Section Overview

Professional Development

Integer Exponents — Lesson 7-1

Why? Integer exponents are used to express measurements in biology and manufacturing.

For $x \neq 0$ and $n > 0$:

$x^0 = 1$ $\quad 0^0$ is undefined.

$x^{-n} = \frac{1}{x^n}$ $\quad 0^{-n}$ is undefined.

$\frac{1}{x^{-n}} = x^n$ $\quad \frac{1}{0}$ is undefined.

$$(-2)^{-4} = \frac{1}{(-2)^4} = \frac{1}{(-2)(-2)(-2)(-2)} = \frac{1}{16}$$

$$-2^{-4} = -\frac{1}{2^4} = -\frac{1}{2 \cdot 2 \cdot 2 \cdot 2} = -\frac{1}{16}$$

Powers of 10 and Scientific Notation — Lesson 7-2

Why? Powers of 10 and scientific notation can be used to read and write very large and very small numbers.

Multiplying by Powers of 10

23.67×10^5 → 2 3.6 7 0 0 0 → 2,367,000

12.8×10^{-4} → 0 0 1 2.8 → 0.00128

Scientific Notation

$a \times 10^b$

$1 \leq a < 10$; b is an integer.

$1.67 \times 10^{12} = 1{,}670{,}000{,}000{,}000$

$8.75 \times 10^{-6} = 0.00000875$

Multiplication and Division Properties of Exponents — Lessons 7-3, 7-4

Why? Multiplication and division properties of exponents are used to solve problems involving scientific notation.

Properties of Exponents		
Product of Powers Property	$a^m a^n = a^{m+n}$	Example: $y^2 \cdot y^6 \cdot y = y^{2+6+1} = y^9$
Power of a Power Property	$(a^m)^n = a^{mn}$	Example: $(x^6)^2 = x^{6 \cdot 2} = x^{12}$
Power of a Product Property	$(ab)^n = a^n b^n$	Example: $(4t^3)^2 = 4^2 \cdot (t^3)^2 = 16t^6$
Quotient of Powers Property	$\frac{a^m}{a^n} = a^{m-n}$	Example: $\frac{3^7 b^5}{3^2 b^4} = 3^{7-2} b^{5-4} = 3^5 b$
Positive Power of a Quotient Property	$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	Example: $\left(\frac{2x^2y^3}{z^4}\right)^3 = \frac{(2x^2y^3)^3}{(z^4)^3} = \frac{2^3(x^2)^3(y^3)^3}{(z^4)^3} = \frac{8x^6y^9}{z^{12}}$
Negative Power of a Quotient Property	$\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}$	Example: $\left(\frac{4x^6y^2}{z}\right)^{-4} = \left(\frac{z}{4x^6y^2}\right)^4 = \frac{z^4}{4^4x^{24}y^8} = \frac{z^4}{256x^{24}y^8}$