7.3
DEFINE AND USE ZERO AND NEGATIVE EXPONENTS

Zero Power

- Anything raised to the zero power is ONE.
- EX: $3^0 = 1$

  $x^0 = 1$
- WHY:

$\frac{4^3}{4^3} = 1$ ← * Any divided by itself is one.

$\frac{4^3}{4^3} = 4^0$ ← * When dividing like bases subtract exponents.

* Therefore: $4^0 = 1$

Negative Exponents

- When you have a negative exponent in the numerator:
  - Put it in the denominator and make it positive.
  - EX: $5^{-3} = \frac{1}{5^3}$
- When you have a negative exponent in the denominator:
  - Put it in the numerator and make it positive.
  - EX: $\frac{1}{3^{-2}} = 3^2$
- NOTE: Negative exponents represent small numbers.

EX:

Evaluate the expression.

→ As much as possible. Multiply out all numbers.

- Write your answer using only positive exponents.

* $\left(\frac{2}{3}\right)^0$

1

* $\left(\frac{1}{5}\right)^{-2}$

$\frac{1^{-2}}{5^{-2}}$

$\frac{5^2}{1^2}$

25

* $16\left(\frac{2^{-3}}{2^2}\right)$

$16\left(\frac{1}{2^2 \cdot 2^3}\right)$

$16\left(\frac{1}{2^5}\right)$

$1\cancel{16}\left(\frac{1}{\cancel{32}\ 2}\right)$

$\frac{1}{2}$

* $(-8)^{-2}$

$\frac{1}{(-8)^2}$

$\frac{1}{64}$

* $\left(4^{-7} \cdot 4^3\right)$

4^{-4}

$\frac{1}{4^4}$

$\frac{1}{256}$

* 0^{-3}

$\frac{1}{0^3}$

$\frac{1}{0}$

Undefined

EX:

Simplify the expression.

- Write your answer using only positive exponents.

* $(2xy^{-5})^3$

$(2)^3 x^3 (y^{-5})^3$

$8x^3y^{-15}$

$\frac{8x^3}{y^{15}}$

* $\frac{(2x)^{-2}y^5}{-4x^2y^2}$

$\frac{2^{-2}x^{-2}y^5}{-4x^2y^2}$

$\frac{y^5}{2^2x^2(-4x^2y^2)}$

$\frac{y^5}{4x^2(-4x^2y^2)}$

$\frac{y^{5-3}}{-16x^4y^2}$

$\frac{y^3}{-16x^4}$

EX:

- The mass of one peppercorn is about 10^{-2} gram. About how many peppercorns are in a box containing 1kilogram of peppercorns?

* $1\ kg = 1000g = 10^3 g$

$$\frac{\text{Total Mass}}{\text{Individual Mass}} = \#$$

$$\frac{10^3}{10^{-2}}$$

$10^3 \cdot 10^2$

10^5 peppercorns