Complex Fractions

Step 1: Find the least common denominator (LCD).
Step 2: Multiply each fraction by what is missing in the LCD.
Step 3: Cancel all denominators.
Step 4: Factor and simplify.

Directions: Simplify each complex fraction.

1. $\dfrac{\frac{12a}{b^3}}{\frac{b^2}{4}} = \dfrac{12a}{b^3} \div \dfrac{b^2}{4} = \dfrac{12a}{b^3} \cdot \dfrac{4}{b^2} = \boxed{\dfrac{48a}{b^5}}$

2. $\dfrac{\frac{3}{a}+\frac{1}{2a}}{a+\frac{a}{2}}$

$\dfrac{2\cdot 3}{2\cdot a} + \dfrac{1}{2a} = \dfrac{6}{2a} + \dfrac{1}{2a} = \dfrac{6+1}{2a} = \dfrac{7}{2a}$

LCD=2a

$\dfrac{2\cdot a}{2\cdot 1} + \dfrac{a}{2} = \dfrac{2a}{2} + \dfrac{a}{2} = \dfrac{2a+a}{2} = \dfrac{3a}{2}$

LCD=2

$\dfrac{\frac{7}{2a}}{\frac{3a}{2}} = \dfrac{7}{2a} \div \dfrac{3a}{2} = \dfrac{7}{2a} \cdot \dfrac{2}{3a} = \dfrac{\cancel{14}^{\,7}}{\cancel{6}_{\,3}a^2} = \boxed{\dfrac{7}{3a^2}}$

3. $\dfrac{\frac{1}{x^2}-\frac{3}{x}}{3+\frac{1}{x^2}}$

$$\frac{1}{x^2}-\frac{3\cdot x}{x\cdot x}=\frac{1}{x^2}-\frac{3x}{x^2}=\frac{1-3x}{x^2}$$

LCD $= x^2$

$$\frac{x^2\cdot 3}{x^2\cdot 1}+\frac{1}{x^2}=\frac{3x^2}{x^2}+\frac{1}{x^2}=\frac{3x^2+1}{x^2}$$

LCD $= x^2$

$$\frac{\frac{1-3x}{\cancel{x^2}}}{\frac{3x^2+1}{\cancel{x^2}}}=\boxed{\frac{1-3x}{3x^2+1}}$$

4. $\dfrac{\frac{x}{y}-\frac{1}{x}}{\frac{y}{x}+\frac{1}{y}}$

$$\frac{x\cdot x}{x\cdot y}-\frac{1\cdot y}{x\cdot y}=\frac{x^2}{xy}-\frac{y}{xy}=\frac{x^2-y}{xy}$$

LCD $= xy$

$$\frac{y\cdot y}{y\cdot x}+\frac{1\cdot x}{y\cdot x}=\frac{y^2}{xy}+\frac{x}{xy}=\frac{y^2+x}{xy}$$

LCD $= xy$

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

5. $\dfrac{\dfrac{25}{x-y}+\dfrac{4}{x+y}}{\dfrac{5}{x-y}-\dfrac{3}{x+y}}$ $(x+y)$ $(x+y)$

$$\frac{25}{x-y} + \frac{4\cdot(x-y)}{x+y\cdot(x-y)} = \frac{25(x+y)}{(x+y)(x-y)} + \frac{4(x-y)}{(x+y)(x-y)}$$

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

$$= \frac{25(x+y)+4(x-y)}{(x+y)(x-y)} = \frac{25x+25y+4x-4y}{(x+y)(x-y)}$$

$$= \frac{29x+21y}{(x+y)(x-y)} \quad *$$

$$\frac{(x+y)\cdot 5}{(x+y)\cdot x-y} - \frac{3\cdot(x-y)}{x+y\cdot(x-y)} = \frac{5(x+y)}{(x+y)(x-y)} - \frac{3(x-y)}{(x+y)(x-y)} =$$

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

$$\frac{5(x+y)-3(x-y)}{(x+y)(x-y)} = \frac{5x+5y-3x+3y}{(x+y)(x-y)} = \frac{2x+8y}{(x+y)(x-y)} \quad *$$

$$\frac{\dfrac{29x+21y}{\cancel{(x+y)(x-y)}}}{\dfrac{2x+8y}{\cancel{(x+y)(x-y)}}} = \frac{29x+21y}{2x+8y} = \boxed{\frac{29x+21y}{2(x+4y)}}$$