

Combining Rational Expressions with Unlike Denominators

(Pages 662–667)

The **least common multiple** (LCM) of two or more positive whole numbers is the least positive number that is a common multiple of all the numbers. To add or subtract rational expressions with unlike denominators, first rename the fractions so the denominators are alike, using the **least common denominator** of the fractions. You may need to factor one or both of the denominators first. The least common denominator (LCD) is the LCM of the denominators.

EXAMPLES

A Write $\frac{5}{2y}$ and $\frac{4}{3y^2}$ with the same LCD.

List the prime factors of $2y$ and $3y^2$ to find the LCD.

$$2y = 2 \cdot y \quad 3y^2 = 3 \cdot y \cdot y$$

Use each prime factor the greatest number of times it appears in each of the factorizations.

$$\text{LCD: } 2 \cdot 3 \cdot y \cdot y \text{ or } 6y^2$$

Then write each fraction with the same LCD.

$$\frac{5}{2y} \cdot \frac{3y}{3y} = \frac{15y}{6y^2} \quad \frac{4}{3y^2} \cdot \frac{2}{2} = \frac{8}{6y^2}$$

B Find $\frac{x}{x-1} - \frac{5}{x-2}$.

$$\text{LCD: } (x-1)(x-2)$$

$$\begin{aligned} \frac{x}{x-1} - \frac{5}{x-2} &= \frac{x}{x-1} \cdot \frac{x-2}{x-2} - \frac{5}{x-2} \cdot \frac{x-1}{x-1} \\ &= \frac{x^2 - 2x}{(x-1)(x-2)} - \frac{5x - 5}{(x-1)(x-2)} \\ &= \frac{x^2 - 2x - (5x - 5)}{(x-1)(x-2)} \\ &= \frac{x^2 - 7x + 5}{(x-1)(x-2)} \end{aligned}$$

PRACTICE

Find the LCM for each pair of expressions.

1. $x^2, 7x$

2. $b + 3, b^2 - 9$

3. $g - 2, 4g - 8$

Write each pair of rational expressions with the same LCD.

4. $\frac{9}{a^3}, \frac{7}{a}$

5. $\frac{2}{3x+6}, \frac{5}{x+2}$

6. $\frac{4}{x+3}, \frac{5x}{x-3}$

Find each sum or difference. Write in simplest form.

7. $\frac{1}{2x} - \frac{2}{10x}$

8. $\frac{10}{xy^2} + \frac{5}{y^2}$

9. $\frac{7}{2x-8} - \frac{2}{x-4}$

10. $\frac{7x}{x^2-16} + \frac{2}{x+4}$

11. $\frac{x}{x-10} - \frac{3}{x^2-100}$

12. $\frac{2x}{x+1} + \frac{x}{4x+4}$



13. Standardized Test Practice Find $\frac{3}{x^2+x-20} + \frac{2}{x+5}$.

A $\frac{5}{x-4}$

B $\frac{5}{(x-4)(x+5)}$

C $\frac{2x-5}{x-4}$

D $\frac{2x-5}{(x-4)(x+5)}$

<p>Answers: 1. $7x^2$ 2. $(b+3)(b-3)$ 3. $4(g-2)$ 4. $\frac{9}{7a^2}$ 5. $\frac{3(x+2)}{2}$ 6. $\frac{4x-12}{15} \cdot \frac{(x+3)(x+3)}{(x+3)(x+3)}$ 7. $\frac{10x}{3}$ 8. $\frac{5x+10}{3xy^2}$ 9. $\frac{3}{9}$ 10. $\frac{9x-8}{9x-8} \cdot \frac{(x-4)(x+4)}{(x-4)(x+4)}$ 11. $\frac{x^2+10x-3}{x^2+10x-3}$ 12. $\frac{4x+1}{9}$ 13. D</p>
