{array}{r} 12a^4 + 3a^2 - 8a^2 - 2 = 2 \\ \underline{12a^4 + 3a^2 - 8a^2 - 2} \\ 3a^2(4a^2+1) - 2(4a^2+1) = 0 \\ (4a^2+1)(3a^2-2) = 0 \\ 4a^2+1=0 \quad 3a^2-2=0 \\ \sqrt{a^2} = \sqrt{\frac{-1}{4}} \quad \sqrt{a^2} = \sqrt{\frac{2}{3}} \\ a = \pm \frac{1}{2}i \quad a = \pm \sqrt{\frac{2}{3}} \end{array}$$

$1x^2 + bx + c$

Factoring Trinomial when $a = 1$

$b = -1 \quad c = -2$
 $x^2 - x - 2$

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

$x^2 + 5x = -6$

$m \cdot n \rightarrow (x+m)(x+n)$

$x^2 - 4x + 3$

$(x-3)(x-1)$

$x^6 + 6 = 5x^3$

Quadratic Form

middle exponent is half biggest

$c^2 + 7c^2 - 8$
 $(c^2 + 8)(c^2 - 1)$

$x^8 = 24 - 10x^4$

①

Factoring Trinomial when a is not 1

$ax^2 + bx + c$
 $16r^2 - 8r + 1$

$16r^2 - 4r - 4r + 1$
 $4r(4r-1) - 1(4r-1)$
 $(4r-1)(4r-1)$

$18x^2 - 27x - 5$

$18 + 12y^4 + 2y^8$
 $(y^4 + 3)(2y^4 + 6)$

② Split middle Term

$48x^4 + 22x^2 = 15$

$48x^4 + 22x^2 - 15 = 0$

$8m^6 - 44m^3 + 48 = 0$

$-4c^2 + 12c + 20 = 21$

③ Factor by grouping

$48x^4 + 40x^2 - 18x^2 - 15 = 0$
 $8x^2(6x^2 + 5) - 3(6x^2 + 5)$
 $0 = (6x^2 + 5)(8x^2 - 3)$

$x = \pm \sqrt{\frac{3}{8}}$ $x = \pm \sqrt{\frac{5}{6}}$ $(x + \sqrt{c})(x - \sqrt{c})$
 binomial w/ subtraction

Difference of Squares

$x^2 - 144$

$25d^2 - 100$

$4a^3 - 64a$

$(x + 12)(x - 12)$ $(5d + 10)(5d - 10)$

$3b^3 - 27b = 0$

$9x^3 = 25x$

$7a^3 = 175a$

$-25x - 25x$
 $9x^3 - 25x = 0$
 $x(9x^2 - 25) = 0$
 $x(3x - 5)(3x + 5) = 0$

$x^2 + bx + c$

Factoring Trinomial when $a = 1$
 $b = -1$ $c = -2$
 $x^2 - x - 2 = (x - 2)(x + 1)$

$x^2 - 4x + 3 = (x - 3)(x - 1)$

$x^2 + 5x = -6$

$x^2 - 4x + 3$ $x^2 + 7x + 8$

$x^2 + 5x = -6$ $-2 \cdot +1$ -1

$x^2 + 6 = 5x^3$ $\star \text{ must } = 0$ $x^2 = 24 - 10x^4$

$x^6 - 5x^3 + 6 = 0$

$(x^3 - 3)(x^3 - 2) = 0$

$x^3 - 3 = 0$ $x^3 - 2 = 0$

$\sqrt[3]{x^3} = \sqrt[3]{3}$ $\sqrt[3]{x^3} = \sqrt[3]{2}$

$x = \sqrt[3]{3}$ $x = \sqrt[3]{2}$ and 4 imaginary

AC Method

$ax^2 + bx + c$

1) $\frac{a \cdot c}{b}$

2) Split middle Term

3) Factor by grouping

$16r^2 - 8r + 1$

$4 \cdot 16r^2 - 4r - 4r + 1 - 4 + 4$

$r(4r - 1) - 1(4r - 1)$

$(4r - 1)(4r - 1)$

$48x^4 + 22x^2 = 15$

$18x^2 - 27x - 5$

$18 + 11$

$2y^4$ $2y^8$ $6y^4$ $12y^4$ $6y^4$ 18

$(y^4 + 3)(2y^4 + 6)$

$8m^6 - 44m^3 + 8 = 0$

$-4c^8 + 12c^4 + 21$

Difference of Squares

$x^2 - 144$ $b = 0$ $c = -144$

$(x + 12)(x - 12)$

$12 \cdot -12$

$12 \cdot -12$

$12 \cdot -12$

binomial of perfect squares no bx

$(\sqrt{a}x + \sqrt{c})(\sqrt{a}x - \sqrt{c})$

$25d^2 - 100$ $4a^3 - 64a$

$(5d + 10)(5d - 10)$

$3b^3 - 27b = 0$

$9x^3 = 25x$

$7a^3 = 175a$

Factoring GCF - A - Squares Notes/Homework

Name

Date

Factor out GCF (leftovers)

$15x + 35$
 $5(3x + 7)$
 $5 \cdot 3x + 5 \cdot 7$

greatest common factor
 $x^2 - 5 - x$
 $-1(x + 5)$

can factor out -1 to change signs

$14 - 7x$
 $-7(2 + x)$
 $-7(x + 2)$

$55x^2 - 11x^2 + 11p^2$
 $11p^2(5 - p^2 + 11p^3)$
 $11p^2(4p^3 - p^2 + 5)$

$14x^3 - 42x^2 - 49x^2$
 $7x^3(2 - 6x^2 - 7x)$
 $-7x^3(16x^2 + 7x - 2)$

$30mn^2 + m^2n - 6n$
 $n(30mn + m^2 - 6)$
 $n(m^2 + 30mn - 6)$

$5x^2 - 4x = 0$
 $3 \cdot x \cdot x - 4 \cdot x$
 $x(3x - 4) = 0$

$x = 0$

$3x - 4 = 0$
 $x = \frac{4}{3}$

expand
 determine what solutions

$27x^2 - 108x = 0$
 $3 \cdot 9 \cdot x \cdot x - 3 \cdot 9 \cdot 4 \cdot x$
 $27x(x - 4) = 0$

$27x = 0$
 $x = 0$

$x^2 - 4 = 0$
 $\sqrt{x^2} = \sqrt{4}$
 $x = \pm 2$

want to get exponent to be positive

$45x^2 - 18x = 0$
 $9 \cdot 5 \cdot x^2 - 2 \cdot 9 \cdot x$
 $9x^2(5 - 2) = 0$

$9x^2 = 0$
 $x = 0$

$5x - 2 = 0$
 $5x = 2$
 $x = \frac{2}{5}$

Factor by Grouping

$12ax + 3xz + 4ay + yz$
 $3x(4a + z) + y(4a + z)$
 $(4a + z)(3x + y)$

break up terms into pairs
 factor GCF of pairs
 common factor left over pulled out

$4m^2 + 4mn + 3mn + 3n^2$
 $4m(m + n) + 3n(m + n)$
 $(m + n)(4m + 3n)$

$z + y^2 - 2zy^2 + 3y + 6$
 $14y^2(y - 2) + 3(y + 2)$
 give next same by cont factor

rewrite
 $14y^3 - 28y^2 - 3y + 6$
 $14y^2(y - 2) - 3(y - 2)$
 $(y - 2)(14y^2 - 3)$

Factor by Grouping and Solve

$6y^2 - 4y + 3y - 2 = 0$

$2y(3y - 2) + 1(3y - 2) = 0$
 $(3y - 2)(2y + 1) = 0$
 $3y - 2 = 0$ $2y + 1 = 0$
 $y = \frac{2}{3}$ $y = -\frac{1}{2}$

sometimes you need to just factor out 1 or -1

$12a^4 + 3a^2 - 8a^2 = 2$
 $-2 - 2$

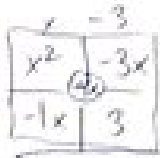
$12a^4 + 3a^2 - 8a^2 - 2 = 0$
 $3a^2(4a^2 + 1) - 2(4a^2 + 1) = 0$
 $4a^2 + 1 = 0$ $3a^2 - 2 = 0$
 $a^2 = -\frac{1}{4}$ $a^2 = \frac{2}{3}$
 $a = \pm \frac{1}{2}i$ $a = \pm \sqrt{\frac{2}{3}}$

Factoring Trinomial when $a = 1$ $x^2 + bx + c \rightarrow (x+m)(x+n)$ or $\begin{matrix} x & + & m \\ x & + & n \\ \hline x^2 & + & (m+n)x & + & mn \end{matrix}$

$x^2 - x - 2$ $b = -1$ $c = -2$
 $(x-2)(x+1)$



$x^2 - 4x + 3$
 $(x-3)(x-1)$



$x^2 + 7x - 8$
 $(x-1)(x+8)$



$x^2 + 5x + 6 = 0$
 $(x+3)(x+2) = 0$
 $x = -3$ $x = -2$

if b has a sign opposite to c, then one factor will be positive and one will be negative.

$x^2 - 5x + 6 = 0$
 $(x-3)(x-2) = 0$
 $x = 3$ $x = 2$

Quadratic Form $ax^2 + bx + c = 0$
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x^2 = 24 - 10x$
 $x^2 + 10x - 24 = 0$
 $(x+12)(x-2) = 0$
 $x = -12$ $x = 2$

splitting the middle term

Factoring Trinomial when a is not 1

ac method

$6x^2 - 5x + 1$
 $ac = 6$
 $6x^2 - 4x - 1x + 1$
 $2x(3x-1) - 1(3x-1)$
 $(3x-1)(2x-1)$

$18x^2 - 27x - 5$
 $3x(6x-9) - 5(6x-9)$
 $(6x-9)(3x-5)$

$18x^2 - 27x - 5$
 $3x(6x-9) - 5(6x-9)$
 $(6x-9)(3x-5)$

$2y^2 + 11y + 18$
 $(y+3)(2y+6)$

split middle term

$48x^2 + 22x^2 = 15$
 $48x^2 + 22x^2 - 15 = 0$

$48x^2 + 22x^2 - 15 = 0$

$8m^2 - 44m + 48 = 0$
 $4(2m^2 - 11m + 12) = 0$
 $4(2m^2 - 8m - 3m + 12) = 0$
 $4(2m^2 - 3)(m^2 - 4) = 0$
 $2m^2 - 3 = 0$ $m^2 - 4 = 0$
 $2m^2 = 3$ $m^2 = 4$
 $m = \pm\sqrt{3/2}$ $m = \pm 2$

$4c^8 - 20c^4 + 21 = 0$
 $4c^8 - 6c^4 - 14c^4 + 21 = 0$
 $2c^4(2c^4 - 3) - 7(2c^4 - 3) = 0$
 $(2c^4 - 3)(2c^4 - 7) = 0$
 $2c^4 - 3 = 0$ $2c^4 - 7 = 0$
 $c^4 = 3/2$ $c^4 = 7/2$
 $c = \pm\sqrt[4]{3/2}$ $c = \pm\sqrt[4]{7/2}$ and 4 imaginary solutions



$6x^2 + 15 = 0$ $8x^2 - 3 = 0$
 $6x^2 = -15$ $8x^2 = 3$
 $x = \pm\sqrt{-15/6}$ $x = \pm\sqrt{3/8}$

$2m^2 - 3 = 0$ $m^2 - 4 = 0$
 $2m^2 = 3$ $m^2 = 4$
 $m = \pm\sqrt{3/2}$ $m = \pm 2$

$2c^4 - 3 = 0$ $2c^4 - 7 = 0$
 $c^4 = 3/2$ $c^4 = 7/2$
 $c = \pm\sqrt[4]{3/2}$ $c = \pm\sqrt[4]{7/2}$ and 4 imaginary solutions

Difference of Squares

$x^2 - 144 = 0$
 $(x+12)(x-12)$

$25a^2 - 100 = 0$
 $(5a+10)(5a-10)$

$a^2 - 64 = 0$
 $(a+8)(a-8)$

$4a(a^2 - 16) = 0$
 $4a(a+4)(a-4)$

$3b(b^2 - 9) = 0$
 $3b(b-3)(b+3) = 0$
 $3b = 0$ $b-3 = 0$ $b+3 = 0$
 $b = 0$ $b = 3$ $b = -3$

$9x^2 = 25x$
 $-25x - 25x = 0$
 $9x^2 - 25x = 0$
 $x(9x - 25) = 0$
 $x(3x-5)(3+5) = 0$
 $x = 0$ $x = 5/3$ $x = -5/3$

$7a^3 = 175a$
 $7a^3 - 175a = 0$
 $7a(a^2 - 25) = 0$
 $7a(a-5)(a+5) = 0$
 $7a = 0$ $a-5 = 0$ $a+5 = 0$
 $a = 0$ $a = 5$ $a = -5$

Look for Factor GCF first