

What you will learn about:
Simplifying Rational Complex Expressions

Simplifying Complex Rational Expressions by Dividing

Step 1 - Simplify the numerator and denominator

Step 2 - Rewrite complex expression as a division problem

Step 3 - Divide the expression

Simplify: $\frac{\frac{4}{y-3}}{\frac{8}{y^2-9}}$

$$\frac{\frac{4}{y-3}}{\frac{8}{(y+3)(y-3)}}$$

$$\frac{4}{y-3} \div \frac{8}{(y+3)(y-3)}$$

Simplify: $\frac{\frac{1}{3} + \frac{1}{6}}{\frac{1}{2} - \frac{1}{3}}$ $\frac{\frac{1}{3} + \frac{1}{6}}{\frac{1}{2} - \frac{1}{3}}$

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

$$\frac{3}{6} \div \frac{1}{6}$$

$$\frac{3}{6} \cdot \frac{6}{1} = 3$$

Simplify: $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{x}{y} - \frac{y}{x}}$ $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{x}{y} - \frac{y}{x}}$

$$\frac{\frac{y}{xy} + \frac{x}{xy}}{\frac{x^2}{xy} - \frac{y^2}{xy}}$$

$$\frac{\frac{x+y}{xy}}{\frac{x^2-y^2}{xy}}$$

$$\frac{x^2-y}{xy}$$

$$\frac{x+y}{\cancel{xy}} \cdot \frac{\cancel{xy}}{x^2-y^2}$$

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

$$\frac{x+y}{(x+y)(x-y)}$$

$$\frac{1}{x-y}$$

Simplify: $\frac{\frac{1}{x^2-7x+12}}{\frac{2}{x-4}}$

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

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

$$\frac{1}{x^2-7x+12}$$

$$\frac{2}{x-4}$$

Simplify: $\frac{\frac{3}{4} - \frac{1}{3}}{\frac{1}{8} + \frac{5}{6}}$

$$\frac{\frac{9}{12} - \frac{4}{12}}{\frac{3}{24} + \frac{20}{24}} = \frac{\frac{5}{12}}{\frac{23}{24}}$$

$$\frac{5}{12} \div \frac{23}{24} = \frac{5}{12} \cdot \frac{24}{23} = \frac{10}{23}$$

$$\frac{\frac{3}{4} - \frac{1}{3}}{\frac{1}{8} + \frac{5}{6}}$$

Simplify: $\frac{\frac{1}{a} + \frac{1}{b}}{\frac{1}{a^2} - \frac{1}{b^2}}$

$$\frac{\frac{b}{ab} + \frac{a}{ab}}{\frac{b^2}{a^2b^2} - \frac{a^2}{a^2b^2}}$$

$$\frac{\frac{b+a}{ab}}{\frac{b^2-a^2}{a^2b^2}}$$

$$\frac{\cancel{b+a}}{ab} \cdot \frac{a^2b^2}{\cancel{(b+a)}(b-a)}$$

$$\frac{ab}{b-a}$$

Simplify: $\frac{\frac{n}{1} - \frac{4n}{n+5}}{\frac{1}{n+5} + \frac{1}{n-5}}$

$$\frac{\frac{n}{1} - \frac{4n}{n+5}}{\frac{1}{n+5} + \frac{1}{n-5}}$$

$$\frac{\frac{n(n+5) - 4n}{n+5}}{\frac{1(n-5) + 1(n+5)}{n+5}}$$

$$\frac{n^2+5n-4n}{n+5} \cdot \frac{n+5}{(n-5)(n+5)}$$

$$\frac{n-5}{(n-5)(n+5)} + \frac{n+5}{(n-5)(n+5)}$$

Simplify: $\frac{b - \frac{3b}{b+5}}{\frac{2}{b+5} + \frac{1}{b-5}}$

$$\frac{\frac{b^2+b}{b+5}}{\frac{2}{b+5} + \frac{1}{b-5}}$$

$$\frac{b^2+b}{n+5} \cdot \frac{(n-5)(n+5)}{2n}$$

$$\frac{\cancel{n}(n+1)}{\cancel{n+5}} \cdot \frac{(n-5)\cancel{(n+5)}}{2n}$$

$$\frac{(n+1)(n-5)}{2}$$

Simplifying by using the LCD

Step 1 – Find the LCD of all the fractions in the rational expression

Step 2 – Multiply the numerator and the denominator by the LCD

Step 3 – Simplify the Expression

Simplify: $\frac{\frac{1}{2} + \frac{1}{5}}{\frac{1}{10} + \frac{1}{5}}$

$$\frac{5+2}{1+2}$$

$$\frac{7}{3}$$

Simplify: $\frac{\frac{1}{4} + \frac{3}{8}}{\frac{1}{2} - \frac{5}{16}}$

$$\frac{4+6}{8-5} = \frac{10}{3}$$

Simplify: $\frac{\frac{1}{x} + \frac{1}{y}}{\frac{x}{y} - \frac{y}{x}}$

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

$$\frac{\cancel{x+y}}{(xy)(x-y)}$$

$$\frac{1}{x-y}$$

Simplify: $\frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{x} + \frac{1}{y}}$

$$\frac{y^2-x^2}{xy^2+x^2y}$$

$$\frac{(y-x)(y+x)}{xy(y+x)}$$

$$\frac{y-x}{xy}$$

$$LCD = (x+2)(x-2)$$

Simplify: $\frac{\frac{3}{x+6}}{\frac{4}{x-6} - \frac{4}{x^2-36}}$

Simplify: $\frac{\frac{3}{x^2} (x+2)(x-2)}{\frac{5}{x^2} - \frac{3}{x^2-4} (x+2)(x-2)}$

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

$$\frac{3x-6}{5x+10-3} = \frac{3x-6}{5x+7}$$

$$(x-7)(x+7)$$

$$\frac{2(x+7)}{(x+7)(x-7)} - \frac{(x-7)}{(x+7)(x-7)}$$

$$2x+14 - x - 7$$

Simplify: $\frac{\frac{2}{x+7} - \frac{1}{x-7}}{\frac{6}{x^2} - \frac{1}{x^2-49}}$

$$\frac{2(x+7) - (x-7)}{6(x-7) - 1}$$

$$\frac{2x+14-x+7}{6x-42-1}$$

$$\frac{x+21}{6x-43}$$

Simplify: $\frac{\frac{3}{x^2+7x+10}}{\frac{4}{x+2} + \frac{1}{x+5}}$

$$\frac{3}{4(x+5) + 1(x+2)}$$

$$\frac{3}{4x+20+x+2}$$

$$\frac{3}{5x+22}$$

Simplify: $\frac{\frac{4}{y+5} + \frac{2}{y+6}}{\frac{3y}{y^2+11y+30}}$

$$\frac{4(y+6) + 2(y+5)}{3y}$$

$$\frac{4y+24+2y+10}{3y}$$

$$\frac{6y+34}{3y}$$

Simplify: $\frac{\frac{y}{y+1}}{1 + \frac{1}{y-1}}$

$$\frac{\frac{y}{y+1}}{\frac{y-1}{y-1} + \frac{1}{y-1}}$$

$$\frac{\frac{y}{y+1}}{\frac{y-1+1}{y-1}}$$

$$\frac{\frac{y}{y+1}}{\frac{y}{y-1}} \cdot \frac{y-1}{y-1} = \frac{y-1}{y+1}$$

$$\frac{6y}{3y} + \frac{34}{3y}$$

$$2 + \frac{34}{3y}$$

$$\frac{y}{y+1} \cdot \frac{y-1}{y}$$