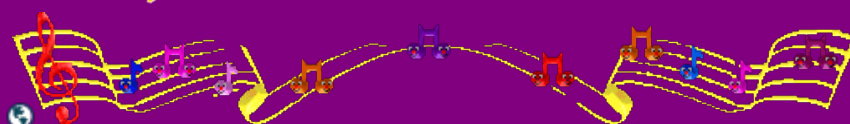
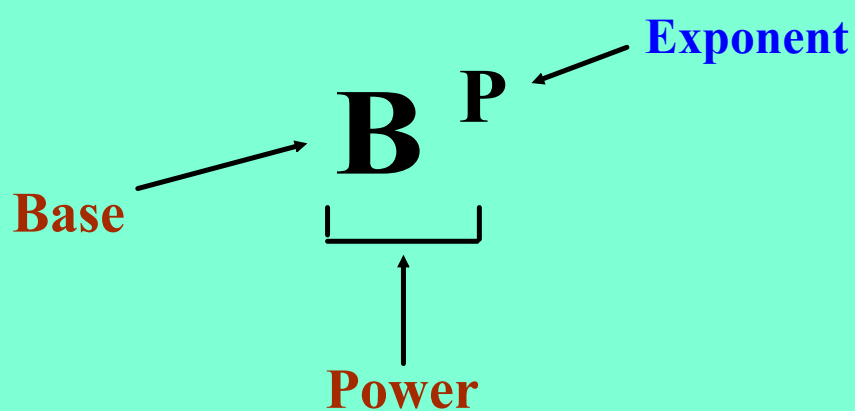


# Exponent Laws



## Laws of Exponents



Example: Identify the base and the exponent for each expression

a)  $4^3$

Base:

4

Exponent:

3

b)  $7^{23}$

Base:

7

Exponent:

23

c)  $a^b$

Base:

a

Exponent:

b

## Laws Of Exponents



### *Law #1:*

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

- when multiplying powers with the same base you add the exponents

Examples:  $5^3 \times 5^6 = \quad =$

$$(z^6)(z^4) = \quad =$$

### **Exercise:**

**Simplify the following using the laws of exponents**

a)  $3^2 \times 3^4$

b)  $4^3 \times 3^4$

c)  $(q^7)(q)$

d)  $p \times p^3 \times p^2$

e)  $(2x^3)(4x^2)$

f)  $(3z^3)(6z^{12})$

$$\text{Law \#3: } (b^m)^n = b^{mn}$$

$$\text{Law \#4: } (ab)^m = a^m b^m$$

- when brackets are involved you must multiply the exponents

Examples:

$$(5^3)^5 = \quad =$$

$$(m^8)^4 = \quad =$$

$$(e^2 f)^3 = \quad =$$

Exercise:

Simplify the following using Laws of Exponents

a)  $(m^3)^4$

b)  $(x^2 y^4)^3$

c)  $(2d^3)^3$

d)  $(2m^4 n)^2 (m^3 n^2)$

**Law #2:  $b^m \div b^n = b^{m-n}$** 

- when dividing powers with the same base you subtract the exponents

Examples:

$$7^5 \div 7^2 = \quad =$$

$$\frac{10e^{13}}{e^4} = \quad =$$

Exercise:

Simplify the following using exponent laws

a)  $5^{23} \div 5^{12}$

b)  $\frac{x^{34}}{x^{19}}$

c)  $c^3 \div e^2$

d)  $\frac{12x^3}{4x}$

e)  $\frac{25c^{30}}{5c^{23}}$

**Law #5:**  $\left(\frac{a}{b}\right)^n = \left(\frac{a^n}{b^n}\right)$

**Examples:**  $\left(\frac{2}{3}\right)^5 =$

**Law #6:**  $b^{-m} = \frac{1}{b^m}$

**Examples:**

$$6^{-2}$$

$$\text{Law \#7: } \left(\frac{a}{b}\right)^{-n} = \left(\frac{b^n}{a}\right)$$

**Examples:**

$$\left(\frac{3}{4}\right)^{-3} =$$



*Law #8:  $b^0 = 1$*

- any power raised to the exponent 0 (zero) is equal to 1

$$(-6)^0 = 1$$

$$x^{-3} = \frac{1}{x^3}$$

$$\frac{x^{-3}}{y^{-2}} = \frac{y^2}{x^3}$$



i)

$$\frac{[2u^3 v^3] \cdot (3u^2)^2}{2u^2}$$

$$\frac{(2u^3 v^3) (9u^4)}{2u^2}$$

$$\frac{18 u^7 v^3}{2u^2}$$

$$= 9u^5 v^3$$

$$\frac{(4xy^2)^3}{(4y^3)^4 \cdot 2y^{-3}}$$

3. Use the laws of exponents to simplify the following (Express all answers with positive exponents)  
(18)

a)  $[(-2x^3y)(5x^3y^4)]^{-3}$

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

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$$c) \left( \frac{4p^2}{q^6} \right)^{-3}$$

$$d) \frac{(3x^2y^3)(2x^3y^9)^3}{2x^{-2}y}$$



# Polynomials



Expand and simplify:

i)  $3x(x^2 - 7x + 5)$

ii)  $(2x-7)(3x^2 - 4y + 6)$

iii)  $(4x-5)^2$

iv)  $(2x)(x-3) - (5x)(x+1)$

