12.8: Mixed Expressions & Complex Fractions

HCPS III:
- **Standard 3:** Numbers and Operations: COMPUTATION STRATEGIES: Use computational tools and strategies fluently and, when appropriate, use estimation.
- **Benchmark MA.AI.3.1:** Apply arithmetic properties to operate on and simplify expressions that include radicals and other real numbers.

Objectives:
- Simplify mixed expressions.
- Simplify complex fractions.

**Simplify Mixed Expressions**

A mixed expression contains a whole term (monomial) and a fraction (rational expression).

\[
3 + \frac{x + 2}{x - 3} \quad \text{or} \quad 4 + \frac{7}{8}
\]

We are going to change a mixed expression into a completely rational expression. * (Mixed number → Improper Fraction)

**Pre-Example 1: Mixed Number to Improper Fraction**
Convert the mixed number into an improper fraction.

a.) \(2 + \frac{1}{2}\)  
b.) \(6 + \frac{2}{3}\)
Example 1: Mixed Expression to Rational Expression

Simplify the expression.

a.) \(3 + \frac{6}{x + 3}\)  
b.) \(2 + \frac{3}{n + 3}\)

Simplify Complex Fractions

A complex fraction is a fraction that contains more than one fraction in the numerator and/or denominator.

Example 2: Complex Fractions Involving Numbers

Simplify the expression.

a.) \(\frac{2\frac{2}{3}}{1\frac{2}{5}}\)  
b.) \(\frac{2\frac{1}{2}}{1\frac{1}{2}}\)
Example 3: Complex Fraction Involving Monomials

Simplify the expression.

\[
\frac{x^2 y^2}{a} \div \frac{x^2 y}{a^3}
\]

a.) \[
\frac{x}{y^3}
\]

b.) \[
\frac{x^3}{y^2}
\]

Example 4: Complex Fractions Involving Polynomials

Simplify the expression.

\[
\frac{a - 15}{a - 2} \div \frac{2 + \frac{4}{a}}{a + 2}
\]

a.) \[
\frac{a}{a + 2}
\]

b.) \[
\frac{3}{a}
\]