

FRACTION GUIDE

ADDING AND SUBTRACTING FRACTIONS WITH LIKE DENOMINATORS

To add or subtract fractions which have the same denominator, simply add or subtract the numerators and place the result over the denominator.

$$\frac{3}{7} + \frac{2}{7} = \frac{5}{7}$$

$$\frac{3}{7} - \frac{2}{7} = \frac{1}{7}$$

ADDING AND SUBTRACTING FRACTIONS WITH UNLIKE DENOMINATORS

To add or subtract fractions which do not have the same denominator, you must first find the Least Common Multiple (**LCM**) between the denominators. This can be done by finding the first number they have in common using a multiplication table. This common number becomes the new denominator you want to achieve through multiplication. Whatever you need to multiply the original denominator by to achieve the Least Common Denominator (**LCD**) also has to be used to multiply the numerator so that you will have "equivalent fractions". Sometimes you only need to change the denominator of one of the fractions.

$$\begin{array}{r} \frac{1}{4} \left(\frac{5}{5} \right) = \frac{5}{20} \\ + \frac{3}{10} \left(\frac{2}{2} \right) = \frac{6}{20} \\ \hline = \frac{5+6}{20} = \frac{11}{20} \end{array}$$

$$\begin{array}{r} \frac{1}{3} \left(\frac{2}{2} \right) = \frac{2}{6} \\ - \frac{1}{6} \\ \hline = \frac{2-1}{6} = \frac{1}{6} \end{array}$$

ADDING FRACTIONS WHICH RESULT IN AN IMPROPER FRACTION

Sometimes the sum of fractions will result in an improper fraction. Long division will reveal the whole number (**quotient**) and the new numerator (remainder).

$$\frac{4}{7} + \frac{5}{7} = \frac{9}{7}$$

$$7 \overline{)9} \begin{array}{r} 1 \\ -7 \\ \hline 2 \end{array}$$

$$1 \frac{2}{7}$$

ADDING MIXED NUMBERS

Add the fractional parts first, because sometimes it will result in an additional whole number which will then need to be added to the other whole numbers.

$$2\frac{4}{7} + 3\frac{5}{7} = 1\frac{2}{7} + 2 + 3 = 6\frac{2}{7}$$

SUBTRACTING MIXED NUMBERS WITH RENAMING

Sometimes in order to have enough of the first fraction to subtract from, you will have to rename one of the whole numbers in accordance with the denominator. Any number divided by itself equals one whole.

$$\begin{array}{r} 4 \overbrace{} \\ \cancel{5} \frac{5}{8} + \frac{8}{8} = \frac{13}{8} \\ - 3 \frac{7}{8} \\ \hline 1 \frac{13-7}{8} = 1 \frac{6}{8} = 1 \frac{3}{4} \end{array}$$

REDUCING FRACTIONS TO SIMPLEST FORM USING GCF

If the numbers in the fractional part of your answer have a common factor, you divide both numbers by their Greatest Common Factor (**GCF**) to reduce it to its simplest form. You can find common factors using the multiplication table.

6 = 2 x 3 8 = 2 x 4 The GCF for 6 and 8 is 2.

$$\frac{6}{8} \div 2 = \frac{3}{4}$$

$$\frac{8}{8} \div 2 = \frac{4}{4}$$

MULTIPLYING FRACTIONS WITHOUT COMMON FACTORS

To multiply fractions, multiply the numerators to achieve the new numerator, and multiply the denominators to achieve the new denominator.

$$\frac{3}{7} \times \frac{2}{7} = \frac{6}{49} \quad \Bigg| \quad \frac{4}{11} \times \frac{3}{13} = \frac{12}{143}$$

MULTIPLYING FRACTIONS WITH COMMON FACTORS

When fractions have common factors, you can either multiply them first and then reduce the answer to simplest form by dividing with the **GCF**, or you can divide the common factors prior to multiplying (known as cross-canceling). Six is a factor of 6 and 24. Five is a factor of 15 and 25.

$$\frac{6}{25} \times \frac{15}{24} = \frac{90}{600} \div \frac{30}{30} = \frac{3}{20} \quad \frac{\cancel{1}^1}{5} \times \frac{\cancel{15}^3}{\cancel{24}_4} = \frac{3}{20}$$

MULTIPLYING MIXED NUMBERS

Prior to multiplying mixed numbers, you must change them into improper fractions. To do so, multiply the whole number by the denominator and add the original numerator to achieve the new numerator placed over the original denominator. Then multiply as shown above. Change your improper fraction answer back into a mixed number through long division.

$$2\frac{3}{5} \times 3\frac{7}{8} = \frac{13}{5} \times \frac{31}{8} = \frac{403}{40}$$
$$2 \times 5 + 3 = 13 \quad 3 \times 8 + 7 = 31$$
$$40 \overline{)403} \begin{array}{r} 10 \\ -40 \\ \hline 03 \end{array} = 10\frac{3}{40}$$

MULTIPLYING FRACTIONS BY A WHOLE NUMBER

Any whole number can be written as a fraction with a one in the denominator. Then multiply as shown above.

$$9 \times \frac{2}{3} = \frac{18}{3} = 6$$
$$\frac{3}{1} \times \frac{2}{\cancel{3}_1} = \frac{6}{1} = 6$$
$$7\frac{1}{6} \times 8 = \frac{43}{3} \times \frac{8}{1} = \frac{172}{3}$$
$$3 \overline{)172} \begin{array}{r} 57 \\ -15 \\ \hline 22 \\ -21 \\ \hline 1 \end{array} = 57\frac{1}{3}$$

DIVIDING FRACTIONS

To divide fractions, you invert the second fraction (making it a **reciprocal**) and multiply as shown above.

$$\frac{4}{5} \div \frac{3}{7} = \frac{4}{5} \times \frac{7}{3} = \frac{28}{15}$$
$$15 \overline{)28} \begin{array}{r} 1 \\ -15 \\ \hline 13 \end{array} = 1\frac{13}{15}$$

DIVIDING FRACTIONS BY A WHOLE NUMBER

Any whole number can be written as a fraction with a one in the denominator. Then invert it and multiply as shown above.

$$\frac{3}{4} \div 5 = \frac{3}{4} \div \frac{5}{1} = \frac{3}{4} \times \frac{1}{5} = \frac{3}{20}$$

DIVIDING MIXED NUMBERS

Change the mixed numbers into improper fractions. Then invert the second improper fraction, and multiply. Change your improper fraction answer back into a mixed number through long division. Reduce to simplest form using the GCF if needed.

$$6\frac{1}{2} \div 1\frac{4}{5} = \frac{13}{2} \div \frac{9}{5} = \frac{13}{2} \times \frac{5}{9} = \frac{65}{18}$$
$$18 \overline{)65} \begin{array}{r} 3 \\ -54 \\ \hline 11 \end{array} = 3\frac{11}{18}$$
$$6 \times 2 + 1 = 13 \quad 1 \times 5 + 4 = 9$$