

PROGRESSIONS:  
PEER-LED TEAM LEARNING

## Module 8: Complex Fractions

### Objective

- ❖ To understand complex fractions

### Module 8A: Pre-Lecture

A complex fraction is a fraction containing one or more fractions in the numerator or denominator or both the numerator and denominator. Examine the following examples of complex fractions from Arithmetic and Algebra to understand the definition clearly:

Arithmetic	$\frac{\frac{1}{2}}{\frac{1}{3}}$	$\frac{4 - \frac{1}{2}}{\frac{1}{3}}$	$\frac{4 - \frac{1}{2}}{5 + \frac{1}{3}}$	$\frac{\frac{1}{2}}{5}$
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Algebra	$\frac{\frac{1}{x}}{\frac{1}{y}}$ where $x, y \neq 0$	$\frac{4 - \frac{1}{x}}{\frac{1}{y}}$ where $x, y \neq 0$	$\frac{4 - \frac{1}{x}}{5 + \frac{1}{y}}$ where $x, y \neq 0$	$\frac{\frac{1}{x}}{5}$
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The fraction bar represents division, so each of the above examples can also be written as a division problem:

Arithmetic	$\frac{1}{2} \div \frac{1}{3}$	$(4 - \frac{1}{2}) \div \frac{1}{3}$	$(4 - \frac{1}{2}) \div (5 + \frac{1}{3})$	$\frac{1}{2} \div 5$
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Algebra	$\frac{1}{x} \div \frac{1}{y}$ where $x, y \neq 0$	$(4 - \frac{1}{x}) \div \frac{1}{y}$ where $x, y \neq 0$	$(4 - \frac{1}{x}) \div (5 + \frac{1}{y})$ where $x, y \neq 0$	$\frac{1}{x} \div 5$
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To solve these problems, we must follow the rules for adding, subtracting, multiplying and dividing fractions AND follow the Order of Operations.

1. There are four steps in the Order of Operations. Each step must be done in order, from left to right. What are the four steps?

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2. The complex fraction  $\frac{4 - \frac{1}{2}}{5 + \frac{1}{3}}$  can be rewritten as  $(4 - \frac{1}{2}) \div (5 + \frac{1}{3})$ . The

Order of Operations requires that expressions within parentheses be simplified first. Since we must have the same denominators to add and subtract fractions, we can rewrite 4 and 5:

$$4 = \frac{4}{1} = \frac{8}{2} \text{ and } 5 = \frac{?}{1} = \frac{?}{3}.$$

$$\text{So we have } (4 - \frac{1}{2}) \div (5 + \frac{1}{3}) =$$

$$(\frac{8}{2} - \frac{1}{2}) \div (\frac{?}{?} + \frac{1}{3}) =$$

$$\frac{7}{2} \div \quad ? \quad =$$

To finish the solution, follow the rule for division of fractions. Write the rule for division of fractions and complete the solution to the problem.

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3. It is clear that the mastery of operations with fractions is important in solving complex fractions. Consider a different problem-solving strategy:

Go back to the original complex fraction:  $\frac{4 - \frac{1}{2}}{5 + \frac{1}{3}}$

Find the least common denominator of all the fractions in the complex fraction:  
LCD (1, 2, 3) = 6

Use the Distributive Property of Multiplication over Addition to multiply both the numerator and denominator of the complex fraction by the LCD:

$$\frac{6(4 - \frac{1}{2})}{6(5 + \frac{1}{3})} =$$

$$\frac{6(4) - 6(\frac{1}{2})}{6(5) + 6(\frac{1}{3})} =$$

$$\frac{24 - 3}{30 + 2} = ?$$

Finish the solution. Using this strategy correctly, you will get the same answer as in #2.

4. There are two basic strategies that can be used to simplify complex fractions:

**Strategy #1:**

Write the complex fraction as a division problem, then simplify the problem by following rules for operations with fractions and the Order of Operations.

**Strategy #2:**

Multiply the numerator and denominator of the complex fraction by the LCD of all the denominators in the complex fraction, then simplify the result by using appropriate rules.

**Remember to always write your answer in simplest terms.**

Which of the above strategies do you prefer? \_\_\_\_\_

5. Simplify each of the following complex fractions using your preferred strategy. If you have time, solve them a second time using the other strategy.

Problems	Solutions
$\frac{\frac{x}{2}}{\frac{y}{3}}$	
$\frac{\frac{5}{6} - \frac{1}{2}}{\frac{y}{3}}$	
$\frac{2 + \frac{3}{4}}{5 - \frac{6}{7}}$	
$\frac{\frac{y}{5}}{2y}$	

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