

COMPLEX FRACTIONS

Ex: $\frac{\frac{1}{x} + \frac{3x}{x-5}}{\frac{x}{1-x} + \frac{7}{3}}$ main fraction line

Simplify a complex fraction.

$$\frac{\frac{2 + \frac{1}{x}}{1}}{4 - \frac{1}{x^2}} = \frac{\frac{2x^2 + x}{x^2}}{\frac{4x^2 - 1}{x^2}} = \frac{2x^2 + x}{4x^2 - 1} = \frac{x(2x+1)}{(2x+1)(2x-1)} = \frac{x}{2x-1}$$

1. Find the LCD for numerator together with denominator

$$\begin{array}{l} \text{LCD (numerator)} = x \\ \text{LCD (denominator)} = x^2 \end{array} \quad \Bigg| \quad \begin{array}{l} \text{LCD (Complex Fraction)} \\ x^2 \end{array}$$

2. Multiply the numerator and denominator by LCD of the complex fraction

3. Multiply (distribute) the LCD with each term ~~at~~ on the numerator / denominator

4. Factor the numerator and denominator and simplify the expression

$$\begin{aligned} \text{Ex: } & \frac{x+1 - \frac{4}{x-2}}{x-4 - \frac{24}{x-2}} \cdot \frac{(x-2)}{(x-2)} \neq \\ & \frac{x(x-2) + 1(x-2) - \frac{4}{(x-2)}(x-2)}{x(x-2) - 4(x-2) - \frac{24}{(x-2)}(x-2)} \\ & = \frac{x^2 - 2x + x - 2 - 4}{x^2 - 2x - 4x + 8 - 24} \\ & = \frac{x^2 - x - 6}{x^2 - 6x - 16} = \frac{(x-3)(\cancel{x+2})}{(x-8)(\cancel{x+2})} \\ & = \frac{x-3}{x-8} \end{aligned}$$

Ex

$$\frac{\frac{y}{y+2} - \frac{y}{y-2}}{\frac{y}{y+2} + \frac{y}{y-2}} \cdot \frac{(y+2)(y-2)}{(y+2)(y-2)}$$

$$= \frac{\frac{y}{y+2} \cdot \cancel{(y+2)(y-2)} - \frac{y}{y-2} \cdot \cancel{(y+2)(y-2)}}{\frac{y}{y+2} \cdot \cancel{(y+2)(y-2)} + \frac{y}{y-2} \cdot \cancel{(y+2)(y-2)}}$$

$$= \frac{y(y-2) - y(y+2)}{y(y-2) + y(y+2)}$$

$$= \frac{y^2 - 2y - y^2 - 2y}{y^2 - 2y + y^2 + 2y}$$

$$= \frac{-4y}{2y^2} = -\frac{2}{y}$$

\uparrow
 $2 \cdot y$

Problem 1

$$A. \frac{3 + \frac{14}{x} + \frac{16}{x^2}}{6 + \frac{5}{x} - \frac{4}{x^2}} \cdot \frac{x^2}{x^2}$$

$$= \frac{3(x^2) + \frac{14}{x}(x^2) + \frac{16}{x^2}(x^2)}{6(x^2) + \frac{5}{x}(x^2) - \frac{4}{x^2}(x^2)} = \frac{3x^2 + 14x + 16}{6x^2 + 5x - 4}$$

$$= \frac{\cancel{(3x+4)}(x+4)}{\cancel{(3x+4)}(2x-1)} = \boxed{\frac{x+4}{2x-1}}$$

$$B. \frac{2x+5 + \frac{14}{x-3}}{4x+16 + \frac{49}{x-3}} \cdot \frac{(x-3)}{(x-3)}$$

$$\frac{2x+5(x-3) + 14(x-3)}{4x+16(x-3) + 49(x-3)}$$

$$\frac{2x^2 - x - 15 + 14}{4x^2 + 4x - 48 + 49} = \frac{2x^2 - x - 1}{4x^2 + 4x + 1}$$

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