Name: ___________________________________ Date: _________________

SIMPLIFYING RATIONAL EXPRESSIONS
COMMON CORE ALGEBRA II

Simplifying a rational expression into its lowest terms is an extremely useful skill. Its algebra is based on how we simply numerical fractions. The basic principle is developed in the first exercise.

***Exercise* #1:** Recall that to multiply fractions, one simply multiplies their numerators and denominators.

(a) Simplify the numerical fraction $\frac{18}{12}$ by first expressing it as a product of two fractions, one of which is equal to one.

(b) Simplify the algebraic fraction $\frac{x^2-9}{2x+6}$ by first expressing it as the product of two fractions (factor!), one of which is equal to one.

Every time we simplify a fraction, we are essentially finding all common factors of the numerator and denominator and dividing them to be equal to one. Key in this process is that the numerator and denominator **must be factored** and **only common factors cancel each other.** This is true whether our fraction contains monomial, binomial, or polynomial expressions.

***Exercise* #2:** Simplify each of the following monomials dividing other monomials.

(a) $\frac{3x^5y^6}{6x^8y^3}$

(b) $\frac{20x^{10}y^8}{4x^2}$

(c) $\frac{7x^3y}{21x^5y^8}$

***Exercise* #3:** Which of the following is equivalent to $\frac{10x^6y^3}{15x^2y^6}$?

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

(3) $\frac{2x^4}{3y^3}$

(2) $\frac{3x^8}{2y^9}$

(4) $\frac{3x^2}{2y^3}$

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When simplifying rational expressions that are more complex, always factor first, then identify common factors that can be eliminated.

***Exercise* #4:** Simplify each of the following rational expressions.

(a) $\dfrac{x^2+5x-14}{x^2-4}$ (b) $\dfrac{4x^2-1}{10x-5}$ (c) $\dfrac{3x^2+14x+8}{x^2-16}$

A special type of simplifying occurs whenever expressions of the form $(x-y)$ and $(y-x)$ are involved.

***Exercise* #5:** Simplify each of the following fractions.

(a) $\dfrac{9-6}{6-9}$ (b) $\dfrac{15-3}{3-15}$ (c) $\dfrac{a-b}{b-a}$

***Exercise* #6:** Which of the following is equivalent to $\dfrac{2x-10}{25-x^2}$?

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

(2) $\dfrac{2-x}{5}$ (4) $\dfrac{2}{x-5}$

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***Exercise* #7:** Which of the following is equivalent to $\dfrac{x^2-6x+9}{18-6x}$?

(1) $\dfrac{-x-3}{6}$ (3) $\dfrac{x+3}{9}$

(2) $\dfrac{x-3}{6}$ (4) $\dfrac{3-x}{6}$

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SIMPLIFYING RATIONAL EXPRESSIONS
COMMON CORE ALGEBRA II HOMEWORK

FLUENCY

1. Write each of the following ratios in simplest form.

(a) $\frac{5x^8}{20x^2}$ (b) $\frac{-12y^3}{8y^{12}}$ (c) $\frac{6x^{10}y^2}{15x^4y^5}$ (d) $\frac{24x^3y^7}{12x^6y^{10}}$

2. Which of the following is equivalent to the expression $\frac{4x^6y^4}{12x^2y^6}$?

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

(2) $\frac{3y^2}{x^3}$ (4) $\frac{x^3}{3y^2}$ __________

3. Simplify each of the following rational expressions.

(a) $\frac{x^2-25}{4x-20}$ (b) $\frac{x^2+11x+24}{x^2-9}$ (c) $\frac{4x^2-1}{5x-10x^2}$

(d) $\frac{9x^2-4}{3x^2+4x-4}$ (e) $\frac{7x^2-42x}{x^2+2x-48}$ (f) $\frac{2x^2-3x-5}{25-4x^2}$

4. Which of the following is equivalent to the fraction $\frac{x^2-9x+18}{15x-5x^2}$?

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

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

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5. The rational expression $\frac{2x^2+7x+6}{x^2-4}$ can be equivalently rewritten as

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

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

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6. Written in simplest form, the fraction $\frac{y^2-x^2}{5x-5y}$ is equal to

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

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

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REASONING

7. When we simplify an algebraic fraction, we are producing equivalent expressions for *most* values of x. Consider the expressions $\frac{x^2-4}{2x-4}$ and $\frac{x+2}{2}$.

(a) Show by simplifying the first expression that these two are equivalent.

(b) Use your calculator to fill out the value for both of these expressions to show their equivalence.

x	$\frac{x^2-4}{2x-4}$	$\frac{x+2}{2}$
0		
1		
2		
3		
4		

(c) Clearly these two expressions are *not* equivalent for an input value of $x=2$. Explain why.