

COMPLEX FRACTIONS COMMON CORE ALGEBRA II



Complex fractions are simply defined as fractions that have other fractions within their numerators and/or denominators. To simplify these fractions means to remove these minor fractions and then eliminate any common factors. The key, as always, is to multiply by the number one in ways that simplify the fraction.

Exercise #1: Consider the complex fraction $\frac{\frac{1}{9} + \frac{1}{18}}{\frac{1}{3}}$.

- (a) What is the least common denominator amongst the three minor fractions?
- (b) Multiply the numerator and denominator of the major fraction by your answer in part (a) and then simplify your result.
- (c) Why is it acceptable to perform the operation in part (b)? What number are you effectively multiplying by?

By multiplying the major fraction by the number one, by using the least common denominator, we will always eliminate the minor fractions (by turning them into integer expressions).

Exercise #2: Simplify each of the following complex fractions.

(a) ~~$\frac{\frac{1}{2} - \frac{1}{10}}{\frac{2}{5}}$~~

TOP

$$\frac{2x}{3x} + \frac{2}{x} \cdot 3$$

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



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

Bottom

$$\frac{5x}{3x} + \frac{5}{x} \cdot 3$$

$$\frac{5x+15}{3x}$$

(c) ~~$\frac{\frac{3}{8} + \frac{1}{4}}{\frac{7}{2x} + \frac{3}{4}}$~~

K.C.F.

$$\frac{2x+16}{3x} \cdot \frac{3x}{5x+15}$$

$$\frac{2x+16}{3x} \cdot \frac{3x}{5(x+3)}$$

$$\frac{2}{5}$$

These types of problems can certainly involve more complicated secondary simplification. Don't forget the primary use of factoring in order to simplify.

Exercise #3: Simplify each of the following complex fractions.

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

TOP
 $\frac{2^x}{5x} - \frac{2}{x} \cdot \frac{5}{5}$

$\frac{2x-10}{5x}$

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

Bottom
 $\frac{1^x}{5x^x} - \frac{1}{x^2} \cdot \frac{5}{5}$

$\frac{x-5}{5x^2}$

(c) $\frac{\frac{x}{12} + \frac{1}{6} - \frac{2}{x}}{\frac{x}{12} - \frac{4}{3x}}$

KCF

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

$= 2x$

If the denominators of the minor fractions become more complex, be sure to factor them first, just as you did with the addition and subtraction in the previous lesson.

Exercise #4: Simplify each of the following complex fractions.

(a) $\frac{\frac{4}{x+2} + \frac{2}{x-4}}{\frac{12x-24}{x^2-2x-8}}$

TOP
 $\frac{4x-16+2x+8}{(x+2)(x-4)}$

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

Bottom
 $\frac{12(x-2)}{(x-4)(x+2)}$

KCF
 $\frac{6(x-2)}{(x+2)(x-4)} \cdot \frac{(x-4)(x+2)}{12(x-2)}$

$= \frac{1}{2}$

(b) $\frac{\frac{x}{x+6} - \frac{1}{x+2}}{\frac{x^2-4}{x^2+8x+12}}$

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

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

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

$= \frac{x+3}{x+2}$

Name: _____

Date: _____

COMPLEX FRACTIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Simplify each of the following numerical complex fractions.

(a)
$$\frac{\frac{1}{4} + \frac{3}{20}}{\frac{1}{2}}$$

(b)
$$\frac{\frac{5}{18} + \frac{1}{6}}{\frac{1}{3}}$$

(c)
$$\frac{\frac{3}{4} - \frac{1}{5}}{\frac{1}{4}}$$

2. Simplify each of the following complex fractions.

(a)
$$\frac{\frac{1}{2} + \frac{1}{3x}}{\frac{3}{10} + \frac{1}{5x}}$$

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

(c)
$$\frac{\frac{1}{8} - \frac{1}{2x}}{\frac{1}{12x} - \frac{1}{3x^2}}$$

3. Simplify each of the following complex fractions.

(a)
$$\frac{\frac{5}{3x} - \frac{5}{x^2}}{\frac{1}{3} - \frac{1}{x^2}}$$

(b)
$$\frac{\frac{x}{10} - \frac{1}{10} - \frac{2}{x}}{\frac{1}{2} - \frac{x}{10}}$$

(c)
$$\frac{3 - \frac{3}{4x}}{2 - \frac{1}{8x^2}}$$



4. Simplify each of the following complex fractions.

$$(a) \frac{\frac{x}{x-4} + \frac{4}{x-10}}{\frac{5x+10}{x^2-14x+40}}$$

$$(b) \frac{\frac{3x+2}{x-1} - \frac{8}{x-4}}{\frac{2x^2-12x}{x^2-5x+4}}$$

5. Which of the following is equivalent to $\frac{\frac{1}{x-1} - \frac{1}{x}}{\frac{1}{x^2-x}}$?

(1) 1

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

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

(4) $x - x^2$

REASONING

6. Since one can multiply by the number 1 at any point in an expression, simplify the following complex fraction by simplifying the more minor complex fraction first, then continue

$$\frac{\frac{\frac{1}{2} - \frac{1}{x}}{1} - \frac{1}{10x}}{\frac{\frac{x}{2} - 1}{\frac{1}{10x} - \frac{1}{5x^2}}}$$

