

## Exponent and Radical Rules

**Adding with exponents:** You can only add exponents if they have like terms.

$$\text{Example: } 4x^2 + 5x^2 = 9x^2$$

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

**Subtracting with exponents:** You can only subtract exponents if they have like terms.

$$\text{Example: } 9m^2 - 7m^2 = 2m^2$$

$$9m^2 - 7m = 9m^2 - 7m$$

**Multiplying with exponents:** When multiplying, **combine** the terms and **add** the exponents.

$$\text{Example: } 2y^2 \times 2x^2 = 2xy^4$$

**Multiplying with parentheses: 1<sup>st</sup> Step**—Multiply through the parentheses.

$$\text{Example: } (2x + 2y)(x + y) = 2x \times x = 2x^2$$

$$2x \times y = 2xy$$

$$2y \times x = 2xy$$

$$2y \times y = 2y^2$$

*Or*

$$2x^2 + 2xy + 2xy + 2y^2$$

**2<sup>nd</sup> Step**—Add all like terms

$$\text{Example: } 2x^2 + 2xy + 2xy + 2y^2 = 2x^2 + 4xy + 2y^2$$

**Dividing with exponents:** When dividing, divide the numbers **and then** subtract the exponents.

$$\text{Example: } 4w^3 \div 2w = 4 \div 2 = 2$$

$$w^3 - w = w^2$$

*Or*

$$4w^3 \div 2w = 2w^2$$

**Square roots with exponents:** Always, find the square of the number **and then** multiply the exponent by  $\frac{1}{2}$ .

$$\text{Example: } \sqrt{81^4} = 9 \times 9 \qquad \frac{4}{1} \times \frac{1}{2} = \frac{4}{1} \times \frac{1}{2} = \frac{2}{1} = 2$$

*Or*

$$\sqrt{81^4} = 9^2$$

**Square roots with exponents:** If you cannot divide the exponent by  $\frac{1}{2}$  leave it inside of the radical symbol.

$$\text{Example: } \sqrt{25y^5} = 5 \times 5 \qquad \frac{5}{1} \times \frac{1}{2} \neq \text{(exponents cannot equal a fraction)}$$

*Or*

$$\sqrt{25y^5} = 5\sqrt{y^5}$$

**Cubed roots with exponents:** Always, find the cubed root of the number **and then** multiply the exponent by  $\frac{1}{3}$ .

$$\text{Example: } \sqrt[3]{64^6} = 4 \times 4 \times 4 \qquad \frac{6}{1} \times \frac{1}{3} = \frac{6}{1} \times \frac{1}{3} = \frac{2}{1} = 2$$

*Or*

$$\sqrt[3]{64^6} = 4^2$$

**Cubed roots with exponents:** If you cannot divide the exponent by  $\frac{1}{3}$  leave it inside of the radical symbol.

$$\text{Example: } \sqrt[3]{125x} = 5 \times 5 \times 5 \qquad \frac{1}{1} \times \frac{1}{3} \neq \text{(exponents cannot equal a fraction)}$$

*Or*

$$\sqrt[3]{125x} = 5\sqrt[3]{x}$$

**Multiplying with even and odd exponents.**

$$-x^2 = +$$

$$\text{Example: } -2^2 = -2 \times (-2) = 4$$

$$-x^3 = -$$

$$\text{Example: } -2^3 = -2 \times (-2) \times (-2) = -8$$

**(If the number is negative: even exponents will produce a positive answer and odd exponents will produce a negative answer).**