Section P.2 Integer Exponents

Objectives

- Evaluate algebraic expressions
- Define positive and negative exponents
- Simplify expressions involving exponents

Algebraic Expressions

Variable- a letter that represents a number

x, y

Algebraic Expression-- a combination of variables and numbers separated by addition, subtraction, multiplication, and division

$2x+6$ x^2-3x+7

Evaluating an Algebraic Expression

Example: Evaluate each expression if $x = 2$ and $y = -5$.

a. $x + 7y$ $= 2 + 7(-5) = 2 + -35 = -33$

multiplication

b. $10xy$ $= 10(2)(-5) = -100$

c. $\frac{-4x}{1-6y}$ $= \frac{-4(2)}{1-6(-5)} = \frac{-8}{1-(-30)} = \frac{-8}{1+30} = \frac{-8}{31}$

Positive Integer Exponents

exponent

$a^n = \underbrace{a \cdot a \cdot \cdots a}_{n \text{ times}}$

base

$2^3 = 2 \cdot 2 \cdot 2 = 8$

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3 = 81$

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

base = -3

$-3^4 = -3 \cdot 3 \cdot 3 \cdot 3 = -81$

base = 3

Zero as an Exponent

$a^0 = 1$

$\frac{x^{-2}}{5y^{-3}} = \frac{y^3}{5x^2}$

Negative Integer Exponents

$a^{-n} = \frac{1}{a^n}$

reciprocal

Properties of Exponents

$a^m a^n = a^{m+n}$ add exponent

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

$(a^m)^n = a^{mn}$ power to a power rule multiply exponents

$(x^2)^3 = x^2 \cdot x^2 \cdot x^2 = x \cdot x \cdot x \cdot x \cdot x \cdot x = x^6$ (x^2: base)

$(ab)^m = a^m b^m$

$(xy)^5 = x^5 y^5$

$\frac{a^m}{a^n} = a^{m-n}$

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

$\frac{x^6 y^5}{x^2 y^1} = x^4 y^4$

$\frac{a^6 b^7}{a^{13} b^4} = \frac{b^3}{a^7}$

①

② $a^{6-13} \cdot b^{7-4} = a^{-7} b^3 = \frac{b^3}{a^7}$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$\left(\frac{2}{3}\right)^4 = \frac{2}{3}\cdot\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{2}{3} = \frac{2^4}{3^4} = \frac{16}{81}$$

Writing Expressions so that all Exponents are Positive

Example: $(4y^5)^2$

Example: $(4y^5)^{-2}$ $= \frac{1}{(4y^5)^2} = \frac{1}{16y^{10}}$

Example: $(x^{-1}y)^3$ $= \frac{y^3}{x^3}$

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

Example: $\left(\frac{5x^2}{2y^2}\right)^{-3}$ $= \frac{5^{-3}x^{-6}}{2^{-3}y^{-6}} = \frac{2^3y^6}{5^3x^6} = \frac{8y^6}{125x^6}$

$\left(\frac{2y^2}{5x^2}\right)^3 = \frac{2^3y^6}{5^3x^6} = \frac{8y^6}{125x^6}$

Example: $\left(\frac{5x^2y^3}{2x^7y^2}\right)^{-3}$ $= \left(\frac{2x^7y^2}{5x^2y^3}\right)^3 = \left(\frac{2^1x^5}{5^1y^1}\right)^3$

reciprocal

$= \frac{2^3x^{15}}{5^3y^3} = \frac{8x^{15}}{125y^3}$

Example: $\frac{(5yz)^{-2}}{2^3x^4y}$

Class Exercises: 18, 22, 26, 30, 34, 36

Homework: Section R.2: 1 – 37 (every other odd: 1, 5, 9....)
Also, please buy or rent a calculator

**Please remember to check your answers in the back of the book

On Thursday, if you have any questions about the material, please write the problem number on the board. I will go over several of the most requested problems.