

PreAlgebra
Skill-Builder #SMN-5
Raising Signed Mixed Numbers to a Positive Integer Exponent

Recall that when multiplying two numbers with **same signs**, the product will be **positive**.
 If the two numbers have **different signs**, the product will be **negative**. As a result, we can generalize that a negative number raised to an even exponent will end up with a positive result and a negative number raised to an odd exponent will end up with a negative result.

$$\begin{aligned} (\text{negative number})^{\text{odd exponent}} &= \text{negative result} \\ (\text{negative number})^{\text{even exponent}} &= \text{positive result} \end{aligned}$$

After taking care of the signs, you should convert the mixed numbers to improper fractions, then raise both the numerator and denominator to the given integer exponent:

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

Remember to always reduce your final answer to lowest terms. Usually, it is stated that you have to give your answer as a mixed number if possible.

Example 1

Simplify: $\left(5\frac{1}{2}\right)^3$

$$(\text{positive number})^{\text{any exponent}} = \text{positive result}$$

$$= \left(\frac{5 \cdot 2 + 1}{2}\right)^3 = \left(\frac{11}{2}\right)^3 = \frac{11^3}{2^3} = \frac{1331}{8} = 166\frac{3}{8}$$

Example 2

Simplify: $\left(-1\frac{2}{5}\right)^3$ The negative mixed number is raised to an **odd** exponent!
 So, the result will be **negative**.

$$= -\left(\frac{1 \cdot 5 + 2}{5}\right)^3 = -\left(\frac{7}{5}\right)^3 = -\frac{7^3}{5^3} = -\frac{343}{125} = -2\frac{93}{125}$$

Example 3

Simplify: $\left(-3\frac{1}{4}\right)^2$ The negative mixed number is raised to an **even** exponent!
 So, the result will be **positive**.

$$= +\left(\frac{3 \cdot 4 + 1}{4}\right)^2 = +\left(\frac{13}{4}\right)^2 = \frac{13^2}{4^2} = \frac{169}{16} = 10\frac{9}{16}$$

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Simplify the following. Give your final answer as a mixed number if possible.

1. $\left(5\frac{1}{4}\right)^2$

2. $\left(-4\frac{1}{6}\right)^2$

3. $\left(-1\frac{1}{2}\right)^4$

4. $\left(-2\frac{1}{3}\right)^3$

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Answers

1. $27\frac{9}{16}$

2. $17\frac{13}{36}$

3. $5\frac{1}{16}$

4. $-12\frac{19}{27}$