Factoring

* Factoring the GCF (greatest common factor)

Factoring "undoes" multiplication.

Factor:

Ex) $-12p^5, -18q^4$ ← coefficient (number)

← variable term

$$\boxed{\text{GCF: } -6}$$

Ex) $5y^2 + 10y^1 = 5y(y+2)$

Tip: Factor the <u>smallest</u> variable exponent.

Ex) $20m^5 + 10m^4 - 15m^3$ ← trinomial (3-term polynomial)

$$\boxed{5m^3(4m^2 + 2m - 3)}$$

Factoring by Grouping (cont.)

Ex) $6ax + 24x + a + 4$

$(6ax + 24x) + (a + 4) =$

$6x(a + 4) + 1(a + 4) =$

$$\boxed{(a + 4)(6x + 1)}$$

Practice Problems

Factor:

① $60z^4, 70z^8, 90z^9$

② $18s^3t^2 + 10st$

③ $6t^2 + 15t$

④ $13z^5 - 80$

⑤ $8x^2 + 6x$

Prepare for homework, due 4/16/14.

Factor:

Ex) $20m^7p^2 - 36m^3p^4 =$

$$4m^3p^2(5m^4 - 9p^2)$$

Ex) $10y^5 - 8y^4 + 6y^2$

$$2y^2(5y^3 - 4y^2 + 3)$$

Ex) $8p^5q^2 + 16p^6q^3 - 12p^4q^7$

$$4p^4q^2(2p + 4pq - 3q^5)$$

Factoring by Grouping

1) Group terms

2) Factor within groups

3) Factor the entire polynomial

4) Rearrange terms (if necessary)

Factor by Grouping:

$$Ex) (t^3 + 2t^2) - (3t - 6)$$

$$t^2(t + 2) - 3(t + 2) =$$

$$(t^2 - 3)(t + 2) \quad OR \quad (t + 2)(t^2 - 3)$$

$$Ex) (2xy + 3y) + (2x + 3) \longleftarrow \text{Prime}$$

$$y(2x + 3) + (2x + 3)$$

$$\boxed{(2x + 3)(y + 1)}$$

Practice Problems — Factor by Grouping

① $2a^2 - 4a + 3ab - 6b$

② $x^3 + 3x^2 - 5x - 15$

③ $6y^2 - 20w + 15y - 8yw$

④ $2mn - 8n + 3m - 12$

⑤ $6xy - 21x + 8y - 28$

Pg 496
(Green Algebra
book)

Factor   4/16/14

$$45q^4p^5 + 36qp^6 + 81q^2p^3$$

$$9qp^3\left(5q^3p^2 + 4p^3 + 9q\right)$$

$\underbrace{9qp^3}_{GCF}$

Factoring by Grouping

Ex) Factor

$$\left(2x^2 - 10x\right) + \left(3xy - 15y\right) =$$

$$2x(x-5) + 3y(x-5) =$$

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

Check: Using FOIL $\Rightarrow 2x^2 + 3xy - 10x - 15y$

Factoring by Grouping

4/21/14

#3 $6y^2 - 20w + 15y - 8yw$

$6y^2 + 15y - 20w - 8yw$

$3y(2y + 5) - 4w(5 + 2y)$

$(3y - 4w)(2y + 5)$

Factoring Trinomials   4/21/14

Ex) Factor

$$y^2 + \boxed{12}y + \boxed{20}$$

Product (LAST)

$$\dfrac{20}{4,5}$$
$$3,10$$
$$1,20$$

Outer/Inner = sum

$$(y + 10)(y + 2)$$

Check w/ FOIL!!

Factor into two integers that yield this product, but also yield (this) sum.

Ex) Factor $x^2 + 9x + 18$

$$(x + 3)(x + 6)$$

Check w/ FOIL

$$x^2 + \underline{6x + 3x} + 18$$
$$x^2 + 9x + 18$$

Ex) Factor: $x^2 - 9x + 20$

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

Ex) Factor: $t^2 - 12t + 32$

$$(t-8)(t-4)$$

Factoring Trinomials

Factor

Ex) $t^2 - 12t + 32$

Key: Factor into the product
of two binomials

$$(t - 8)(t - 4)$$

Check: FOIL

$t^2 - 4t - 8t + 32$

$t^2 - 12t + 32$ ✓

Examples: Factor

1) $y^2 - 10y + 24 = (y - 4)(y - 6)$

2) $p^2 - 2p - 15 = (p - 5)(p + 3)$

3) $k^2 - 8k + 11 = $ PRIME

4) $b^2 - 3ab - 4a^2 = (b + 1a)(b - 4a)$

More factoring ...

Factor: $2p^3 + 6p^2 - 8p$

$$2p(p^2 + 3p - 4) =$$

Factor $\boxed{2p(p-1)(p+4)}$

Factor: $4x^2 + 12x - 40$

$(4 \quad\quad)(\quad\quad)$

$4(x^2 + 3x - 10)$

$\boxed{4(x+5)(x-2)}$

*"Factor" before you factor.

In the (green) Alg. I Book
Pg 483 - 484
(22 - 50) evens

Bridge Math Warm Up   4/23/14

Factor: $v^2 - 11vx + 24x^2$ $\underline{24}$

$(v - 3x)(v + 8x)$ 6, 4

          3, 8

$\cancel{v^2 + 8vx - 3vx - 24x^2}$ 2, 12

          1, 24

$\boxed{(v - 3x)(v - 8x)}$

Pg 483-484 Solutions

Factor

#30
$$p^2 + 10pq + 9q^2$$

$$\boxed{(p + 9q)(p + 1q)}$$

$$\frac{9}{3,3}$$

$$\boxed{9,1}$$

#32 $x^2 + 8xy + 15y^2$

$$\boxed{(x + 3y)(x + 5y)}$$

#38 $x^2 - 10xy - 39y^2$

$$\boxed{(x - 13y)(x + 3y)}$$

$x^2 + 1x - \boxed{12}$

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

OR

$x^2 + 1x - 30$

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

#40 $x^2 + 1x - \boxed{2}$

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

$x^2 - 1x + 2x - 2$

$\underset{+1x}{\underline{}}$

OR

Factoring Trinomials of the form $ax^2 + bx + c$

Factor: $2p^2 + 9p + 9$

$(2p + 3)(1p + 3)$

"Guess and check method"

Check: $2p^2 + 6p + 3p + 9$

$\underbrace{}_{9p}$

$\{ \}$

Factor: $6p^2 + 19p + 10$

$(2p + 2)(3p + 5)$

$6p^2 + 10p + 6p + 10$

$\underbrace{}_{16p}$

$(2p + 5)(3p + 2)$ ✓

$6p^2 + 4p + 15p + 10$

$\underbrace{}_{19p}$

Factor: $8x^2 + 14x + 3$

$($ $)($ $)$

Factoring Trinomials
4/24/14

We will $\wedge$ trinomials of the form

factor

$ax^2 + bx + c.$

Ex) Factor: $\underline{8x^2} + 14x + \boxed{3}$

$$\boxed{(2x + 3)(4x + 1)}$$

Check: $8x^2 + 2x + 12x + 3$

$8x^2 + 14x + 3 \checkmark$

Ex) Factor: $8p^2 + \boxed{14}p + \circled{5}$ sum   product

$(4p + 5)(2p + 1)$

$8p^2 + 4p + 10p + 5$

$8p^2 + 14p + 5$

Factor: $4y^2 - 11y + 6$

1st try: $(2y - 2)(2y + 3)$

$4y^2 + 6y - 4y - 6$

$2y$

2nd try: $(y + 2)(4y - 3)$

$4y^2 - 3y + 8y - 6$

$4y^2 + 5y - 6$

3rd try: $\boxed{(y - 2)(4y - 3)}$

$4y^2 - 3y - 8y + 6$

$4y^2 - 11y + 6$ ✓

$(2y - 2)(2y - 3)$

$4y^2 - 6y - 4y + 6$

$-10y$

In-Class Problem Solving

Factor completely:

① $9x^2 - 21x + 10 = (3x - 2)(3x - 5)$

② $6x^2 + 5x - 4 = (3x + 4)(2x - 1)$

③ $4x^2 - 3x - 7 = (4x + 7)(x - 1)$

④ $3y^2 + 8y - 6$

⑤ $2x^2 - 5xy - 3y^2$

⑥ $8a^2 + 2ab - 3b^2$

⑦ $6x^2 - 11x + 3.$

⑧ $5z^2 + 12z + 4.$

Homework due 4/25/14

4/25/14

Factor

(#4) $3y^2 + 8y - 6$

~~$(3y - 3)(y + 2)$~~

~~$(2y \quad)(3y \quad)$~~

~~$(3y - 2)(y + 3)$~~

$(3y \quad)(y \quad)$

1, 6
3, 2

PRIME

(#5) $2x^2 - 5xy - 3y^2 =$

~~$(x - 4)(2x + 3y)$~~

$(2x + y)(x - 3y)$ ✓

$2x^2 \underbrace{- 6xy + xy}_{-5xy} - 3y^2$

Ex) $h^2 + 16h - 17$

$(h - 1)(h + 17)$

#7) $6x^2 - 11x + 3$

$(3x - 1)(2x - 3)$ ✓

F: $6x^2$

$+\begin{array}{l} O: -9x \\ I: -2x \end{array}\Big\} -11x$

L: 3

(#2) $6x^2 + 5x - 4 =$

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

$$6x^2 - 3x + 8x - 4$$

$$6x^2 + 5x - 4 \checkmark$$

Factor: $4x^2 - 3x - 7$

(#3) ( )( )