

Algebra 1

Our Goal: To learn to factor polynomials by grouping

Warm Up: Fractional exponents review

Today's Homework

- 7.8 Exercises, p.407-408: 4-40 (evens)
- iready, if needed

Previous Homework

7.7 Exercises, p.401: 4-40 (evens)

**Reusable water
bottles contain
more bacteria than
toilet seats do,
says study**

Angelica Stabile | Fox News
Published on March 15, 2023

$$\begin{aligned} & 9x^2 - 4 \\ & (3x)^2 - (2)^2 \\ & (3x + 2)(3x - 2) \end{aligned}$$

$$64x^2 - 64$$

$$64(x^2 - 1)$$

$$\boxed{64(x+1)(x-1)}$$

$$2 \begin{array}{r} 18 \\ 1 \\ 9 \\ 1 \\ 3 \end{array}$$

$$x^{16} - 1 \quad (x^2)^2$$

$$(x^8 + 1)(x^8 - 1)$$

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

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

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

$a^2 + b^2$ prime

$$(a+b)(a+b)$$
$$a^2 + 2ab + b^2$$

$$y \times y = 25$$

$$39^2 - 36^2$$

$$75 \cdot 3 (39+36)(39-36)$$

$$225$$

$$3x^2 - 75$$

$$3(x^2 - 25)$$

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

Evaluate the expression.

1. $64^{1/6}$

2. $(-27)^{2/3}$

3. $(256)^{3/8}$

4. $(\sqrt{4})^2$

5. $(-64)^{4/3}$

6. $216^{1/3}$

$$\sqrt[6]{64} = x$$

$$x^6 = 64$$

Core Concept

Factoring by Grouping

To factor a polynomial with four terms, group the terms into pairs. Factor the GCF out of each pair of terms. Look for and factor out the common binomial factor.

This process is called **factoring by grouping**.

Factor each polynomial by grouping.

a. $x^3 + 3x^2 + 2x + 6$

b. $x^2 + y + x + xy$

$$\begin{aligned} & (x^3 + 3x^2) + (2x + 6) \\ & x^2(x+3) + 2(x+3) \\ & (x+3)(x^2 + 2) \end{aligned}$$

Factor each polynomial by grouping.

a. $x^3 + 3x^2 + 2x + 6$

b. $x^2 + y + x + xy$

Handwritten solution for problem b:

$$(x^2 + y) + (x + xy)$$

$$x^2 + (y + x + xy)$$

$$(x^2 + x) + (y + xy)$$

$$x(x+1) + y(1+x)$$

$$(x+1)(x+y)$$

Factor the polynomial by grouping.

1. $a^3 + 3a^2 + a + 3$

2. $y^2 + 2x + yx + 2y$

Handwritten solutions for problems 1 and 2:

1. $a^2(a+3) + (a+3)$
 $(a+3)(a^2+1)$

2. $(y^2 + 2y) + (2x + yx)$
 $y(y+2) + x(2+y)$
 $(y+2)(x+y)$

Factor a. $3x^3 + 6x^2 - 9x$

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

$$3x(x+3)(x-1)$$

b. $7x^4 - 28x^2$

$$7x^2(x^2 - 4)$$

$$7x^2(x+2)(x-2)$$

Solve. $2x^3 + 8x^2 = 10x$

$$2x^3 + 8x^2 - 10x = 0$$

$$2x(x^2 + 4x - 5) = 0$$

$$2x(x+5)(x-1) = 0$$

$$x = 0, -5, 1$$

$3x^5 - 6x^4 - 45x^3 = 0$

$$x+5=0$$

$$x=-5$$

$$3x^5 - 6x^4 - 45x^3 = 0$$

$$3x^2(x^3 - 2x^2 - 15x) = 0$$

$$x = 0, 5, -3$$

Factor the polynomial completely.

3. $3x^3 - 12x$

4. $2y^3 - 12y^2 + 18y$

5. $m^3 - 2m^2 - 8m$

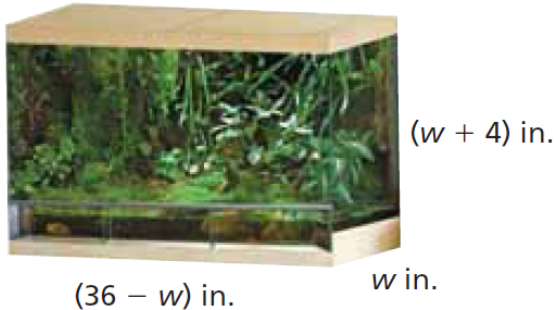
Solve the equation.

6. $w^3 - 8w^2 + 16w = 0$

7. $x^3 - 25x = 0$

8. $c^3 - 7c^2 + 12c = 0$

A terrarium in the shape of a rectangular prism has a volume of 4,608 cubic inches. Its length is more than 10 inches. The dimensions of the terrarium in terms of its width are shown. Find the length, width, and height of the terrarium.



9. A box in the shape of a rectangular prism has a volume of 72 cubic feet. The box has a length of x feet, a width of $(x - 1)$ feet, and a height of $(x + 9)$ feet. Find the dimensions of the box.