

# MODULE 4: EXPONENTS

*"I DON'T REGRET THE THINGS I'VE DONE, I REGRET THE THINGS I DIDN'T DO WHEN I HAD THE CHANCE."*

## 4.1 PROPERTIES OF POSITIVE EXPONENTS

An example of an exponent problem is  $x^2$ :

"x" is the \_\_\_\_\_, and "2" is the \_\_\_\_\_.

If there is no exponent assume the number \_\_\_\_\_ (1<sup>st</sup> power).

Simplify exponential expressions with the same \_\_\_\_\_.

Ex.  $3^2 \cdot 3^8$

Do these have the same base? \_\_\_\_\_.

Ex.  $2^4 \cdot 4^2$

Do these have the same base? \_\_\_\_\_.

### Properties of Exponents: Multiplication Rule

When exponential expressions, of the same base are multiplied together (side by side): \_\_\_\_\_ the exponents together.

Ex. simplify  $(-5)^6(-5)^8$

Ex. simplify  $x^5 x^3$

Ex. simplify  $x^7 y^2 x^6 y$

Note: When using properties of exponents, only change the exponent. Do not change anything about the common base.

Note: multiply numbers to numbers and letters to letters.

Ex.  $(4 a^7 b^3)(-3 a^2 b)$

Ex.  $(x - 4)^3(x - 4)^5$

### Properties of Exponents: Division Rule

When exponential expression of the same base are divided together (fraction): \_\_\_\_\_ the exponents from each other (always from the bigger number).

Ex. simplify  $\frac{(-3)^7}{(-3)^4}$

Ex. simplify.  $\frac{x^5}{x^2}$

Ex. simplify  $\frac{10x^{12}y^9z^4}{2x^8yz^4}$

Ex. simplify  $\frac{-6a^3b^5}{9a^4b^5c^4c^2}$

## Properties of Exponents: Power Rule

When raising exponential expression to a power (another exponent): \_\_\_\_\_ the exponents together.

Ex. simplify  $(10^5)^{12}$

Ex. simplify  $(x^3)^7$

Note: Distribute exponent to the coefficient and each variable

Ex. simplify  $(2x^3y^4z)^3$

Ex. simplify  $(-3a^2b^8)^4$

Ex. simplify  $\left(\frac{3a^5b^2}{2c^4}\right)^2$

## First Power Exponents

Anything to \_\_\_\_\_ stays the same.

Ex.  $x^1$

Ex.  $249820^1$

Note: The first power is never written, it is assumed to be there

## 4.2 ZERO AND NEGATIVE

### Zero Exponent

Any exponential expression to the zero power, equals \_\_\_\_\_.

Ex. simplify  $(x^3)^0$

Ex. simplify  $\left(\frac{3a^5b^2}{2c^4}\right)^0$

Ex. simplify  $x^0 + 2$

Note: Which part of the expression has the zero power?

Ex. simplify  $3x^0$

Ex. simplify  $(2x^5y^0)^3$

Ex. simplify  $(5a^5b^3)^0(4a^6b^0)$

### Negative Exponents

Make negative exponents positive by \_\_\_\_\_  
the base to the other side.

If it is on the top it moves to the \_\_\_\_\_ (denominator).

If it is on the bottom it moves to the \_\_\_\_\_ (numerator).

Note: If it is not written as a fraction, make it a fraction

Rewrite all \_\_\_\_\_ exponents as \_\_\_\_\_ .

Ex. simplify  $6^{-3}$

Ex. simplify  $\frac{1}{7^{-2}}$

Ex. simplify  $(-4)^{-1}$

Ex. simplify  $\frac{x^{-2}y^5}{z^{-1}}$

Ex. simplify  $\frac{-3x^5y^{-2}z^{-1}}{x^{-2}y^{-4}z^4}$

Ex. simplify  $\left(\frac{3x^{-2}y^0}{z^5}\right)^{-2}$

Ex. simplify  $\left(\frac{12a^0x^5y^{-3}z^{-1}}{4x^{12}y^6z^{-9}}\right)^{-2}$

#### Homework Checklist

- Section 4.1 Properties of Positive Exponents*
- Section 4.2 Exponents: Zero and Negative*