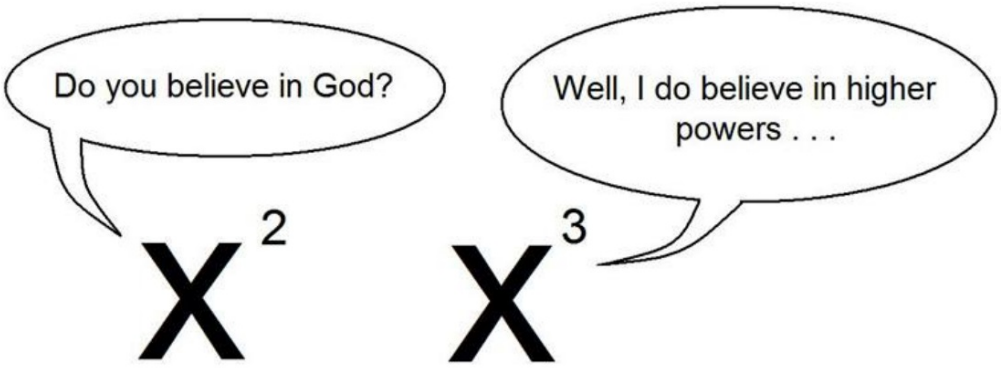
Algebra 2 5.1 *Algebra 1 Ch. 8

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

base
exponent (power)
monomial number, variable, product
polynomial mult. monomials
simplify
degree (of a polynomial) (bi=2) (tri=3)
terms
like terms
distributive property

whiteboards
triangle puzzles


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

multiplicative inverse = reciprocal

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

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

p.303

Property
Product of Powers
Quotient of Powers
Negative Exponent
Power of a Power
Power of a Product
Power of a Quotient
Zero Power

$a^3 \cdot a^5 = (a \cdot a \cdot a)(a \cdot a \cdot a \cdot a \cdot a) = a^8$

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

$b^{-3} = \frac{1}{b^3}$ $\frac{1}{n^4} = n^{-4}$

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

$(a^2b^3)^4 = a^8b^{12}$

$\left(\frac{x^2}{y^3}\right)^2 = \frac{(xx)(xx)}{(yyy)(yyy)} = \frac{x^4}{y^6}$

$a^0 = 1$

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

p. 304

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.

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

zero exp.

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

$6a^{1}b^{2}c^{-2} = \frac{6ab^{2}}{c^{2}}$

-1

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

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

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

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

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

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

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

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 $d=7$

$d=7$ $d=5$

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

no

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

GuidedPractice

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

2B. $x^5y^1 + 9x^4y^3 - 2x^1y^1$

no

6 7 2

$d = 7$

Like terms = same var. same exp.

Example 3 Simplify Polynomial Expressions

Simplify each expression.

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

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

$2x^2 - 8x + 7$

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

$3x \cdot 2x^2 \quad 3x \cdot -4x \quad 3x \cdot 6$

$6x^3 - 12x^2 + 18x$

GuidedPractice

Find each product.

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

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

$\frac{4}{3}x^2 \cdot \frac{6x^2}{1} + \frac{4}{3}x^2 \cdot \frac{9x}{1} + \frac{4}{3}x^2 \cdot \frac{-12}{1}$

$8x^4 + 12x^3 - 16x^2$

triangle puzzles

17-610