NAME _____ DATE _____ PERIOD _____

11-6 Study Guide and Intervention

Adding and Subtracting Rational Expressions

Add and Subtract Rational Expressions with Like Denominators To add rational expressions with like denominators, add the numerators and then write the sum over the common denominator. To subtract fractions with like denominators, subtract the numerators. If possible, simplify the resulting rational expression.

Example 1 **Find $\frac{5n}{15} + \frac{7n}{15}$.**

$\frac{5n}{15} + \frac{7n}{15} = \frac{5n + 7n}{15}$ Add the numerators.

$= \frac{12n}{5}$ Simplify.

$= \frac{\cancel{12}^{4}n}{\cancel{15}_{5}}$ Divide by 3.

$= \frac{4n}{5}$ Simplify.

Example 2 **Find $\frac{3x + 2}{x - 2} - \frac{4x}{x - 2}$.**

$\frac{3x + 2}{x - 2} - \frac{4x}{x - 2} = \frac{3x + 2 - 4x}{x - 2}$ The common denominator is $x - 2$.

$= \frac{2 - x}{x - 2}$ Subtract.

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

$= \frac{-1(\cancel{x - 2})^{1}}{\cancel{x - 2}_{1}}$

$= \frac{-1}{1}$ Simplify.

$= -1$

Exercises

Find each sum or difference.

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

2. $\frac{x^2}{8} + \frac{x}{8}$

3. $\frac{5x}{9} - \frac{x}{9}$

4. $\frac{11x}{15y} - \frac{x}{15y}$

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

6. $\frac{m + 1}{2m - 1} + \frac{3m - 3}{2m - 1}$

7. $\frac{y + 7}{y + 6} - \frac{1}{y + 6}$

8. $\frac{3y + 5}{5} - \frac{2y}{5}$

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

10. $\frac{5a}{3b^2} + \frac{10a}{3b^2}$

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

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

13. $\frac{3x + 2}{x + 2} + \frac{x + 6}{x + 2}$

14. $\frac{a - 4}{a + 1} + \frac{a + 6}{a + 1}$

NAME _____ DATE _____ PERIOD _____

11-6 Study Guide and Intervention *(continued)*

Adding and Subtracting Rational Expressions

Add and Subtract Rational Expressions with Unlike Denominators

Adding or subtracting rational expressions with unlike denominators is similar to adding and subtracting fractions with unlike denominators.

Adding and Subtracting Rational Expressions	Step 1 Find the LCD of the expressions. Step 2 Change each expression into an equivalent expression with the LCD as the denominator. Step 3 Add or subtract just as with expressions with like denominators. Step 4 Simplify if necessary.

Example 1 **Find** $\frac{n+3}{n} + \frac{8n-4}{4n}$.

Factor each denominator.

$n = n$

$4n = 4 \cdot n$

$\text{LCD} = 4n$

Since the denominator of $\frac{8n-4}{4n}$ is already $4n$, only $\frac{n+3}{n}$ needs to be renamed.

$$\frac{n+3}{n} + \frac{8n-4}{4n} = \frac{4(n+3)}{4n} + \frac{8n-4}{4n}$$
$$= \frac{4n+12}{4n} + \frac{8n-4}{4n}$$
$$= \frac{12n+8}{4n}$$
$$= \frac{3n+2}{n}$$

Example 2 **Find** $\frac{3x}{x^2-4x} - \frac{1}{x-4}$.

$\frac{3x}{x^2-4x} - \frac{1}{x-4} = \frac{3x}{x(x-4)} - \frac{1}{x-4}$ Factor the denominator.

$= \frac{3x}{x(x-4)} - \frac{1}{x-4} \cdot \frac{x}{x}$ The LCD is $x(x-4)$.

$= \frac{3x}{x(x-4)} - \frac{x}{x(x-4)}$ $1 \cdot x = x$

$= \frac{2x}{x(x-4)}$ Subtract numerators.

$= \frac{2}{x-4}$ Simplify.

Exercises

Find each sum or difference.

1. $\frac{1}{a} + \frac{7}{3a}$

2. $\frac{1}{6x} + \frac{3}{8}$

3. $\frac{5}{9x} - \frac{1}{x^2}$

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

5. $\frac{8}{4a^2} + \frac{6}{3a}$

6. $\frac{4}{h+1} + \frac{2}{h+2}$

7. $\frac{y}{y-3} - \frac{3}{y+3}$

8. $\frac{y}{y-7} - \frac{y+3}{y^2-4y-21}$

9. $\frac{a}{a+4} + \frac{4}{a-4}$

10. $\frac{6}{3(m+1)} + \frac{2}{3(m-1)}$

11. $\frac{4}{x-2y} - \frac{2}{x+2y}$

12. $\frac{a-6b}{2a^2-5ab+2b^2} - \frac{7}{a-2b}$

13. $\frac{y+2}{y^2+5y+6} + \frac{2-y}{y^2+y-6}$

14. $\frac{q}{q^2-16} + \frac{q+1}{q^2+5q+4}$