Section 5.2 notes

Objective: Greatest Common Factor and factor by grouping Factoring Unit (F.IF.8)

Factoring: The reverse of multiplying. It means figuring out what you would multiply together to get a polynomial, and writing the polynomial as the product of several factors (writing it as a multiplication problem).

Greatest Common Factor (GCF): The monomial with the largest possible coefficient and the variables with the largest possible exponents that divides evenly into every term of the polynomial.

Prime Polynomial: A polynomial that cannot be factored.

Factoring Out a Common Factor:

- 1. Find the GCF.
- 2. Use the distributive property in reverse to "factor out" the GCF: Write the GCF outside a set of parentheses.

Inside the parentheses, write what is left when you *divide* the original terms by the GCF. **Note:** If the GCF is the same as one of the terms of the polynomial, there will be a 1 left inside the parentheses.

3. If leading coefficient is negative, factor out a common factor with a negative coefficient.

Examples: Factor the following expressions.

a)
$$x^{2} + 3x$$
 $(2y + 6)$
 $(2y - 6)$
 $(2y$

e)
$$2z^{3} + 2z$$

 $2z^{2} + 2z$
 $2z(z^{2} + 1)$

f)
$$-6h^2 + 3h$$

 $-1.2.3.4h$
 $3h(-2h+1)$
 $-3h(2h-1)$

g)
$$-20m^3 + 24m^2 - 32m$$

 -165 9.6 9.8

h)
$$2a^2b^3c^4 + 8a^4b^8c^7 - 6a^3bc^5$$
 $2a^2b^3c^4 + 8a^4b^8c^7 - 6a^3bc^5$
 $2a^2b^3-1$
 $2a^2b^3c^4 + 8a^4b^8c^7 - 6a^3bc^5$
 $2a^2b^3-1$
 $2a^2b^3-1$

$$(2a^{2}bc^{4}(b^{2}+4a^{2}b^{2}c^{3}-3a^{4}c^{4})$$

i)
$$p(q-6)+2(q-6)$$

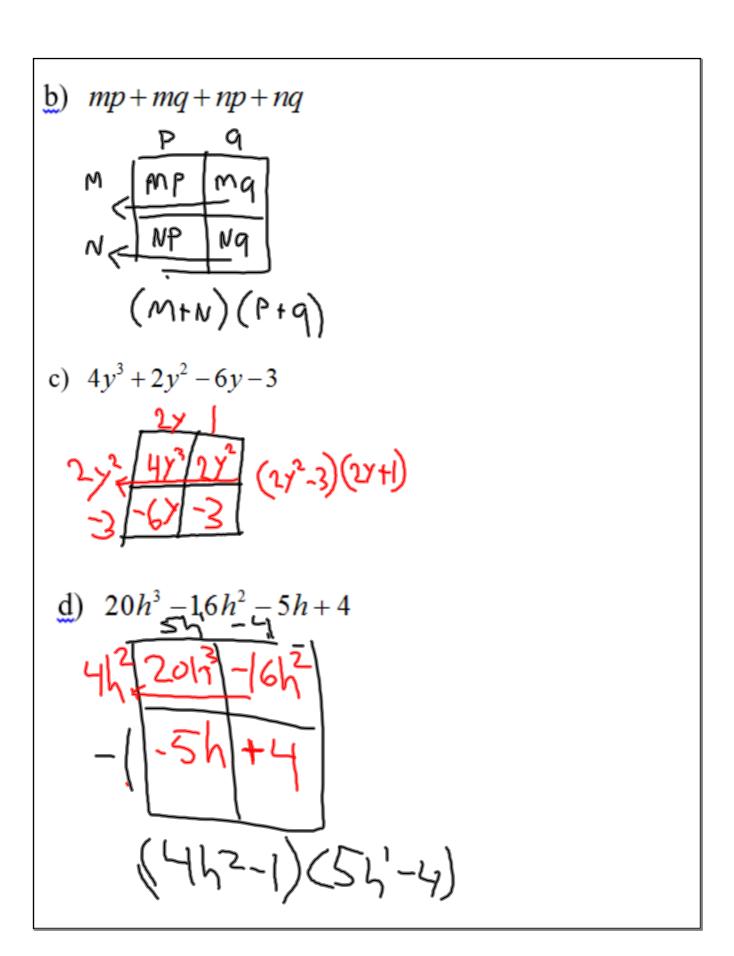
GCF $(q-6)$
 $(q-6)(p+2)$

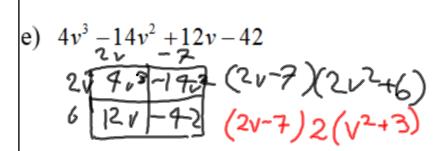
Factoring by Grouping (4 Terms):

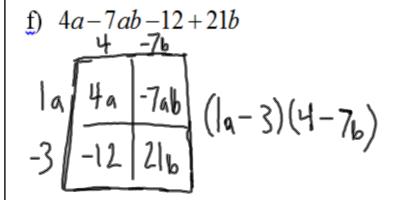
- 1. Factor out any common factors from all four terms first.
- 2. Look at the first two terms and the last two terms of the polynomial separately.
- 3. Factor out the GCF from the first two terms, write a plus sign (or a minus sign if the GCF on the last two terms is negative), then factor out the GCF from the last two terms.
- 4. You should have the same thing left in both sets of parentheses after you take out the GCFs. Factor out this common binomial factor from the two groups.

Examples: Factor the following expressions.

a)
$$x^{3}-4x^{2}+3x-12$$
 $X^{3}-4x^{2}+3x-12$ $(X^{2}-4)$ $(X^{2}-4)$ $(X^{2}-4)$ $(X^{2}-4)$ $(X^{2}-4)$ $(X^{2}+3)$ $(X^{2}-4)$ $(X^{2}+3)$ $(X^{2}-4)$ $(X^{2}+3)$







g)
$$6q^3 + 2q^2r - 36q - 12r$$

 $2q^2 - 6q^3 - 2q^2r - (3q+r)(2q^2 - 12)$
 $-12 - 36q - 12r - (3q+r)(2)(q^2 - 6)$

