

Lesson 5 Addition and Subtraction of Rational Expressions
(Binomial Denominators)

Steps for Adding or Subtracting (Different Denominators):

- Factor all expressions
- Write each term with the lowest common denominator (LCD)
- Add or Subtract the numerators, keeping the denominators the same
- Simplify and State restrictions (set denominator equal to 0)
- **Note:** the LCD is the product which contains each factor that occurs the greatest number of times in any denominator.

Examples

1. $\frac{x}{2x-4} - \frac{5}{3x-6}$

LCD
 $6(x-2)$

$$\frac{x}{2(x-2)} - \frac{5}{3(x-2)}$$

$$\frac{3x - 5(2)}{6(x-2)}$$

$$x \neq 2$$

$$\frac{3x - 10}{6(x-2)}$$

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$$2. \frac{x}{6x+6} + \frac{5}{4x-12}$$

LCD
 $12(x+1)(x-3)$

$$\frac{x}{6(x+1)} + \frac{5}{4(x-3)} \quad x \neq -1, 3$$

$$\frac{2x(x-3) + 5(3)(x+1)}{12(x+1)(x-3)}$$

$$\frac{2x^2 - 6x + 15x + 15}{12(x+1)(x-3)}$$

$$\frac{2x^2 + 9x + 15}{12(x+1)(x-3)}$$

$$3. \frac{6}{x+3} + \frac{5}{3-x} - \frac{3x}{x^2-9}$$

LCD
 $(x-3)(x+3)$

$$\frac{6}{x+3} - \frac{5}{x-3} - \frac{3x}{(x-3)(x+3)}$$

$$\frac{6(x-3) - 5(x+3) - 3x}{(x-3)(x+3)} \quad x \neq \pm 3$$

$$\frac{6x - 18 - 5x - 15 - 3x}{(x-3)(x+3)}$$

$$\frac{-2x - 33}{(x-3)(x+3)}$$

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$$4. \frac{1}{x^2-36} - \frac{1}{6x-x^2}$$

LCD
 $x(x-6)(x+6)$

$$\frac{1}{(x-6)(x+6)} + \frac{1}{x^2-6x}$$

$$\frac{1}{(x-6)(x+6)} + \frac{1}{x(x-6)}$$

$$x \neq -6, 0, 6$$

$$\frac{x + x + 6}{x(x-6)(x+6)}$$

$$\frac{2x+6}{x(x-6)(x+6)}$$

or $\frac{2(x+3)}{x(x-6)(x+6)}$

$$5. \frac{x-1}{x^2-x-6} - \frac{2}{x-3} + \frac{3}{1}$$

LCD
 $(x-3)(x+2)$

$$\frac{x-1}{(x-3)(x+2)} - \frac{2}{x-3} + 3$$

$$x \neq -2, 3$$

$$\frac{x-1 - 2(x+2) + 3(x^2-x-6)}{(x-3)(x+2)}$$

$$\frac{x-1-2x-4+3x^2-3x-18}{(x-3)(x+2)}$$

$$\frac{3x^2-4x-23}{(x-3)(x+2)}$$

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$$6. \frac{x+5}{x+6} + \frac{1}{x+4} \div \frac{x+6}{x^2-x-20}$$

BEDMAS
Follow order of operations

$$\frac{x+5}{x+6} + \frac{1}{x+4} \cdot \frac{(x-5)\cancel{(x+4)}}{x+6}$$

$$\frac{x+5}{x+6} + \frac{x-5}{x+6}$$

$$x \neq -6, -4, 5$$

$$\frac{2x}{x+6}$$

$$7. \frac{\frac{1}{x-1} + \frac{2}{x+2}}{\frac{2}{x+2} - \frac{1}{x-3}}$$

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

← LCD of top

$$\frac{2(x-3) - (x+2)}{(x+2)(x-3)}$$

← LCD of bottom

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

$$\frac{2x - 6 - x - 2}{(x+2)(x-3)}$$

$$\frac{3x}{(x-1)(x+2)} \cdot \frac{x-8}{(x+2)(x-3)}$$

same as

$$\frac{3x}{(x-1)(x+2)} \div \frac{x-8}{(x+2)(x-3)}$$

$$x \neq -2, 1, 3, 8$$

$$\frac{3x(x-3)}{(x-1)(x-8)}$$

riddle sheet(s)

and

pg. 67
3a-p

pg 74
1, g, h
2, i, j