Exercise 1: Multiply the monomials $(5x^3 y^6)(-3xy^4)$

$(5)(-3)$ $x^3 \cdot x^1$ $y^6 \cdot y^4$

-15 x^{3+1} y^{6+4}

$-15 x^4 y^{10}$

Exercise 2: Multiply using the Distributive Property

a) $2p^3(4p^7 - 5)$

$(2p^3)(4p^7) + (2p^3)(-5)$

$8p^{10}$ $+$ $(-10p^3)$

$8p^{10} - 10p^3$

b) $9m^3n^6(-6m^2n^2 + 8m^2n + 1)$

$(9m^3n^6)(-6m^2n^2) + (9m^2n^6)(8m^2n) + (9m^3n^6)(1)$

$-54 m^5 n^8$ $+$ $72m^4n^7$ $+$ $9m^3n^6$

The Greatest Common Factor

The greatest common factor (GCF) for a polynomial is the largest monomial that divides each term of the polynomial.

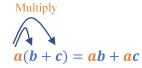GCF 1. "largest constant" that each coefficient is divisible by.

Factoring the greatest common factor of a polynomial:
1. Determine the greatest common factor
2. Write the answer in factored form.

2. if there is a variable in each term, use "the lowest power" you see.

The GCF factoring process is the reverse of the Distributive Property

Multiply

The Distributive Property: $a(b + c) = ab + ac$

Factor/Divide

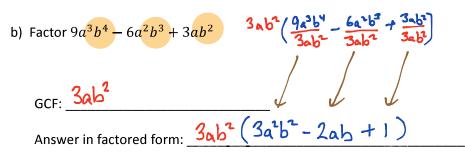**The GCF factoring:** $ab + ac = a(b + c)$

Exercise 3: Factor the greatest common factor and express the answer in factored form. Check by multiplying using the Distributive Law.

a) Factor $5p^3 + 15p^2 - 30p^1$

5 - largest constant

GCF: $\underline{5p^1}$ p^1 - in each term, lowest power=1

$5p^3 + 15p^2 - 30p$

$= 5p\left(\dfrac{5p^3 + 15p^2 - 30p}{5p}\right)$

$= 5p\left(\dfrac{5p^3}{5p} + \dfrac{15p^2}{5p} - \dfrac{30p}{5p}\right)$

$= 5p\left(p^2 + 3p - 6\right)$

Answer in factored form: _____

Check: _____   check: $5p^3 + 15p^2 - 30p$

b) Factor $9a^3b^4 - 6a^2b^3 + 3ab^2$

$3ab^2\left(\dfrac{9a^3b^4}{3ab^2} - \dfrac{6a^2b^3}{3ab^2} + \dfrac{3ab^2}{3ab^2}\right)$

GCF: $\underline{3ab^2}$

Answer in factored form: $\underline{3ab^2\left(3a^2b^2 - 2ab + 1\right)}$

Check: _____

c) Factor $5(x + y) - 6x(x + y)$ $= (x+y)\left(\dfrac{5(x+y)}{(x+y)} - \dfrac{6x(x+y)}{(x+y)}\right)$

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

GCF: $\underline{(x+y)}$

Answer in factored form: $\underline{(x+y)(5-6x)}$ or $(5-6x)(x+y)$

Check: _____ $5(x+y) - 6x(x+y)$

Factoring by Grouping

Before factoring by grouping, first we factor out GCF from all four terms.

Steps in factoring by grouping (Assume there is no GCF)
1. Group pairs of terms and factor each pair.
2. If there is a common binomial factor, then factor it out.
3. If there is no common binomial factor, then interchange the middle two terms and repeat the process over. If there is still no common binomial, then the polynomial cannot be factored.

Factor $4x + 6y + 2xy + 3y^2$ by grouping

Step 1: Group the pairs of terms	$(4x + 6y) + (2xy + 3y^2)$
Step 2: Factor the GCF from each pair	$2(2x + 3y) + y(2x + 3y)$
Step 3: Factor the common binomial factor	$(2x + 3y)(2 + y)$

Exercise 4: Factor by grouping. Follow the steps in the table

a) Factor by grouping: $56 + 21k + 8h + 3hk$

	Show work here
Step 1: Group the pairs of terms	$(56 + 21k) + (8h + 3hk)$
Step 2: Factor the GCF from each pair	$7(8 + 3k) + h(8 + 3k)$
Step 3: Factor the common binomial factor	$(8 + 3k)(7 + h)$

Check: $56 + 8h + 21k + 3hk$

$56 + 21k + 8h + 3hk$ ✓

b) Factor by grouping: $5x^2 + 40x - xy - 8y$

	Show work here
Step 1: Group the pairs of terms. Be careful with the signs.	$(5x^2 + 40x) + (-xy - 8y)$
Step 2: Factor the GCF from each pair. Be careful with the signs.	$5x(x + 8) + (-y)(x + 8)$
Step 3: Factor the common binomial factor	$(x + 8) \quad (5x - y)$

$5x^2 - xy + 40x - 8y$

$(5x^2 - xy) + (40x - 8y)$

$x(5x - y) + 8(5x - y)$

$(x + 8)(5x - y)$