Complex Fractions

A complex fraction is a fraction whose numerator or denominator
or both contain fractions.

Two Methods for Simplifying Complex Fractions

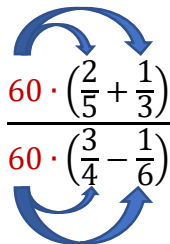| The First Method	
Example:	Explanation:
Simplify the complex fraction: $$\dfrac{\dfrac{2}{5}+\dfrac{1}{3}}{\dfrac{3}{4}-\dfrac{1}{6}}$$ <u>Solution:</u> $$\dfrac{\dfrac{2\cdot 3}{5\cdot 3}+\dfrac{1\cdot 5}{3\cdot 5}}{\dfrac{3\cdot 3}{4\cdot 3}-\dfrac{1\cdot 2}{6\cdot 2}}$$ $$=\dfrac{\dfrac{6}{15}+\dfrac{5}{15}}{\dfrac{9}{12}-\dfrac{2}{12}}$$ $$=\dfrac{\dfrac{11}{15}}{\dfrac{7}{12}}$$ $$=\dfrac{11}{15}\div\dfrac{7}{12}$$ $$=\dfrac{11}{15}\cdot\dfrac{12}{7}$$ $$=\dfrac{11}{\overset{}{\underset{5}{\cancel{15}}}}\cdot\dfrac{\overset{4}{\cancel{12}}}{7}$$ $$=\dfrac{44}{35}$$	Find the least common denominator for the top fractions: the LCD of 5 and 3 is 15. Write each fraction as an equivalent fraction whose denominator is 15. $$\dfrac{2\cdot 3}{5\cdot 3}=\dfrac{6}{15}\qquad\dfrac{1\cdot 5}{3\cdot 5}=\dfrac{5}{15}$$ Find the least common denominator for the bottom fractions: the LCD of 4 of 6 is 12. Write each fraction as an equivalent fraction whose denominator is 12. $$\dfrac{3\cdot 3}{4\cdot 3}=\dfrac{9}{12}\qquad\dfrac{1\cdot 2}{6\cdot 2}=\dfrac{2}{12}$$ Add 6 and 5 on the top. Keep the denominator the same. Subtract 9−2 on the bottom. Keep the denominator the same. Rewrite the division of these fractions using the ÷ symbol. Flip the second fraction and convert division into multiplication. Divide both 15 and 12 by 3. Then multiply the remaining factors: $11\cdot 4=44$ in the numerator. $5\cdot 7=35$ in the denominator.

The Second Method	
Example:	Explanation:
Simplify the complex fraction: $$\frac{\frac{2}{5} + \frac{1}{3}}{\frac{3}{4} - \frac{1}{6}}$$ Solution: $$\frac{60 \cdot \left(\frac{2}{5} + \frac{1}{3}\right)}{60 \cdot \left(\frac{3}{4} - \frac{1}{6}\right)}$$ $$= \frac{24 + 20}{45 - 10}$$ $$= \frac{44}{35}$$	Find the least common denominator for all four fractions: the LCD of $5, 3, 4, and\ 6$ is 60. Multiply the top and the bottom of the complex fraction by 60. Use the distributive property to remove the parentheses. $$60 \cdot \frac{2}{5} = \frac{60}{1} \cdot \frac{2}{5} = 24$$ $$60 \cdot \frac{1}{3} = \frac{60}{1} \cdot \frac{1}{3} = 20$$ $$60 \cdot \frac{3}{4} = \frac{60}{1} \cdot \frac{3}{4} = 45$$ $$60 \cdot \frac{1}{6} = \frac{60}{1} \cdot \frac{1}{6} = 10$$ Add: $24 + 20 = 44$ Subtract: $45 - 10 = 35$