

Questions

1. Find the lowest common denominator, then add the fractions $\frac{7}{15}, \frac{11}{21}$.
2. Find the lowest common denominator, then add the fractions $\frac{7}{10}, \frac{1}{4}$.
3. Combine $\frac{3}{8} + \frac{2}{8}$.
4. Combine $\frac{5}{14} - \frac{1}{14}$.
5. Combine $\frac{5}{36} + \frac{7}{9} - \frac{5}{12}$.
6. Combine $4\frac{1}{3} + 3\frac{2}{5}$.
7. Combine $\frac{7}{9} + \frac{5}{6}$.
8. Combine $2\frac{1}{7} + 3\frac{11}{14}$.

Solutions

1. Technique: **prime factor** the numerators to determine the LCD (lowest common denominator).

$$\begin{array}{l} 15 = 3 \times 5 \\ 21 = 3 \times 7 \\ \hline \Rightarrow \text{LCD} = 3 \times 5 \times 7 = 105 \end{array}$$

$$\begin{aligned} \frac{7}{15} + \frac{11}{21} &= \frac{7 \times 7}{15 \times 7} + \frac{11 \times 5}{21 \times 5} \text{ multiply by appropriate numbers to get common denominator} \\ &= \frac{49}{105} + \frac{55}{105} \text{ simplify} \\ &= \frac{49 + 55}{105} \text{ now that the denominators are the same, you can add numerators} \\ &= \frac{104}{105} \text{ simplify} \end{aligned}$$

- 2.

$$\begin{array}{l} 10 = 2 \times 5 \\ 4 = 2 \times 2 \\ \hline \Rightarrow \text{LCD} = 2 \times 5 \times 2 = 20 \end{array}$$

$$\begin{aligned} \frac{7}{10} + \frac{1}{4} &= \frac{7 \times 2}{10 \times 2} + \frac{1 \times 5}{4 \times 5} \\ &= \frac{14}{20} + \frac{5}{20} \\ &= \frac{14 + 5}{20} \\ &= \frac{19}{20} \end{aligned}$$

3. The denominators are already the same.

$$\frac{3}{8} + \frac{2}{8} = \frac{3+2}{8} = \frac{5}{8}$$

4. The denominators are already the same.

$$\frac{5}{14} - \frac{1}{14} = \frac{5-1}{14} = \frac{4}{14} = \frac{2 \times \cancel{2}}{\cancel{2} \times 7} = \frac{2}{7}$$

5.

$$\begin{array}{r} 36 = 3 \times 3 \times 4 \\ 9 = 3 \times 3 \\ 12 = 3 \times 4 \\ \hline \Rightarrow \text{LCD} = 3 \times 3 \times 4 = 36 \end{array}$$

$$\begin{aligned} \frac{5}{36} + \frac{7}{9} - \frac{5}{12} &= \frac{5}{36} + \frac{7 \times 4}{9 \times 4} - \frac{5 \times 3}{12 \times 3} \\ &= \frac{5}{36} + \frac{28}{36} - \frac{15}{36} \\ &= \frac{5 + 28 - 15}{36} \\ &= \frac{18}{36} \\ &= \frac{1 \times \cancel{2} \times \cancel{9}}{2 \times \cancel{2} \times \cancel{9}} \\ &= \frac{1}{2} \end{aligned}$$

Note: we usually would write $18 = 2 \times 9$ but since we are going to cancel everything in the numerator, it helps to write as $18 = 1 \times 2 \times 9$ so we can see that there will still be a 1 left in the numerator.

6. First, convert the mixed numbers to improper fractions since we know how to add improper fractions.

$$\begin{aligned} 4\frac{1}{3} &= 4 + \frac{1}{3} = \frac{4 \times 3}{3} + \frac{1}{3} = \frac{12}{3} + \frac{1}{3} = \frac{12+1}{3} = \frac{13}{3} \\ 3\frac{2}{5} &= 3 + \frac{2}{5} = \frac{3 \times 5}{5} + \frac{2}{5} = \frac{15}{5} + \frac{2}{5} = \frac{15+2}{5} = \frac{17}{5} \end{aligned}$$

Now get a lowest common denominator.

$$\begin{array}{r} 3 = 3 \\ 5 = 5 \\ \hline \Rightarrow \text{LCD} = 3 \times 5 = 15 \end{array}$$

Now we can add.

$$\begin{aligned}4\frac{1}{3} + 3\frac{2}{5} &= \frac{13}{3} + \frac{17}{5} \\ &= \frac{13 \times 5}{3 \times 5} + \frac{17 \times 3}{5 \times 3} \\ &= \frac{65}{15} + \frac{51}{15} \\ &= \frac{65 + 51}{15} \\ &= \frac{116}{15} \\ &= 7\frac{11}{15}\end{aligned}$$

7.

$$\begin{array}{r}9 = 3 \times 3 \times 3 \\ 6 = 3 \times \quad 2 \\ \hline \Rightarrow \text{LCD} = 3 \times 3 \times 2 = 18\end{array}$$

$$\begin{aligned}\frac{7}{9} + \frac{5}{6} &= \frac{7 \times 2}{9 \times 2} + \frac{5 \times 3}{6 \times 3} \\ &= \frac{14}{18} + \frac{15}{18} \\ &= \frac{14 + 15}{18} \\ &= \frac{29}{18}\end{aligned}$$

8. First, convert the mixed numbers to improper fractions since we know how to add improper fractions.

$$\begin{aligned}2\frac{1}{7} &= 2 + \frac{1}{7} = \frac{2 \times 7}{7} + \frac{1}{7} = \frac{14}{7} + \frac{1}{7} = \frac{14 + 1}{7} = \frac{15}{7} \\ 3\frac{11}{14} &= 3 + \frac{11}{14} = \frac{3 \times 14}{14} + \frac{11}{14} = \frac{42}{14} + \frac{11}{14} = \frac{42 + 11}{14} = \frac{53}{14}\end{aligned}$$

Now get a lowest common denominator.

$$\begin{array}{r}7 = 7 \\ 14 = 7 \quad 2 \\ \hline \Rightarrow \text{LCD} = 7 \times 2 = 14\end{array}$$

Now we can add.

$$\begin{aligned}2\frac{1}{7} + 3\frac{11}{14} &= \frac{15}{7} + \frac{53}{14} \\ &= \frac{15 \times 2}{7 \times 2} + \frac{53}{14} \\ &= \frac{30}{14} + \frac{53}{14} \\ &= \frac{30 + 53}{14} \\ &= \frac{83}{14} \\ &= 5\frac{13}{14}\end{aligned}$$