7.4 Adding and Subtracting Rational Expressions
For use with Exploration 7.4

Essential Question How can you determine the domain of the sum or difference of two rational expressions?

1 **EXPLORATION:** Adding and Subtracting Rational Expressions

Work with a partner. Find the sum or difference of the two rational expressions. Then match the sum or difference with its domain. Explain your reasoning.

Sum or Difference

a. $\dfrac{1}{x-1} + \dfrac{3}{x-1} =$

b. $\dfrac{1}{x-1} + \dfrac{1}{x} =$

c. $\dfrac{1}{x-2} + \dfrac{1}{2-x} =$

d. $\dfrac{1}{x-1} + \dfrac{-1}{x+1} =$

e. $\dfrac{x}{x+2} - \dfrac{x+1}{2+x} =$

f. $\dfrac{x}{x-2} - \dfrac{x+1}{x} =$

g. $\dfrac{x}{x+2} - \dfrac{x}{x-1} =$

h. $\dfrac{x+2}{x} - \dfrac{x+1}{x} =$

Domain

A. all real numbers except -2

B. all real numbers except -1 and 1

C. all real numbers except 1

D. all real numbers except 0

E. all real numbers except -2 and 1

F. all real numbers except 0 and 1

G. all real numbers except 2

H. all real numbers except 0 and 2

7.4 **Adding and Subtracting Rational Expressions** (continued)

2 **EXPLORATION:** Writing a Sum or Difference

Work with a partner. Write a sum or difference of rational expressions that has the given domain. Justify your answer.

    a. all real numbers except -1

    b. all real numbers except -1 and 3

    c. all real numbers except -1, 0, and 3

Communicate Your Answer

  3. How can you determine the domain of the sum or difference of two rational expressions?

  4. Your friend found a sum as follows. Describe and correct the error(s).

$$\frac{x}{x+4} + \frac{3}{x-4} = \frac{x+3}{2x}$$

7.4 Notetaking with Vocabulary

For use after Lesson 7.4

In your own words, write the meaning of each vocabulary term.

complex fraction

Core Concepts

Adding or Subtracting with Like Denominators

Let a, b, and c be expressions with $c \neq 0$.

Addition

$$\frac{a}{c} + \frac{b}{c} = \frac{a + b}{c}$$

Subtraction

$$\frac{a}{c} - \frac{b}{c} = \frac{a - b}{c}$$

Notes:

Adding or Subtracting with Unlike Denominators

Let a, b, c, and d be expressions with $c \neq 0$ and $d \neq 0$.

Addition

$$\frac{a}{c} + \frac{b}{d} = \frac{ad}{cd} + \frac{bc}{cd} = \frac{ad + bc}{cd}$$

Subtraction

$$\frac{a}{c} - \frac{b}{d} = \frac{ad}{cd} - \frac{bc}{cd} = \frac{ad - bc}{cd}$$

Notes:

7.4 **Notetaking with Vocabulary** (continued)

Simplifying Complex Fractions

Method 1   If necessary, simplify the numerator and denominator by writing each as a single fraction. Then divide by multiplying the numerator by the reciprocal of the denominator.

Method 2   Multiply the numerator and the denominator by the LCD of *every* fraction in the numerator and denominator. Then simplify.

Notes:

Extra Practice

In Exercises 1–4, find the sum or difference.

1. $\dfrac{1}{x-1} - \dfrac{5}{x-1}$

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

3. $\dfrac{6x}{x+4} + \dfrac{24}{x+4}$

4. $\dfrac{2x^2}{x-7} - \dfrac{14x}{x-7}$

7.4 **Notetaking with Vocabulary** (continued)

In Exercises 5–7, find the least common multiple of the expressions.

5. $9x^3, 3x^2 - 21x$ **6.** $x + 5, 2x^2 + 11x + 5$ **7.** $x^2 + 5x + 6, x^2 - 3x - 18$

In Exercises 8–11, find the sum or the difference.

8. $\dfrac{3}{2x} + \dfrac{11}{5x}$

9. $\dfrac{15}{x - 2} + \dfrac{3}{x + 8}$

10. $\dfrac{3x}{2x + 1} + \dfrac{10}{2x^2 - 5x - 3}$

11. $\dfrac{x}{x - 7} - \dfrac{2}{x + 1} - \dfrac{8x}{x^2 - 6x - 7}$

In Exercises 12 and 13, simplify the complex fraction.

12. $\dfrac{\dfrac{x}{10} - 3}{5 + \dfrac{1}{x}}$

13. $\dfrac{\dfrac{12}{x^2 - 7x - 44}}{\dfrac{2}{x - 11} + \dfrac{1}{x + 4}}$