

Adding and Subtracting Fractions

To add or subtract two fractions with *like denominators*, write the sum or difference of the numerators over the denominator.

Adding or Subtracting Fractions with Like Denominators

$$\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}, \text{ where } c \neq 0 \quad \frac{a}{c} - \frac{b}{c} = \frac{a-b}{c}, \text{ where } c \neq 0$$

Example 1 Find $\frac{7}{12} + \frac{1}{12}$.

$$\begin{aligned} \frac{7}{12} + \frac{1}{12} &= \frac{7+1}{12} && \text{Add the numerators.} \\ &= \frac{8}{12}, \text{ or } \frac{2}{3} && \text{Simplify.} \end{aligned}$$

Example 2 Find $\frac{7}{9} - \frac{2}{9}$.

$$\begin{aligned} \frac{7}{9} - \frac{2}{9} &= \frac{7-2}{9} && \text{Subtract the numerators.} \\ &= \frac{5}{9} && \text{Simplify.} \end{aligned}$$

To add or subtract two fractions with *unlike denominators*, first write equivalent fractions with a common denominator. There are two methods you can use.

Adding or Subtracting Fractions with Unlike Denominators

Method 1 Multiply the numerator and the denominator of each fraction by the denominator of the other fraction.

Method 2 Use the **least common denominator** (LCD). The LCD of two or more fractions is the least common multiple (LCM) of the denominators.

Example 3 Find $\frac{1}{8} + \frac{5}{6}$.

Method 1:

$$\begin{aligned} \frac{1}{8} + \frac{5}{6} &= \frac{1 \cdot 6}{8 \cdot 6} + \frac{5 \cdot 8}{6 \cdot 8} && \text{Rewrite using a} \\ & && \text{common denominator} \\ & && \text{of } 8 \cdot 6 = 48. \\ &= \frac{6}{48} + \frac{40}{48} && \text{Multiply.} \\ &= \frac{46}{48}, \text{ or } \frac{23}{24} && \text{Simplify.} \end{aligned}$$

Example 4 Find $5\frac{3}{4} - 1\frac{7}{10}$.

Method 2: Rewrite the difference as $\frac{23}{4} - \frac{17}{10}$.

The LCM of 4 and 10 is 20. So, the LCD is 20.

$$\begin{aligned} \frac{23}{4} - \frac{17}{10} &= \frac{23 \cdot 5}{4 \cdot 5} - \frac{17 \cdot 2}{10 \cdot 2} && \text{Rewrite using} \\ & && \text{the LCD, 20.} \\ &= \frac{115}{20} - \frac{34}{20} && \text{Multiply.} \\ &= \frac{81}{20}, \text{ or } 4\frac{1}{20} && \text{Simplify.} \end{aligned}$$

Practice

Check your answers at BigIdeasMath.com.

Evaluate.

1. $\frac{1}{14} + \frac{5}{14} \frac{6}{7}$
2. $\frac{2}{5} + \frac{1}{5} \frac{3}{5}$
3. $\frac{9}{10} - \frac{1}{10} \frac{4}{5}$
4. $\frac{11}{16} - \frac{3}{16} \frac{1}{2}$
5. $\frac{5}{8} + \frac{7}{8} \frac{3}{2}, \text{ or } 1\frac{1}{2}$
6. $\frac{1}{6} + \frac{1}{6} \frac{1}{3}$
7. $\frac{7}{9} + \frac{2}{3} \frac{13}{9}, \text{ or } 1\frac{4}{9}$
8. $\frac{3}{5} + \frac{4}{7} \frac{41}{35}, \text{ or } 1\frac{6}{35}$
9. $\frac{3}{4} - \frac{1}{6} \frac{7}{12}$
10. $\frac{7}{12} - \frac{5}{9} \frac{1}{36}$
11. $\frac{9}{10} - \frac{5}{6} \frac{1}{15}$
12. $\frac{5}{12} + \frac{11}{16} \frac{53}{48}, \text{ or } 1\frac{5}{48}$
13. $2\frac{3}{5} + 1\frac{2}{5} 4$
14. $4\frac{6}{7} - 2\frac{4}{7} \frac{16}{7}, \text{ or } 2\frac{2}{7}$
15. $5\frac{5}{12} + 3\frac{3}{8} \frac{211}{24}, \text{ or } 8\frac{19}{24}$
16. $8\frac{1}{3} - 3\frac{2}{11} \frac{170}{33}, \text{ or } 5\frac{5}{33}$
17. $\frac{1}{2} + 3\frac{2}{9} \frac{67}{18}, \text{ or } 3\frac{13}{18}$
18. $4\frac{3}{14} - \frac{1}{7} \frac{57}{14}, \text{ or } 4\frac{1}{14}$
19. $\frac{2}{7} + \frac{3}{4} + \frac{1}{2} \frac{43}{28}, \text{ or } 1\frac{15}{28}$
20. $\frac{13}{16} - \frac{1}{4} - \frac{3}{8} \frac{3}{16}$
21. $2\frac{1}{6} - \frac{5}{9} + \frac{2}{3} \frac{41}{18}, \text{ or } 2\frac{5}{18}$