TOPIC: FACTORING BY GCF AND GROUPING

Factor GCF Out of Polynomials

◆ Recall: The GCF of a list of terms is the largest factor that evenly divides out of every term.

► Once we find the GCF of the terms in a *polynomial*, we can _____ it out.

New **Factoring Out the Greatest Common Factor**

$$9t^2 - 54t$$

Identify GCF: $9t^2 = 3 \cdot 3 \cdot t \cdot t$
$54t = 3 \cdot 3 \cdot 3 \cdot 2 \cdot t$ → GCF: _____

Rewrite: $= \underset{GCF}{\_\_\_\_}(\quad) - \underset{GCF}{\_\_\_\_}(\quad)$

Factor GCF out: $= \underset{GCF}{\_\_\_\_}(\quad - \quad)$

Check answer:

EXAMPLE Factor out the GCF.

$6x + 12x^3 - 24x^4$

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PRACTICE Factor the GCF out of:

$(\boldsymbol{A})$

$8x + 12$

$(\boldsymbol{B})$

$6x^2 + 9x$

EXAMPLE Factor the GCF from the polynomial.

$10a^3b + 15a^2b^2 + 25ab^3$

PRACTICE Factor the GCF from the polynomial.

$18x^3y^2 - 27x^2y^3 + 9x^4y$

EXAMPLE Factor the following.

$3x(x + 4) - 5(x + 4)$

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Factor Polynomials by Grouping

◆ Some polynomials may not have *one* greatest common factor for _____ the terms.

► Given a four-term polynomial, try *grouping* the terms into two _____ & factoring out the _____ from each pair.

New **Factoring by Grouping**

$$x^3 + 2x^2 + 3x + 6$$

$= (\quad\quad) + (\quad\quad)$

GCF: ___ *GCF: ___*

$= \_\_\_(\_\_\_\_\_) + \_\_\_(\_\_\_\_\_)$

$= (\quad\quad)(\quad\quad)$

HOW TO: Factor by Grouping

1) **Group** terms into 2 pairs
   (rearrange if needed)
2) **Factor** out **GCF** from each pair
3) If the terms share **common binomial**, **factor** it out.
4) Check answer by **multiplying** factors

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PRACTICE Use grouping to factor out the polynomial.

(A)

$xy + 2x + 3y + 6$

(B)

$2ab + 4a + 3b^2 + 6b$

EXAMPLE Completely factor the following by first rearranging the terms.

(A)

$y^2 + 26 + 27y + 156$

(B)

$ab - 2a - 6 + 3b$

EXAMPLE Completely factor the following. *Hint: Always factor out the GCF first.*

$6x^2y + 12xy^2 - 9x - 18y$