

TOPIC: FACTORING BY GCF AND GROUPING

GCF of Terms

◆ To factor something means to rewrite it as a product of two or more numbers or terms. (e.g. $10 = \text{---} \cdot \text{---}$) factors

► Given a list of terms, the **Greatest Common Factor (GCF)** is the _____ of *all* their common prime factors.

Recall	GCF of <i>Numbers</i>	New	GCF of <i>Terms</i>
	$9 \quad \& \quad 54$ Factored $9 = \text{---} \cdot \text{---}$ form: $54 = \text{---} \cdot \text{---} \cdot \text{---} \cdot \text{---}$ GCF: $\text{---} \cdot \text{---} =$		$9t^2 \quad \& \quad 54t$ Factored $9t^2 = \text{---} \cdot \text{---} \cdot \text{---} \cdot \text{---}$ form: $54t = \text{---} \cdot \text{---} \cdot \text{---} \cdot \text{---} \cdot \text{---}$ GCF: $\text{---} \cdot \text{---} \cdot \text{---} =$

EXAMPLE

Determine the GCF of the following list of terms.

$$12a^2, 30a^3, 42a^5$$

◆ We can also define the GCF as the largest factor that evenly _____ out of every term.

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PRACTICE

What is the greatest common factor of the following lists of numbers?

(A) 42, 70, 98

(B) 19, 57

EXAMPLE

Find the GCF of the list of monomials.

a^2b, ab^3, a^3b^2

PRACTICE

What is the greatest common factor of the following sets of monomials?

(A) $6x, 9x^2, 15x^3$

(B) $30m^3n^2, 45m^2n^4, 75m^4n^3$

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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: $= \frac{\quad}{\text{GCF}} (\quad) - \frac{\quad}{\text{GCF}} (\quad)$

Factor GCF out: $= \frac{\quad}{\text{GCF}} (\quad - \quad)$

Check answer:

EXAMPLE

Factor out the GCF.

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

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PRACTICE

Factor the GCF out of:

(A) $8x + 12$

(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

$$x^3 + 2x^2 + 3x + 6$$
$$= (\quad) + (\quad)$$

$\underbrace{\hspace{2cm}}_{\text{GCF: } \underline{\hspace{1cm}}} \quad \underbrace{\hspace{2cm}}_{\text{GCF: } \underline{\hspace{1cm}}}$

$$= \underline{\hspace{1cm}} (\underline{\hspace{2cm}}) + \underline{\hspace{1cm}} (\underline{\hspace{2cm}})$$
$$= (\quad) (\quad)$$

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.*

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