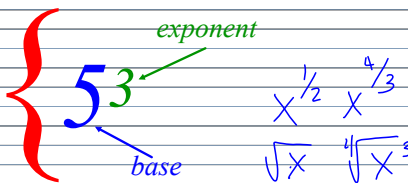


The Laws of Exponents

Objective: Students will be able to use the laws of exponents to simplify problems.

Exponents

Power



Example: $125 = 5^3$ means that 5^3 is the exponential form of the number 125.

5^3 means 3 factors of 5 or $5 \times 5 \times 5$

The Law of Exponents:

#1: **Exponential form:** the exponent of a power indicates how many times the base multiplies itself.

$$x^n = x \cdot x \cdot x \cdot x \cdot \dots$$

n factors of x n-times

Example: $5^3 = 5 \cdot 5 \cdot 5$

#2 **Multiplying powers:** If you are multiplying Powers with the same base, KEEP the BASE & ADD the EXPONENTS!

$$x^m \cdot x^n = x^{m+n}$$

When you multiply Powers, you add the exponents!

$$2^6 \cdot 2^3 = 2^{6+3} = 2^9 = 512$$

$$3^4 = 81$$

$$3^5 = 243$$

#3: **Dividing Powers:** When dividing Powers with the same base, KEEP the BASE & SUBTRACT the EXPONENTS!

$$\frac{x^m}{x^n} = x^m \div x^n = x^{m-n}$$

When you divide Powers, you subtract the exponents!

$$\frac{2^6}{2^2} = 2^{6-2} = 2^4 = 16$$

#4: **Power of a Power:** If you are raising a Power to an exponent, you multiply the exponents!

$$(x^m)^n = x^{mn}$$

$$(5^3)^2 = 5^{3 \cdot 2} = 5^6$$

$$(x^5)^3 = x^{15}$$

Try these:

$$1. \quad 3^2 \cdot 3^2 = 3^4 = 81$$

$$2. \quad 5^2 \cdot 5^4 = 5^6$$

$$3. \quad a^5 \cdot a^2 = a^7$$

$$4. \quad 2s^2 \cdot 4s^7 = 8s^9$$

$$5. \quad (-3)^2 \cdot (-3)^3 = (-3)^5$$

$$6. \quad s^2t^4 \cdot st^3 = st^7$$

$$7. \quad \frac{s^{12}}{s^4} = s^8$$

$$8. \quad \frac{3^9}{3^5} = 3^4 = 81$$

$$9. \quad \frac{s^{12}t^8}{s^4t^4} = s^8t^4$$

$$10. \quad \frac{36a^5b^8}{4a^4b^5} = 9ab^3$$

#5: Product Law of Exponents: If the product of the bases is powered by the same exponent, then the result is a multiplication of individual factors of the product, each powered by the given exponent.

$$(xy)^n = x^n \cdot y^n$$

$$(2a)^2 = 2^2 a^2 = 4a^2$$

#6: Quotient Law of Exponents: If the quotient of the bases is powered by the same exponent, then the result is both numerator and denominator, each powered by the given exponent.

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4} = \frac{16}{81}$$