8-2 Factoring by GCF

8-2 Factoring by GCF

Warm Up

Simplify.

1. $2(w + 1)$ $2w + 2$

2. $3x(x^2 - 4)$ $3x^3 - 12x$

Find the GCF of each pair of monomials.

3. $4h^2$ and $6h$ $2h$

4. $13p$ and $26p^5$ $13p$

8-2 Factoring by GCF

Objective

Factor polynomials by using the greatest common factor.

8-2 Factoring by GCF

Recall that the Distributive Property states that $ab + ac = a(b + c)$. The Distributive Property allows you to "factor" out the GCF of the terms in a polynomial to write a factored form of the polynomial.

$$ab + ac = a(b + c)$$

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8-2 Factoring by GCF

Example 1A: Factoring by Using the GCF

Factor each polynomial. Check your answer.

$2x^2 - 4$

$2x^2 = \boxed{2} \cdot x \cdot x$

$4 = \boxed{2} \cdot 2$

2

$2(x^2 - 2)$

Find the GCF.

The GCF of $2x^2$ and 4 is 2.

Write terms as products using the GCF as a factor.

Use the Distributive Property to factor out the GCF.

Check $2(x^2 - 2)$

$2x^2 - 4$ ✓

Multiply to check your answer.

8-2 Factoring by GCF

Writing Math

Aligning common factors can help you find the greatest common factor of two or more terms.

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8-2 Factoring by GCF

Example 1B: Factoring by Using the GCF

Factor each polynomial. Check your answer.

$8x^3 - 4x^2 - 16x$

$8x^3 = 2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x$
$4x^2 = 2 \cdot 2 \cdot x \cdot x$
$16x = 2 \cdot 2 \cdot 2 \cdot 2 \cdot x$

Find the GCF.

The GCF of $8x^3$, $4x^2$, and $16x$ is $4x$.

$2 \cdot 2 \cdot x = 4x$

Write terms as products using the GCF as a factor.

$4x(2x^2 - x - 4)$

Use the Distributive Property to factor out the GCF.

Check $4x(2x^2 - x - 4)$

$8x^3 - 4x^2 - 16x$ ✓

Multiply to check your answer. The product is the original polynomials.

8-2 Factoring by GCF

Example 1C: Factoring by Using the GCF

Factor each polynomial. Check your answer.

$-14x - 12x^2$

$-1(14x + 12x^2)$

$14x = 2 \cdot 7 \cdot x$
$12x^2 = 2 \cdot 2 \cdot 3 \cdot x \cdot x$

Both coefficients are negative. Factor out –1.

Find the GCF.

$2 \cdot x = 2x$

The GCF of $14x$ and $12x^2$ is $2x$.

$-1[2x(7 + 6x)]$

$-2x(7 + 6x)$

Use the Distributive Property to factor out the GCF.

8-2 Factoring by GCF

Caution!

When you factor out −1 as the first step, be sure to include it in all the other steps as well.

8-2 Factoring by GCF

Example 1D: Factoring by Using the GCF

Factor each polynomial. Check your answer.

$3x^3 + 2x^2 - 10$

$3x^3 = 3 \cdot x \cdot x \cdot x$ *Find the GCF.*

$2x^2 = 2 \cdot x \cdot x$

$10 = 2 \cdot 5$

$3x^3 + 2x^2 - 10$

There are no common factors other than 1.

8-2 Factoring by GCF

Check It Out! Example 1a

Factor each polynomial. Check your answer.

$5b + 9b^3$ $b(5+9b^2)$

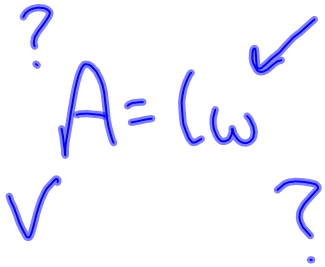
$9d^2 - 8^2$ $9d^2 - 64$

$-18y^3 - 7y^2$ $-y^2(18y+7)$

$8x^4 + 4x^3 - 2x^2$ $2x^2(4x^2+2x-1)$

8-2 Factoring by GCF

To write expressions for the length and width of a rectangle with area expressed by a polynomial, you need to write the polynomial as a product. You can write a polynomial as a product by factoring it.



8-2 Factoring by GCF

Example 2: *Application*

The area of a court for the game squash is $9x^2 + 6x$ m². Factor this polynomial to find possible expressions for the dimensions of the squash court.

$A = 9x^2 + 6x$

$3x(3x+2)$

$3x$ $3x+2$

$l > w$

$l = 3x+2$

$w = 3x$

8-2 Factoring by GCF

Sometimes the GCF of terms is a binomial. This GCF is called a common binomial factor. You factor out a common binomial factor the same way you factor out a monomial factor.

$3x + 5x$

$(3+5)x$

8-2 Factoring by GCF

Example 3: Factoring Out a Common Binomial Factor

Factor each expression.

A. $5(x + 2) + 3x(x + 2)$

$5(x + 2) + 3x(x + 2)$

$(5 + 3x)(x + 2)$

The terms have a common binomial factor of $(x + 2)$.

Factor out $(x + 2)$.

$5x + 3x$

$(5+3)x$

$8x$

B. $-2b(b^2 + 1) + (b^2 + 1)$

$-2b(b^2 + 1) + (b^2 + 1)$

$-2b(b^2 + 1) + 1(b^2 + 1)$

$(b^2 + 1)(-2b + 1)$

The terms have a common binomial factor of $(b^2 + 1)$.

$(b^2 + 1) = 1(b^2 + 1)$

Factor out $(b^2 + 1)$.

$(1-2b)$

8-2 Factoring by GCF

Example 3: Factoring Out a Common Binomial Factor

Factor each expression.

C. $4z(z^2 - 7) + 9(2z^3 + 1)$

$4z(z^2 - 7) + 9(2z^3 + 1)$

There are no common factors.

The expression cannot be factored.

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8-2 Factoring by GCF

Check It Out! Example 3

Factor each expression.

a. $4s(s + 6) - 5(s + 6)$

$(4s-5)(s+6)$

b. $7x(2x + 3) + (2x + 3)$

$(7x+1)(2x+3)$

1 2 3

$3xyz + 5yz - 2xyz^2$

$yz(3x + 5y - 2xz)$

Feb 19-6:39 AM

$30m^3n^2 + 25mp^3 + 25mp^4 + 5mp^4$

$5mp^4\ (6m^2n^2 + 5mp^3 + 5m + 1)$

Feb 19-8:23 AM

$-72x^4 + 16x^3 + 32x^2 - 96x$

$2\ (36x^4 + 8x^3 + 16x^2 - 48x)$

$2 \cdot 4x\ (9x^3 + 2x^2 + 4x - 12)$

$8x$

Feb 19-8:29 AM