



Subtract. Identify any  $x$ -values for which the expression is undefined.

4a.  $\frac{3x - 2}{2x + 5} - \frac{2}{5x - 2}$

4b.  $\frac{2x^2 + 64}{x^2 - 64} - \frac{x - 4}{x + 8}$

Some rational expressions are *complex fractions*. A **complex fraction** contains one or more fractions in its numerator, its denominator, or both. Examples of complex fractions are shown below.

$$\frac{x + 2}{\frac{3}{x}}$$

$$\frac{1 + \frac{1}{x}}{4x + 5}$$

$$\frac{\frac{x + 3}{x}}{\frac{x + 4}{7x}}$$

Recall that the bar in a fraction represents division. Therefore, you can rewrite a complex fraction as a division problem and then simplify. You can also simplify complex fractions by using the LCD of the fractions in the numerator and denominator.

COMMON  
CORE GPS

**EXAMPLE**  
MCC9-12.A.APR.7(+)

5

**Simplifying Complex Fractions**

my.hrw.com



Online Video Tutor

Simplify  $\frac{\frac{2}{x} + \frac{x}{4}}{\frac{x+1}{x}}$ . Assume that all expressions are defined.

**Method 1** Write the complex fraction as division.

$$\left(\frac{2}{x} + \frac{x}{4}\right) \div \frac{x+1}{x}$$

*Write as division.*

$$\left(\frac{2}{x} + \frac{x}{4}\right) \cdot \frac{x}{x+1}$$

*Multiply by the reciprocal.*

$$\left[\frac{2}{x}\left(\frac{4}{4}\right) + \frac{x}{4}\left(\frac{x}{x}\right)\right] \cdot \frac{x}{x+1}$$

*The LCD is  $4x$ .*

$$\left[\frac{2(4) + x(x)}{4x}\right] \cdot \frac{x}{x+1}$$

*Add the numerators.*

$$\frac{8 + x^2}{4x} \cdot \frac{x}{x+1}$$

*Simplify and divide out common factors.*

$$\frac{8 + x^2}{4(x+1)} \text{ or } \frac{x^2 + 8}{4x + 4}$$

*Multiply.*

**Method 2** Multiply the numerator and denominator of the complex fraction by the LCD of the fractions in the numerator and denominator.

$$\frac{\frac{2}{x}(4x) + \frac{x}{4}(4x)}{\frac{x+1}{x}(4x)}$$

*The LCD is  $4x$ .*

$$\frac{(2)(4) + (x)(x)}{(x+1)(4)}$$

*Divide out common factors.*

$$\frac{8 + x^2}{(x+1)(4)} \text{ or } \frac{x^2 + 8}{4x + 4}$$

*Simplify.*



Simplify. Assume that all expressions are defined.

5a.  $\frac{\frac{x+1}{x^2-1}}{\frac{x}{x-1}}$

5b.  $\frac{\frac{20}{x-1}}{\frac{6}{3x-3}}$

5c.  $\frac{\frac{1}{x} + \frac{1}{2x}}{\frac{x+4}{x-2}}$