

3.8 Addition and Subtraction with Mixed Numbers

1. Adding mixed numbers: Mixed numbers may be added in two ways.

- You may convert all mixed numbers to improper fractions, add the improper fractions, and then convert back to a mixed number.

Example: Simplify.

$$\begin{aligned}5\frac{3}{4} + 9\frac{5}{6} &= \frac{23}{4} + \frac{59}{6} \\ &= \frac{69}{12} + \frac{118}{12} \\ &= \frac{187}{12} = 15\frac{7}{12}\end{aligned}$$

- You may add the whole numbers to get the whole number portion of your answer and then add the proper fractions to get the fraction part of your answer. Sometimes the fraction part turns out to be an improper fraction. When this happens, you must convert the improper fraction to a mixed number and then add the result to the whole number part of your sum.

Example: Simplify.

$$\begin{aligned}5\frac{3}{4} + 9\frac{5}{6} &= 5\frac{9}{12} + 9\frac{10}{12} \\ &= 14\frac{19}{12} \\ &= 14 + 1\frac{7}{12} \\ &= 15\frac{7}{12}\end{aligned}$$

Example: Simplify each of the following. Use either of the methods given above. Be sure to fully reduce all fractions that appear in answers.

a. $2\frac{2}{9} + 3\frac{5}{12}$

b. $5\frac{3}{10} + 8\frac{11}{15}$

2. Subtracting mixed numbers: Mixed numbers may be subtracted in several ways.

- You may change all mixed numbers to improper fractions, then subtract. This method always works.

Example: Simplify.

$$\begin{aligned} 4\frac{3}{4} - 1\frac{5}{6} &= \frac{19}{4} - \frac{11}{6} \\ &= \frac{57}{12} - \frac{22}{12} \\ &= \frac{35}{12} = 2\frac{11}{12} \end{aligned}$$

- You may subtract the whole numbers, and subtract the proper fractions. This method is problematic if the second fraction is larger than the first. When this happens, you must use a borrowing technique before you can subtract.

Note: Portions of this document are excerpted from the textbook *Prealgebra*, 7th ed. by Charles McKeague

Example: Simplify.

$$\begin{aligned}4\frac{3}{4} - 1\frac{5}{6} &= 4\frac{9}{12} - 1\frac{10}{12} \\ &= 3\frac{21}{12} - 1\frac{10}{12} \\ &= 2\frac{11}{12}\end{aligned}$$

Example: Simplify each of the following:

a. $7\frac{9}{10} - 6\frac{3}{5}$

b. $7\frac{3}{4} - 3\frac{5}{12}$

c. $5\frac{1}{3} - 3\frac{4}{5}$

d. $12\frac{3}{4} - 5\frac{7}{8}$