

## Exponent Rules

- When **multiplying two numbers** with the same base, **add exponents**.
  - Example:  $2^2 * 2^3 = (2*2)*(2*2*2) = 2^5 = 2^{2+3}$ .
- When **dividing two numbers** with the same base, **subtract exponents**.
  - Example:  $\frac{2^5}{2^2} = \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2} = 2^3 = 2^{5-2}$ .
- When raising a **power to a power**, **multiply exponents**.
  - Example:  $(2^2)^3 = (2*2)^3 = (2*2)*(2*2)*(2*2) = 2^6 = 2^{2*3}$ .
- A **negative exponent** means “flip it over” (reciprocal) and raise to the power. It doesn’t have anything to do with positive or negative numbers.
  - Example:  $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$
- The denominator (bottom) of a **fractional exponent** means “take a root”. The numerator (top) of a fractional exponent means “raise to a power”.
  - Example:  $2^{\frac{1}{3}} = \sqrt[3]{2}$
  - Example:  $4^{\frac{3}{2}} = (\sqrt{4})^3 = (2)^3 = 8$
- Tips:
  - If you are **adding two numbers** with the same base, the only thing you can do is factor out a common term. Example:  
 $2^3 + 2^2 = 2^2(2^1 + 1) = 2^2(3) = 12$ . It does not =  $2^5!!!$
  - Any exponent affects only the thing to its **direct left**.
    - Example:  $-2^4 = -16$  (the exponent affects the 2, not the negative)
    - Example:  $(-2)^4 = +16$  (the exponent affects the parentheses, which includes the negative).