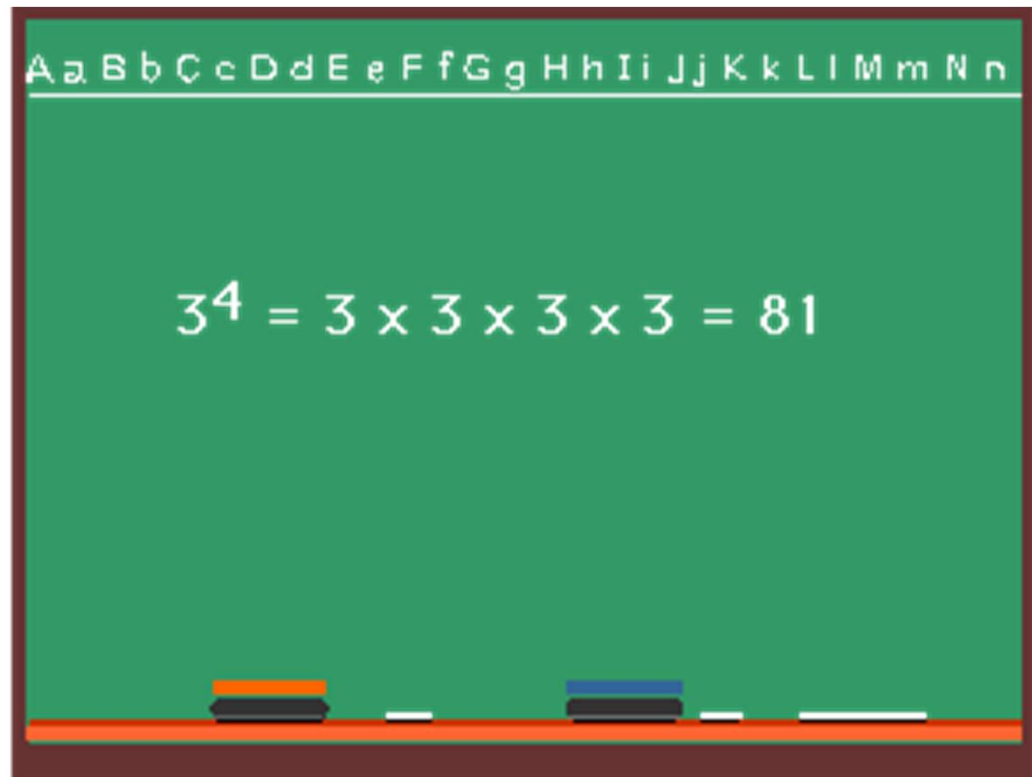
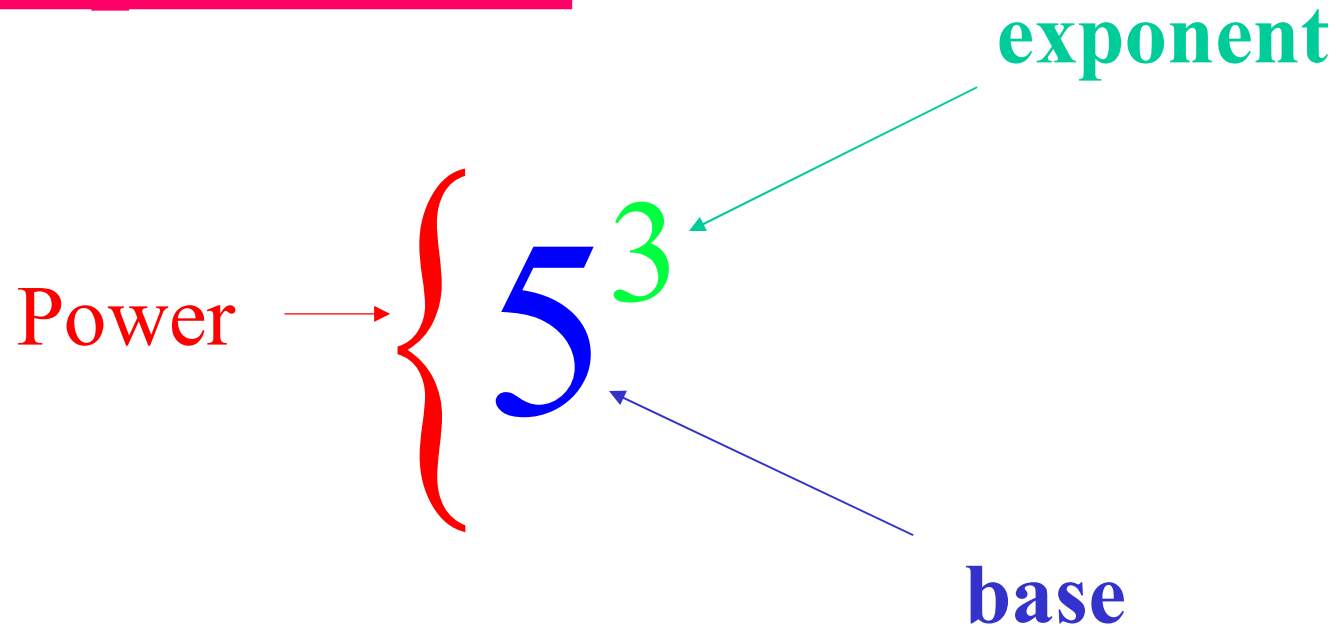


Exponents and Powers

So far this seems pretty easy.



Exponents



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 Laws of Exponents:

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

x^n



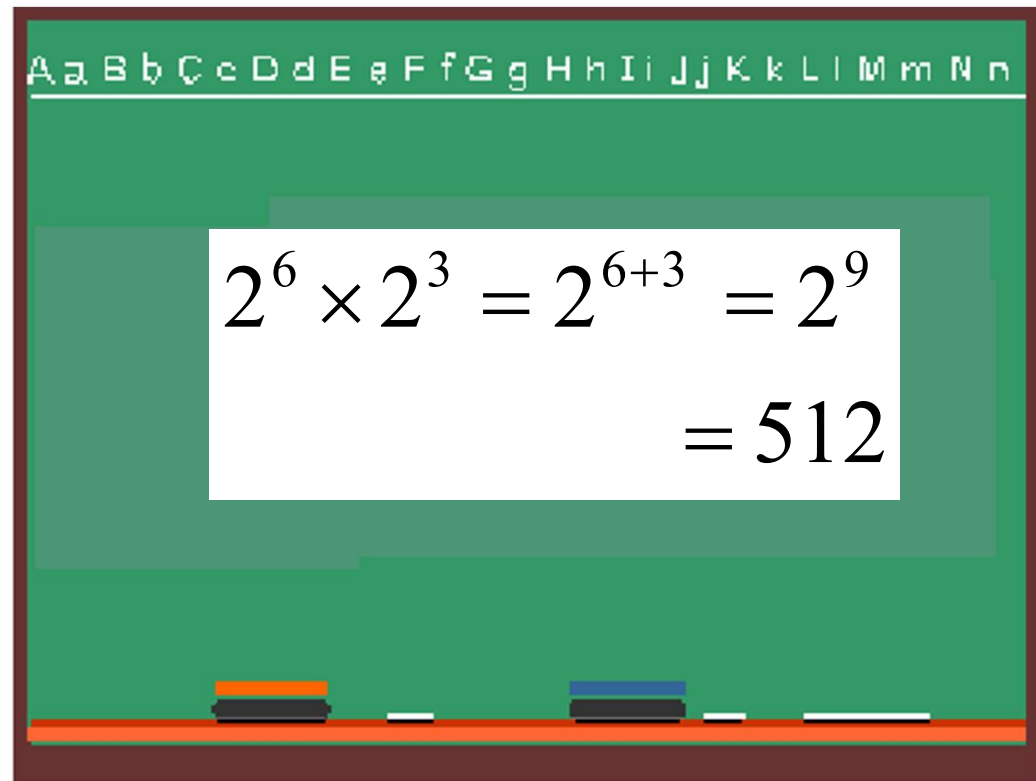
n factors of x

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!*

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

So, I get it!
When you
multiply
Powers, you
add the
exponents!



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

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

So, I get it!

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!*

$$\left(x^m\right)^n = x^{mn}$$

So, when I
take a Power
to a power, I
multiply the
exponents



AaBbCcDdEeFfGgHhIiJjKkLlMmNn

$$(5^3)^2 = 5^{3 \times 2} = 5^5$$

#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.*

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

So, when I take a Power of a Product, I apply the exponent to all factors of the product.



A green chalkboard with a wooden frame. At the top, there is a row of letters: Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn. In the center, the equation $(ab)^2 = a^2 b^2$ is written in black chalk. At the bottom, there are some chalk pieces and erasers.
$$(ab)^2 = a^2 b^2$$

#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.*

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

So, when I take a Power of a Quotient, I apply the exponent to all parts of the quotient.



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

#7: Negative Law of Exponents: *If the base is powered by the negative exponent, then the base becomes reciprocal with the positive exponent.*

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

So, when I have a Negative Exponent, I switch the base to its reciprocal with a Positive Exponent.

Ha Ha!

If the base with the negative exponent is in the denominator, it moves to the numerator to lose its negative sign!



Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn

$$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

and

$$\frac{1}{3^{-2}} = 3^2 = 9$$

#8: Zero Law of Exponents: *Any base powered by zero exponent equals one.*

$$x^0 = 1$$

So zero factors of a base equals 1. That makes sense! Every power has a coefficient of 1.

