

## Complex Fractions

A complex fraction is one in which the numerator or denominator or both contain fractions.

Examples:

$$\frac{\frac{5}{7}}{\frac{3}{x}}, \frac{\frac{16}{11}}{\frac{9}{x}}, \frac{\frac{9}{x}}{x-3} \text{ are all complex fractions}$$

To simplify a complex fraction, we express it as a simple fraction of lowest terms. The best way to handle a complex fraction is to realize that fractions are really quotients. Then you can use the old adage “Flip the last guy and multiply” (Invert and multiply)

Examples:

$$\frac{\frac{3}{4}}{\frac{3}{5}} = \frac{3}{4} \div \frac{3}{5} = \frac{3}{4} \cdot \frac{5}{3} = \frac{15}{12} = \frac{5}{4}$$

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$$\frac{\frac{3}{4} + \frac{1}{3}}{\frac{1}{3} + \frac{1}{6}}$$

Hint: confront the top and bottom separately

$$\frac{3}{4} + \frac{1}{3} = \frac{9}{12} + \frac{4}{12} = \frac{13}{12}$$

$$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{\frac{13}{12}}{\frac{1}{2}} = \frac{13}{12} \cdot \frac{2}{1} = \frac{13}{6}$$

$$\frac{x - \frac{1}{x}}{1 + \frac{1}{x}} \text{ remember to handle top and bottom separately}$$

$$x - \frac{1}{x} = \frac{x}{1} - \frac{1}{x} = \frac{x^2}{x} - \frac{1}{x} = \frac{x^2 - 1}{x}$$

$$1 + \frac{1}{x} = \frac{1}{1} + \frac{1}{x} = \frac{x}{x} + \frac{1}{x} = \frac{x + 1}{x}$$

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