

**CRITIQUE & EXPLAIN**

Teo and Shannon find the following exercise in their homework:

$$\frac{1}{2} + \frac{1}{3} + \frac{1}{9}$$

- A. Teo claims that a common denominator of the sum is  $2 + 3 + 9 = 14$ . Shannon claims that it is  $2 \cdot 3 \cdot 9 = 54$ . Is either student correct? Explain why or why not.

- B. Find the sum, explaining the method you use.

- C. **Construct Arguments** Timothy states that the quickest way to find the sum of any two fractions with unlike denominators is to multiply their denominators to find a common denominator, and then rewrite each fraction with that denominator. Do you agree? © MP.3

**HABITS OF MIND**

**Look for Relationships** For two fractions with denominators 10 and  $x$ , when is  $10x$  the least common multiple? When is  $10x$  NOT the least common multiple? © MP.7

**EXAMPLE 1** **Try It!** Add Rational Expressions With Like Denominators

1. Find the sum.

a.  $\frac{10x-5}{2x+3} + \frac{8-4x}{2x+3}$

b.  $\frac{x-5}{x+5} + \frac{3x-21}{x+5}$

**HABITS OF MIND**

**Make Sense and Persevere** Explain why it does not make sense to add the denominators when adding rational numbers. Use numerical fractions to support your thinking. © MP.1

**EXAMPLE 2** **Try It!** Identify the Least Common Multiple of Polynomials

2. Find the LCM for each set of expressions.

a.  $x^3 + 9x^2 + 27x + 27, x^2 - 4x - 21$

b.  $10x^2 - 10y^2, 15x^2 - 30xy + 15y^2, x^2 + 3xy + 2y^2$

**EXAMPLE 3** **Try It!** Add Rational Expressions With Unlike Denominators

3. Find the sum.

a.  $\frac{x+6}{x^2-4} + \frac{2}{x^2-5x+6}$

b.  $\frac{2x}{3x+4} + \frac{4x^2-11x-12}{6x^2+5x-4}$



**EXAMPLE 4** **Try It! Subtract Rational Expressions**

4. Simplify.

a.  $\frac{1}{3x} + \frac{1}{6x} - \frac{1}{x^2}$

b.  $\frac{3x-5}{x^2-25} - \frac{2}{x+5}$

**HABITS OF MIND****Communicate Precisely** How does finding the LCM of two or more polynomials help you to add and subtract rational expressions? © MP.6**EXAMPLE 5** **Try It! Find a Rate**

5. On the way to work Juan carpools with a fellow co-worker, and then takes the city bus back home in the evening. The average speed of the 20-mi trip is 5 mph faster in the carpool. Write an expression that represents Juan's total travel time.

**HABITS OF MIND****Construct Arguments** Does Juan spend more time in the carpool or riding the bus? How do you know? © MP.3**EXAMPLE 6** **Try It! Simplify a Compound Fraction**

6. Simplify.

a.  $\frac{\frac{1}{x-1}}{\frac{x+1}{3} + \frac{4}{x-1}}$

b.  $\frac{\frac{2-1}{x}}{\frac{x+2}{x}}$

**HABITS OF MIND****Reason** Edwin multiplied the top and bottom of the fraction in problem 6 part (a) by  $\frac{3}{x+1} + \frac{x-1}{4}$ . Will this technique work to simplify the compound fraction? Explain. © MP.2

**Do You UNDERSTAND?**

1. **ESSENTIAL QUESTION** How do you rewrite rational expressions to find sums and differences?

2. **Vocabulary** In your own words, define **compound fraction** and provide an example of one.

3. **Error Analysis** A student added the rational expressions as follows:

$$\frac{5x}{x+7} + \frac{7}{x} = \frac{5x}{x+7} + \frac{7(7)}{x+7} = \frac{5x+49}{x+7}$$

Describe and correct the error the student made. © MP.3

4. **Construct Arguments** Explain why, when stating the domain of a sum or difference of rational expressions, not only should the simplified sum or difference be considered but the original expression should also be considered. © MP.3

5. **Make Sense and Persevere** In adding or subtracting rational expressions, why is the L in LCD significant? © MP.1

**Do You KNOW HOW?**

6. Find the sum of  $\frac{3}{x+1} + \frac{11}{x+1}$ .

Find the LCM of the polynomials.

7.  $x^2 - y^2$  and  $x^2 - 2xy + y^2$

8.  $5x^3y$  and  $15x^2y^2$

Find the sum or difference.

9.  $\frac{3x}{4y^2} - \frac{y}{10x}$

10.  $\frac{9y+2}{3y^2-2y-8} + \frac{7}{3y^2+y-4}$

11. Find the perimeter of the quadrilateral in simplest form.

