

Unit 6.6 – Factoring By Grouping * This method is not used to factor trinomial. *

Steps to Follow When Factoring BY GROUPING

* You should know to use this form of factoring because it is used to FACTOR polynomials with 4-terms.

- 1.) "Group" the First 2-terms and the second 2-terms (including any signs of its terms) by putting (Parentheses) around the group of terms.
- 2.) Factor out the GCF of each "group"
- 3.) The "leftovers" in the "groups" should be exactly the same.
- 4.) Your final answer (factored polynomial) will be the "left overs" times the combined GCFs of each group.

Worked out Example (to show the process): $(x^3 + 3x^2 + 4x + 12)$ * SHOULD BE IN STANDARD FORM *

Step 1 → $\frac{(x^3 + 3x^2)(x + 4x + 12)}{\text{Group 1} \quad \text{Group 2}}$ (Group FIRST 2 terms and LAST 2 terms together)

Step 2 → $\frac{x^2(x+3) + 4(x+3)}{\uparrow \text{SAME} \uparrow}$ (Factor out the GCF of each "group")

Step 3 → $\frac{(x^2+4)(x+3)}{\text{GCFs} \quad \text{Leftovers}}$ (Put "leftovers" and common binomial together)

Examples: Factor each polynomial completely BY GROUPING.

1.) $(2m^3 + 6m^2 + 3m + 9)$
 $2m^2(m+3) + 3(m+3)$
 $\uparrow \text{SAME} \uparrow$
 $(2m^2+3)(m+3)$

2.) $(5x^4 - 20x^3 + 6x - 24)$
 $5x^3(x-4) + 6(x-4)$
 $\uparrow \text{SAME} \uparrow$
 $(5x^3+6)(x-4)$

3.) $(24a^2 - 15a + 40a - 25)$
 $3a(8a-5) + 5(8a-5)$
 $(3a+5)(8a-5)$

4.) $(27b^2 + 45b - 3b - 5)$
 $9b(3b+5) - 1(3b+5)$
 $(9b-1)(3b+5)$

5.) $12x^3 + 10x^2 - 36x - 30$
 $2((6x^3 + 5x^2 - 18x - 15))$
 $x^2(6x+5) - 3(6x+5)$

First rule of FACTORING is what? Take out a GCF!

6.) $45m^4 - 9m^3 + 30m^2 - 6m$
 $3m((15m^3 - 3m^2 + 10m - 2))$
 $3m^2(5m-1) + 2(5m-1)$

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

$3m(2m^2+2)(5m-1)$