

RULES OF EXPONENTS

OVERVIEW: WHAT IS AN EXPONENT?

A base number raised to a power (exponent) represents repeated multiplication of the base.

Base^{Exponent} = Product

$$2^3 = 2 \times 2 \times 2 = 8$$

Examples:

$$10^2 = 100, \text{ e.g., } 5^1 = 5$$

Zero Exponent Rule:

$$b^0 = 1 \quad (\neq 0)$$

Negative Exponent Rule:

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

Identity Rule:

$$b^1 = b$$

MULTIPLICATION RULE

Keep Base, Add Exponents

$$b^m \times b^n = b^{m+n}$$

$$2^3 \times 2^2 = 2^{3+2} = 2^5 = 32$$

$$x^4 \times x^3 = x^{4+3} = x^7$$

DIVISION RULE

Keep Base, Subtract Exponents

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

$$5^4 / 5^2 = 5^{4-2} = 5^2 = 25$$

$$y^6 / y^3 = y^{6-3} = y^3$$

POWER OF A POWER RULE

Keep Base, Multiply Exponents

$$(b^m)^n = b^{m \times n}$$

$$(3^2)^3 = 3^{2 \times 3} = 3^6 = 729$$

$$(a^5)^2 = a^{5 \times 2} = a^{10}$$

FRACTIONAL EXPONENT RULE

Root of Power, Power of Root

$$b^{m/n} = \sqrt[n]{(b^m)} = (\sqrt[n]{b})^m$$

$$4^{3/2} = \sqrt{(4^3)} = \sqrt{64} = 8$$

$$8^{2/3} = (\sqrt[3]{8})^2 = 2^2 = 4$$