



# MATHEMATICS 706

## FRACTIONS:

### ADDITION AND SUBTRACTION

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## I. COMMON FRACTIONS

## OBJECTIVES

When you have completed this section, you should be able to:

1. Add and subtract common fractions with like denominators.
2. Add and subtract common fractions with unlike denominators.

Common fractions are separated into two groups. The first group to be considered in this study are those common fractions that have the same number for the denominator, such as  $\frac{7}{8}$ ,  $\frac{5}{8}$ ,  $\frac{2}{8}$ , and  $\frac{1}{8}$ . These fractions have *like denominators*. The second group are those that do not have the same denominator, such as  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$ , and  $\frac{5}{6}$ . These fractions have *unlike denominators*.

## DEFINITIONS

*Common fraction:* a fraction with a whole number for the numerator and a whole number other than zero for the denominator.

*Numerator:* the number over the bar in a common fraction.

*Denominator:* the number below the bar in a common fraction.

*Like denominators:* denominators that are the same number.

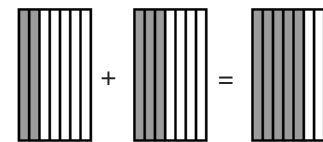
*Unlike denominators:* denominators that are different numbers.

## LIKE DENOMINATORS

The shaded area of the first box represents  $\frac{2}{7}$  of the total box.

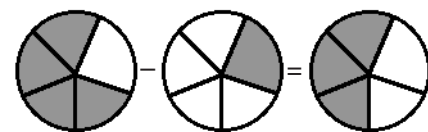
The shaded area of the second box represents  $\frac{3}{7}$  of the total box. When added,  $\frac{5}{7}$  of the total third box is shaded.

**Model 1:**  $\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$  (Note that the denominators are the same. These fractions have like denominators of 7.)



The shaded area of the first circle represents  $\frac{4}{5}$  of the total circle. The shaded area of the second circle represents  $\frac{1}{5}$  of the total circle. When subtracted,  $\frac{3}{5}$  of the total circle is shaded.

**Model 2:**  $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$  (Note that the denominators are the same. These fractions have like denominators of 5.)



## Operations

Only fractions with like denominators can be added or subtracted. Write the sum or the difference of the numerator over the common denominator.

**Model 1:**  $\frac{1}{5} + \frac{2}{5} = \frac{1+2}{5} = \frac{3}{5}$

Think

**Model 2:**  $\frac{9}{11} - \frac{5}{11} = \frac{9-5}{11} = \frac{4}{11}$

Think

### **Add or subtract.**

1.1  $\frac{3}{8} + \frac{2}{8} =$  \_\_\_\_\_

1.4  $\frac{5}{6} - \frac{4}{6} =$  \_\_\_\_\_

1.2  $\frac{6}{11} + \frac{4}{11} =$  \_\_\_\_\_

1.5  $\frac{13}{19} - \frac{6}{19} =$  \_\_\_\_\_

1.3  $\frac{2}{17} + \frac{12}{17} =$  \_\_\_\_\_

1.6  $\frac{12}{23} - \frac{9}{23} =$  \_\_\_\_\_

1.7 
$$\begin{array}{r} \frac{2}{9} \\ + \frac{5}{9} \\ \hline \end{array}$$

1.8 
$$\begin{array}{r} \frac{11}{15} \\ + \frac{2}{15} \\ \hline \end{array}$$

1.9 
$$\begin{array}{r} \frac{17}{29} \\ - \frac{12}{29} \\ \hline \end{array}$$

1.10 
$$\begin{array}{r} \frac{4}{5} \\ - \frac{2}{5} \\ \hline \end{array}$$

Fractions are said to be in *simplified* form when they have been reduced. To reduce a fraction, divide both numerator and denominator by the one largest number that will divide into both evenly.

**Model 1:**  $\frac{4}{9} + \frac{2}{9} = \frac{6}{9} = \frac{6 \div 3}{9 \div 3} = \frac{2}{3}$

Think

**Model 2:**  $\frac{9}{14} - \frac{5}{14} = \frac{4}{14} = \frac{4 \div 2}{14 \div 2} = \frac{2}{7}$

Think

 **Add or subtract and simplify.**

1.11  $\frac{1}{4} + \frac{1}{4} =$  \_\_\_\_\_

1.14  $\frac{7}{10} - \frac{2}{10} =$  \_\_\_\_\_

1.12  $\frac{5}{12} + \frac{3}{12} =$  \_\_\_\_\_

1.15  $\frac{17}{18} - \frac{5}{18} =$  \_\_\_\_\_

1.13  $\frac{3}{16} + \frac{5}{16} =$  \_\_\_\_\_

1.16  $\frac{11}{9} - \frac{8}{9} =$  \_\_\_\_\_

1.17 
$$\begin{array}{r} \frac{7}{15} \\ + \frac{2}{15} \\ \hline \end{array}$$

1.18 
$$\begin{array}{r} \frac{11}{18} \\ + \frac{5}{18} \\ \hline \end{array}$$

1.19 
$$\begin{array}{r} \frac{25}{26} \\ - \frac{12}{26} \\ \hline \end{array}$$

1.20 
$$\begin{array}{r} \frac{15}{16} \\ - \frac{5}{16} \\ \hline \end{array}$$

1.21 
$$\begin{array}{r} \frac{13}{20} \\ + \frac{3}{20} \\ \hline \end{array}$$

1.22 
$$\begin{array}{r} \frac{7}{24} \\ + \frac{11}{24} \\ \hline \end{array}$$

1.23 
$$\begin{array}{r} \frac{7}{12} \\ - \frac{4}{12} \\ \hline \end{array}$$

1.24 
$$\begin{array}{r} \frac{27}{30} \\ - \frac{3}{30} \\ \hline \end{array}$$

When the numerator of a fraction is greater than the denominator, the fraction is called an *improper fraction*. Improper fractions can be simplified to *mixed numbers*, an expression containing a whole number and a fraction.

To simplify an improper fraction to a mixed number, divide the denominator into the numerator, and write the remainder in fractional form.

**Definitions**

*Improper fraction*: a fraction with a numerator greater than or equal to its denominator

*Mixed number*: a number made up of a whole number plus a common fraction.

**Model 1:** improper fraction = quotient  $\frac{\text{remainder}}{\text{divisor}}$

$$\frac{8}{5} = 5 \overline{)8} \frac{3}{5}$$

$$\frac{5}{3}$$