Algebra 2 5.1 *Algebra 1 Ch. 8

Multiply, divide, and simplify monomials and power expressions*
Add, subtract, and multiply monomials*

base $5 \cdot 5 \cdot 5 \cdot 5 = 5^4$
exponent (power)
monomial number, var., product x
polynomial
simplify - (expon)
degree (of a polynomial)
terms $2x^2 + 5x - 7n + 4$
like terms $2x^1 + 5x^1 = 7x$
distributive property

$3x^2 + -2x^2 + 4x^2$
$5x^2$

whiteboards
triangle puzzles

$3n^1 + 8$

$x^2 + 3x^1 + 7$

7

$5n^9$

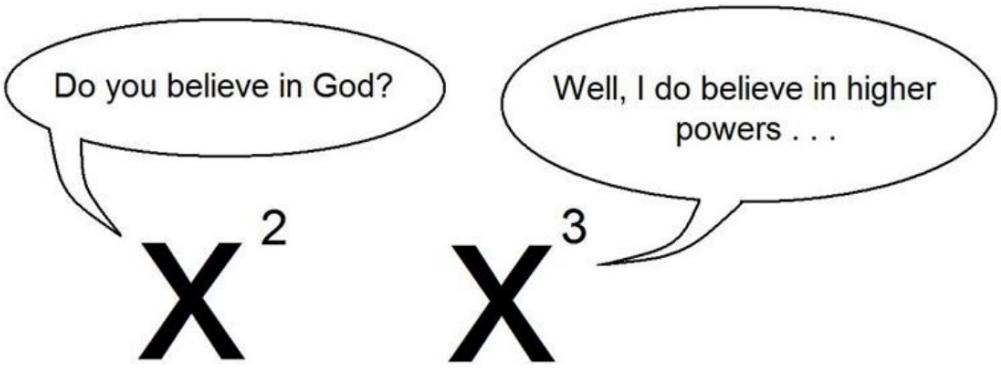
$2 + 3 + 1$

$3x^2y^3n^1$

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

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

$2x^2 + 6x + 12$


Do you believe in God?
Well, I do believe in higher powers . . .
X 2
X 3

"multiplicative inverse" = reciprocal

$$\frac{2}{5} \cdot \frac{5}{2} = \frac{10}{10} = 1$$

$$\frac{a}{b} \cdot \frac{b}{a} = \frac{a \cdot b}{b \cdot a} = \frac{ab}{ab} = 1$$

p.303

Property
Product of Powers
Quotient of Powers
Negative Exponent (recip)
Power of a Power
Power of a Product
Power of a Quotient
Zero Power

$a^2 \cdot a^3 = a^5$

$a \cdot a \cdot a \cdot a \cdot a = a^5$

$\frac{n^5}{n^3} = \frac{n n n n n}{n n n} = 1 \cdot n^2 = n^2$

$x^{-3} = \frac{1}{x^3}$

$(y^3)^2 = (yyy) \cdot (yyy) = y^6$

$(3n)^4 = (3n)(3n)(3n)(3n) = 3^4 n^4 = 81n^4$

$\left(\frac{x}{a}\right)^3 = \left(\frac{x}{a}\right)\left(\frac{x}{a}\right)\left(\frac{x}{a}\right) = \frac{x^3}{a^3}$

$(\ )^0 = 1$

$\frac{3^3}{3^3} = \frac{27}{27} = 1$

$3^{3-3} = 3^0 = 1$

17-6 1 pm

$(3^n)^2$

KeyConcept Simplifying Monomials

A monomial expression is in simplified form when:

- there are no powers of powers,
- each base appears exactly once,
- all fractions are in simplest form, and
- there are no negative exponents.

↑ recipr.

- no zero expon.

b. $\frac{q^2r^4}{q^7r^3}$

$= \frac{r}{q^5}$

$q^{-5}r^1$

$\frac{r}{q^5}$

Example 1 Simplify Expressions

Simplify each expression. Assume that no variable equals 0.

a. $(2a^{-2})(3a^3b^2)(c^{-2})$

$6a^{-2}a^3b^2c^{-2}$

$\frac{6ab^2}{c^2}$

1. negative exponents (reciprocal)
2. expand
3. divide out common factors

no parentheses
no negative exponents
terms are collected

c. $\left(\frac{-2a^4}{b^2}\right)^3$

$\left(\frac{-2a^4}{b^2}\right)\left(\frac{-2a^4}{b^2}\right)\left(\frac{-2a^4}{b^2}\right)$

$\frac{-8a^{12}}{b^6}$

GuidedPractice

1A. $(2x^{-3}y^3)(-7x^5y^{-6})$

$$\frac{-14x^2}{y^3}$$

1B. $\frac{15c^5d^3}{-3c^2d^7}$

$$\frac{-5c^3}{d^4}$$

1C. $\left(\frac{a}{4}\right)^{-3}$

$$\frac{a^{-3}}{4^{-3}} \qquad \frac{4^3}{a^3} = \frac{64}{a^3}$$

1D. $(-2x^3y^2)^5$

StudyTip

Power of 1 Remember that a variable with no exponent indicated can be written as a power of 1.

2 Operations With Polynomials

The **degree of a polynomial** is the degree of the monomial with the greatest degree.

Example 2 Degree of a Polynomial

Determine whether each expression is a polynomial. If it is a polynomial, state the degree of the polynomial.

a. $\frac{1}{4}x^4y^3 - 8x^5$

yes

$d = 7$

b. $\sqrt{x} + x + 4$

$x^{\frac{1}{2}}$

c. $x^{-3} + 2x^{-2} + 6$

GuidedPractice

2A. $\frac{x}{y} + 3x^2$

2B. $x^5y' + 9x^4y^3 - 2xy'$

x^1y^{-1}

$y \cdot 5$

$a = 7$

Like terms

Example 3 Simplify Polynomial Expressions

Simplify each expression.

a. $(4x^2 - 5x + 6) + -1(2x^2 + 3x - 1)$

$4x^2 - 5x + 6 - 2x^2 - 3x + 1$

$2x^2 - 8x + 7$

b. $(6x^2 - 7x + 8) + (-4x^2 + 9x - 5)$

$2x^2 - 2x + 3$

GuidedPractice

3A. $(-x^2 - 3x + 4) - (x^2 + 2x + 5)$

3B. $(3x^2 - 6) + (-x + 1)$

Example 4 Simplify by Using the Distributive Property

Find $3x(2x^2 - 4x + 6)$.

GuidedPractice

Find each product.

4A. $\frac{4}{3}x^2(6x^2 + 9x - 12)$

$\frac{4}{3} x^2 \cdot 6x^2$

$8x^4$

4B. $-2a(-3a^2 - 11a + 20)$

triangle puzzles