

Exponents

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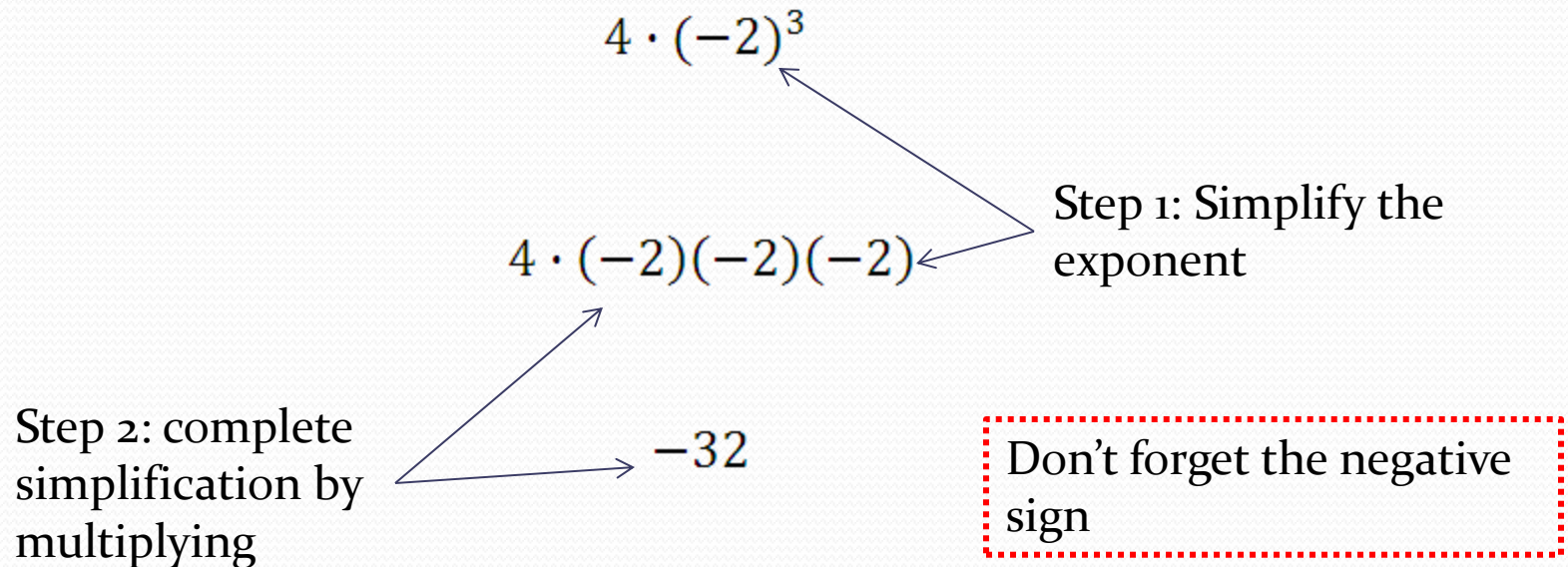
What is an exponent?

- An exponent represents the number of times the base is multiplied
 - Therefore, $2^4 = 2 \cdot 2 \cdot 2 \cdot 2$
- If the exponent is negative, then you must move the base to the other side of the fraction line
 - Therefore $2^{-4} = \frac{1}{2 \cdot 2 \cdot 2 \cdot 2}$
- If a number does not include an exponent, it is understood the exponent is 1.

Operations with exponents:

Examples

- Don't forget order of operations when simplifying the following expressions



Scientific Notation

- One common way exponents are used across curricular areas is using scientific notation
- Scientific notation is a efficient way to write large numbers
 - For example, the distance from Earth to the sun is 93 million miles
 - 93 million = 93,000,000 = $9 \times 10,000,000 = 9 \times 10^7$

Scientific Notation cont'd.

$$3.8 = 3.8 \times 10^0$$

In this example, no
exponent was listed

$$0.0041 = 4.1 \times 0.001 = 4.1 \times \frac{1}{1000} = 4.1 \times 10^{-3}$$

In this example, the exponent is
negative

Which way with the decimal?

- One of the most common mistakes students will make is moving the decimal place the wrong way when simplifying terms with exponents

- If the exponent is positive, the decimal moves to the right

$$10^3=1000.0$$

- If the exponent is negative, the decimal moves to the left

$$10^{-3}=0.001$$

Ideas for application

- Use manipulatives where students can physically move the decimal
- Always include multiple representation of numbers (e.g., $0.001 = \frac{1}{1000}$)
- Create personally-relevant word problems

Making connections

- Simplifying expressions with exponents addresses the middle and high school Core Content Connectors of
 - 6.NO.1i1 Identify what an exponent represents
 - 6.NO.1i2 Solve numerical expressions involving whole number exponents
 - 8.NO.1i1 Convert a number expressed in scientific notation up to 10,000
 - H.NO.1a2 Explain the influence of an exponent on the location of a decimal point in a given number
 - H.NO.2c1 Simplify expressions that include exponents
 - H.NO.2c2 Rewrite expressions that include rational exponents