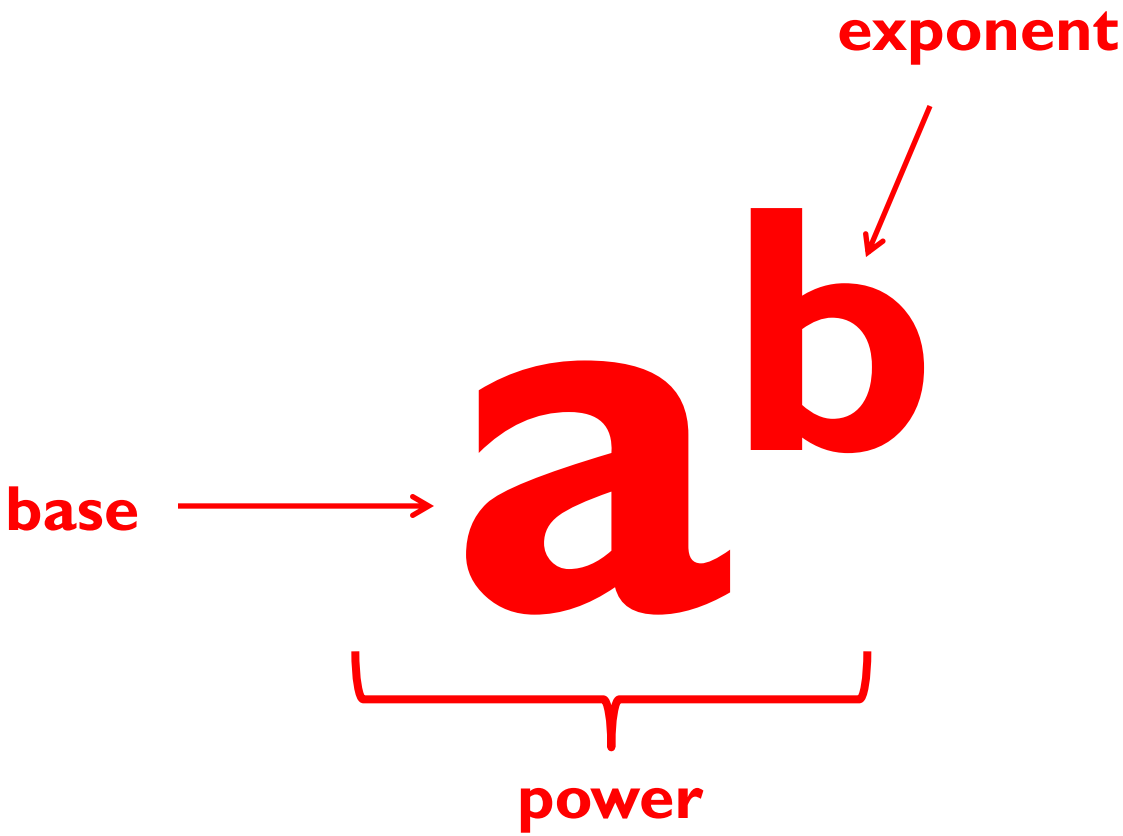
Warmup 10/ $\left(\frac{28}{2}+\frac{28}{4}+\frac{28}{7}+\frac{28}{14}+\frac{28}{28}\right)$

No calculator allowed!!!

1) Guess: what do you think 7^7 is?
2) Guess: what do you think 3^{20} is?
3) Guess: what do you think 2^0 is?
4) Guess: what do you think 4^{-2} is?

Going over the Quiz: End of class if time!

Vocab



"squared" = to the 2nd power
"cubed" = to the 3rd power

What is the number “out in front” called?

$$7x^3$$

Evaluate means "find the value of"…

Evaluate the following:

1. 5^4 $5 \cdot 5 \cdot 5 \cdot 5$ 625

2. $2^7 + 2^2$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 + 2 \cdot 2 \rightarrow 128 + 4 \rightarrow$ 132

3. $(-3)^4$ $-3 \cdot -3 \cdot -3 \cdot -3$ 81

4. $(-4)^4$ $-4 \cdot -4 \cdot -4 \cdot -4$ 256

What is the difference here?

$(-3)^2$ vs. -3^2

$-3 \cdot -3$

9

$-(3^2)$

$\downarrow$

$-(3 \cdot 3)$

$\downarrow$

-9

IMPORTANT

- When you plug a negative number in for x always put it in parentheses!!!

- Ex: Plug in -2 into x^2 and it would be $(-2)^2$ NOT -2^2

Evaluate the following

1. x^3 for x = -2 $(-2)^3$ -8
2. x^5 for x = 3 3^5 243
3. -5^2 $-(5^2)$ -25
4. $(-2)^7$ -128

Finding a pattern

- Find a pattern and use it to complete the table:

Exponential Form	Standard Form
2^5	32
2^4	16
2^3	8
2^2	4
2^1	2
2^0	1
2^{-1}	$\frac{1}{2}$
2^{-2}	$\frac{1}{4}$
2^{-3}	$\frac{1}{8}$

÷2 ÷2 ÷2 ÷2 ÷2 etc.

Finding a pattern

- Find a pattern and use it to complete the table:

Exponential Form	Standard Form
3^5	243
3^4	81
3^3	27
3^2	9
3^1	3
3^0	1
3^{-1}	$\frac{1}{3}$
3^{-2}	$\frac{1}{9}$
3^{-3}	$\frac{1}{27}$

÷3 ÷3 ÷3 etc.

The Rule:

Zero Exponents:

- Anything to the zero power is **1**!

Examples

1) 9^0

2) k^0

3) $\left(\frac{8x^3y^2}{0.27abc} + 12.5q\right)^0$

4) $\frac{a^6}{a^6}$

Examples

1. 9^0 1
2. k^0 1
3. $\left(\frac{3}{8}q\right)^0$ 1
4. $(5x)^0$ 1
5. $5x^0$ $5 \cdot 1 \rightarrow 5$

Examples – Zero Exponents

The Rule:

Negative Exponents:

Rule: $x^{-n} = \frac{1}{x^n}$

- Negative exponent: 1 over the same power with a positive exponent

Basically…

- **NEGATIVE EXPONENTS = DIVIDING!!!**

The “invisible 1”

» Any time you expand a power, there is really an “invisible 1” being multiplied by everything.

$3^4 = 1 \cdot 3 \cdot 3 \cdot 3 \cdot 3$

›

» POSITIVE EXPONENTS:

- > Are 1 TIMES the base that many times
- > $2^4 = 1 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

» NEGATIVE EXPONENTS:

- > Are 1 DIVIDED BY the base that many times
- > $2^{-4} = 1 \div 2 \div 2 \div 2 \div 2$

$$= \frac{1}{2 \cdot 2 \cdot 2 \cdot 2}$$

$$= \frac{1}{2^4}$$

» ZERO EXPONENTS:

- > Are the 1 not multiplied or divided by anything
- > $2^0 = 1$

Evaluate:

1) $4^{-2} \rightarrow \frac{1}{4^2} \rightarrow \frac{1}{16}$

2) $(-2)^{-3} \rightarrow \frac{1}{(-2)^3} \rightarrow \frac{1}{-8}$

3) $10^{-3} \rightarrow \frac{1}{10^3} \rightarrow \frac{1}{1000}$

4) $2^{-4} \rightarrow \frac{1}{2^4} \rightarrow \frac{1}{16}$

5) $(-7)^{-1} \rightarrow \frac{1}{(-7)^1} = -\frac{1}{7}$

- **Write each using negative exponents:**

6) $\frac{1}{8^3}$ 8^{-3}

7) $\frac{1}{c^5}$ c^{-5}

8) $\frac{1}{16}$ 4^{-2} or 2^{-4} or 16^{-1}

9) $\frac{1}{27}$ 3^{-3} or 27^{-1}

Simplify:

10) $x^{-2} \rightarrow \frac{1}{x^2}$

11) $\frac{1}{x^{-2}} \rightarrow x^2$

12) $a^{-3} \rightarrow \frac{1}{a^3}$

13) $\frac{1}{a^{-3}} \rightarrow a^3$

Homework

Worksheet