

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**COMBINING RATIONAL EXPRESSIONS WITH ADDITION AND SUBTRACTION**  
**COMMON CORE ALGEBRA II**



Occasionally it will be important to be able to combine two or more rational expressions by addition. Keep in mind two key principles that dictate fraction addition.

**TWO GUIDELINES FOR ADDITION AND SUBTRACTION OF FRACTIONS**

1. Fractions must have a common denominator.
2. Denominators can only be changed by multiplying the overall fraction by one.

**Exercise #1:** Combine each of the following fractions by first finding a common denominator. Express your answers in simplest form.

(a)  $\frac{2x-5}{4x} + \frac{4x+2}{6x}$

(b)  $\frac{4x-1}{5x} + \frac{x+5}{10}$

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

Each of the combinations in *Exercise #1* should have been reasonably easy because each denominator was monomial in nature. If this is not the case, then it is wise to **factor** the denominators before trying to find a common denominator.

**Exercise #2:** Combine each of the following fractions by factoring the denominators first. Then find a common denominator and add.

(a)  $\frac{4}{5y-15} + \frac{5}{y^2-9}$

(b)  $\frac{x-3}{x^2-9x+20} + \frac{2}{x^2-6x+8}$



Subtraction of rational expressions is especially challenging because of errors that naturally arise when students forget to distribute the subtraction (or the multiplication by -1). Still, with careful execution, these problems are no different than their addition counterparts.

**Exercise #3:** Perform each of the following subtraction problems. Express your answers in simplest form.

(a)  $\frac{3x+7}{x^2-4} - \frac{x+3}{x^2-4}$

$$\frac{3x+7-x-3}{x^2-4}$$

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

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

$$\frac{5x-15-4x+2}{5(2x+1)(2x-1)}$$

(c)  $\frac{x}{x^2-4} - \frac{6}{x^2-8x+20}$

$$\frac{x^2+10x-6x-12}{(x+2)(x-2)(x+10)}$$

$$\frac{x^2+4x-12}{(x+2)(x-2)(x+10)} = \frac{(x+6)(x-2)}{(x+2)(x-2)(x+10)}$$

(d)  $\frac{x-2}{x^2-5x+4} - \frac{8}{x^2+12x+32}$

$$\frac{x^2+6x-16-8x-8}{(x+1)(x+4)(x+8)}$$

$$\frac{x^2-2x-24}{(x-6)(x+4)}$$

$$\frac{x-6}{(x+1)(x+8)}$$

**Exercise #4:** Which of the following is equivalent to  $\frac{1}{x-1} - \frac{1}{x}$ ?

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

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

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

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



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**COMBINING RATIONAL EXPRESSIONS WITH ADDITION AND SUBTRACTION**  
**COMMON CORE ALGEBRA II HOMEWORK**

**FLUENCY**

1. Combine each of the following using addition. Simplify your result whenever possible.

(a)  $\frac{3x-1}{6} + \frac{2x+5}{9}$

(b)  $\frac{x}{10} + \frac{1}{15x}$

(c)  $\frac{3}{7x} + \frac{5}{14x^2}$

2. Combine and simplify each of the following. Note that each pair of fractions already has a common denominator.

(a)  $\frac{3x+7}{x+2} + \frac{2x+3}{x+2}$

(b)  $\frac{5x+2}{4x-12} - \frac{3x+8}{4x-12}$

(c)  $\frac{6x^2-8x}{x^2-25} - \frac{4x^2+2x}{x^2-25}$

3. Combine each of the following using addition. Simplify your final answers.

(a)  $\frac{x}{5x+25} + \frac{2x-3}{x^2-3x-40}$

(b)  $\frac{x-4}{x^2-24x+128} + \frac{2}{x^2-12x+32}$



4. Which of the following represents the sum of  $\frac{1}{x+1}$  and  $\frac{1}{x-1}$ ?

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

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

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

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

5. When the expressions  $\frac{x^2-8x}{9-x^2}$  and  $\frac{3x+6}{9-x^2}$  are added the result can be written as

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

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

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

(4)  $\frac{x+7}{x-3}$

6. Express each of the following differences in simplest form.

(a)  $\frac{x+2}{x^2+4x-32} - \frac{4}{x^2-16}$

(b)  $\frac{2x+3}{8x^2+6x+1} - \frac{3}{2x^2-x-1}$

7. When  $\frac{7x+14}{3x+12}$  is subtracted from  $\frac{2x-6}{3x+12}$  the result can be simplified to

(1)  $-\frac{5}{3}$

(3)  $\frac{10}{3}$

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

(4)  $\frac{7}{3}$

