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.

\[
\begin{align*}
\text{(negative number)}^{\text{odd exponent}} &= \text{negative result} \\
\text{(negative number)}^{\text{even exponent}} &= \text{positive result}
\end{align*}
\]

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:

\[
\left(5\frac{1}{2}\right)^3
\]

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

**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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Raising Signed Mixed Numbers to a Positive Integer Exponent

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. \[ \frac{27}{16} \]

2. \[ \frac{17}{36} \]

3. \[ \frac{5}{16} \]

4. \[ -\frac{12}{27} \]

Prepared by Susan Vo, Fall 2010