SUBTRACTING FRACTIONS AND MIXED NUMBERS

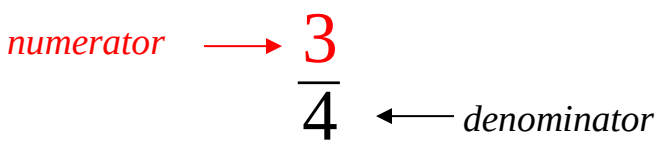
To find the difference between two fractions, we subtract. To subtract fractions with like denominators, subtract just the numerators. To subtract mixed fractions, find an LCD if necessary, then subtract. In subtraction there are times when we need to borrow. We borrow when we subtract a mixed fraction from a whole number and sometimes we will need to borrow to subtract mixed fractions.

Write fraction answers using the form in these examples.

Example 1: two-thirds is written as 2/3.
Example 2: five and three fourths is written as 5 3/4.

Subtraction of Fractions

To subtract fractions, identify the numerators and the denominators, and then make the adjustments necessary to complete the operation.



When subtracting fractions and the denominators are the same, subtract the numerators. If the denominators are not the same, write the fractions as equivalent fractions with the same denominator, and then subtract the numerators. In some instances, borrowing will be necessary.

Example 1: Subtract 11/12 – 5/12.

Subtract the numerators of the fractions.

$$\begin{array}{r} \frac{11}{12} \\ -\frac{5}{12} \\ \hline \frac{6}{12} = \frac{1}{2} \end{array}$$

*To simplify (reduce) 6/12, divide the numerator and denominator by six.

$$\frac{6}{12} \div \frac{6}{6} = \frac{1}{2}$$

Example 2: Subtract 7/8 – 5/6.

First, find the least common denominator (LCD) for 8 and 6.

List the multiples of 8: 8 = {8, 16, 24, 32, 40…}
List the multiples of 6: 6 = {6, 12, 18, 24, 30…}

*A good "rule of thumb" is to list the multiples of the larger denominator first because the LCD will occur sooner in the multiples of the larger number.

The "least" multiple that is common to both sets is 24; that is, the LCD = 24.

$$\begin{array}{r} \frac{7}{8}=\frac{21}{24} \\ -\frac{5}{6}=\frac{20}{24} \\ \hline \frac{1}{24} \end{array}$$

$$\frac{7}{8}\times\frac{3}{3}=\frac{21}{24}$$

$$\frac{5}{6}\times\frac{4}{4}=\frac{20}{24}$$

Example 3: Subtract 8 14/15 – 2 3/5.

First, find the least common denominator (LCD) for 15 and 5.

List the multiples of 15: 15 = {15, 30, 45, 60, 75…}
List the multiples of 5: 5 = {5, 10, 15, 20, 25…}

The "least" multiple that is common to both sets is 15; that is, the LCD = 15.

When changing the fraction part of the mixed number to the same denominator, just rewrite the whole number with the fraction.

$$8\frac{14}{15} = 8\frac{14}{15}$$
$$-2\ \frac{3}{5} = 2\frac{9}{15} \quad \left(\frac{3}{5}\times\frac{3}{3}=\frac{9}{15}\right)$$
$$6\frac{5}{15} = 6\frac{1}{3}$$

*To simplify (reduce) 5/15, divide the numerator and denominator by five.

$$\frac{5}{15}\div\frac{5}{5}=\frac{1}{3}$$

Example 4: Subtract 7 – 2 4/13.

To subtract a mixed number from a whole number, borrowing is needed. In this problem, **borrow** a one from seven and write the one in thirteenths (13/13).

$$\begin{array}{r} \cancel{7}^{\,6} = 6\frac{13}{13} \quad \left(7 = 6+1 = 6+\frac{13}{13} = 6\frac{13}{13}\right) \\ -2\ \frac{4}{13} = 2\frac{4}{13} \\ \hline 4\frac{9}{13} \end{array}$$

Example 5: Subtract 9 3/8 – 4 7/8.

In this problem, not only will we need to **borrow** a one and change it to eighths; but, we will also have to combine the eighths that are equal to one (8/8) with the eighths that are part of the mixed number (3/8).

$$\begin{array}{r} \cancel{9}^{\,8}\,\frac{3}{8} = 8\frac{11}{8} \\ -4\ \frac{7}{8} = 4\ \frac{7}{8} \\ \hline 4\frac{4}{8} = 4\frac{1}{2} \end{array}$$

$$9\frac{3}{8} = 8 + 1 + \frac{3}{8} = 8 + \frac{8}{8} + \frac{3}{8} = 8\ \frac{11}{8}$$

A shortcut to find 11 in $\frac{11}{8}$ is to add the 3 + 8 in $\frac{3}{8}$.

Example 6: Subtract 5 5/12 – 2 11/18.

In this problem, we must first find the LCD and rewrite the mixed numbers. From there, we will need to borrow as shown in the previous problem.

First, find the least common denominator (LCD) for 12 and 18.

List the multiples of 18: 18 = {18, 36, 54, 72, 90…}
List the multiples of 12: 12 = {12, 24, 36, 48, 60…}

The "least" multiple that is common to both sets is 36; that is, the LCD = 36.

$$5\frac{5}{12} = 5\frac{15}{36} = 4\frac{51}{36}$$
$$-2\frac{11}{18} = 2\frac{22}{36} = 2\frac{22}{36}$$
$$2\frac{29}{36}$$