Lesson 13: Rational Expressions

Objectives

- To understand the parts of a fraction.
- To place fractions on a number line.
- To perform operations using fractions.
- Use the fraction rules to simplify expression and solve equations.

Terms

- Numerator
- Denominator
- Form of one
- Rational Expressions
- Reciprocal

Recall: Parts of a Fraction and Form of One

Numerator: How many _____ of the unit you actually have.

Denominator: If we had 1 unit of something, the _____ of parts of the unit is broken into.

Form of one: Any number or expression

_____

Examples: $\frac{5}{5}$ $\frac{x+2}{x+2}$ $\frac{\log(2x)}{\log(2x)}$

- **Rational Expressions:** A fraction with polynomials in the numerator and/or denominator.
- **Common Denominator or Least Common Denominator (LCD)**
  - The smallest value that the denominators of fractions have in common.
  - Needed for adding/subtracting fractions.
  - Can be numbers, variables, or a combination of the two.

Examples

1. Use the expression to complete the following:
   a. What is a common denominator?

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

   b. Multiply each fraction by a form of one to rewrite with a common denominator.

   c. Simplify the expression by adding the fractions.

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2. Simplify the expression. $\frac{12}{(x-1)x} - \frac{4}{x-1}$
   a. What is a common denominator?

   b. Multiply each fraction by a form of one to rewrite with a common denominator.

   c. Simplify the expression by adding/subtracting the fractions, then simplifying forms of one.

3. Simplify the expression. $\frac{3}{2x-10} \cdot \frac{5x-25}{12}$
   a. Simplify the expressions by multiplying the fractions.

   b. Factor each term in the numerator and denominator.

   c. Identify forms of one.

   d. Simplify forms of one to one and write your final answer.

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Dividing Rational Expressions

- **Reciprocal**: When you rewrite a fraction by interchanging the numerator and the denominator.

    - When you divide one fraction by another, you:
        - Convert to a multiplication problem.
            - Take the reciprocal of the second fraction.
            - Change the division to multiplication.
        - Follow the rules developed for fraction multiplication.

4. Simplify the expression.

$$\frac{3x}{2x-8} \div \frac{3x}{5x-20}$$

    a. Simplify the expression by multiplying by the reciprocal.

    b. Factor each term in the numerator and denominator, if possible.

    c. Identify forms of one.

    d. Simplify forms of one to one and write your final answer.

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Practice: Complete the indicated operations. Use the space provided to show your work.

1. $\frac{3x+9}{x-2} \cdot \frac{4x-8}{9x+18}$

2. $\frac{5}{6a} - \frac{9}{8a}$

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

4. $\frac{5x+35}{6} \div \frac{x+7}{3x}$

Where will you see this in upcoming material?	What are the calculator skills you needed?