Fractions: Operations on Mixed Numbers

Vocabulary

Mixed Number	The sum of a whole number and a proper fraction Example: $2\frac{3}{4}$

An improper fraction can always be written as a mixed number or a whole number (if the denominator is a factor of the numerator).

To convert from an improper fraction to a mixed number:

$\frac{11}{4}$ $4\overline{)11}$ $\quad 2, r = 3$	Divide the numerator by the denominator. If there is a remainder, write the remainder over the original denominator. 11 divided by 4 is 2 with a remainder of 3.
$2\frac{3}{4}$	The mixed number is composed of the integer quotient as the whole number part and the remainder, if any, as the numerator of the proper fraction part.

TRY:

Convert each of the following improper fractions to mixed numbers.

$\frac{17}{3}$ $\qquad$ $\frac{-19}{4}$ $\qquad$ $\frac{-20}{5}$ $\qquad$ $\frac{23}{5}$

To convert from a mixed number to a improper fraction:

$2\frac{3}{4}$	Multiply the whole number by the denominator.
$(2 \bullet 4) + 3$	Add the numerator of the fraction to that product.
$\frac{11}{4}$	Write that sum over the original denominator.

TRY:

Convert each of the following mixed numbers to improper fractions.

$4\frac{3}{5}$ $\qquad$ $-3\frac{1}{7}$ $\qquad$ -6 $\qquad$ $5\frac{3}{4}$

To MULTIPLY two mixed numbers:

$2\frac{3}{4}\bullet 1\frac{5}{33}$	Change each mixed number to improper fractions.
$\frac{11}{4}\bullet\frac{38}{33}$	Simplify if possible. $\frac{11}{2\cdot 2}\bullet\frac{2\cdot 19}{3\cdot 11}$
$\frac{1}{2}\bullet\frac{19}{3}$	Multiply the resulting fractions.
$\frac{19}{6}$	

CAUTION:

$2\frac{3}{4}\bullet 1\frac{1}{7}\neq(2\bullet 1)+(\frac{3}{4}\bullet\frac{1}{7})$ Be sure to convert each mixed number to improper fractions first!

$$2\frac{3}{4}\bullet 1\frac{1}{7}=\frac{11}{4}\bullet\frac{8}{7}=\frac{11}{1}\bullet\frac{2}{7}=\frac{22}{7}$$

TRY:

Multiply.

$4\frac{1}{5}\bullet\frac{4}{7}$ $\qquad$ $-3\frac{1}{7}\bullet 2\frac{8}{11}$

To DIVIDE two mixed numbers:

Change each mixed number to improper fractions and follow the rules for dividing fractions.

$$5\frac{3}{5}\div 2\frac{1}{10}\ \rightarrow\ \frac{28}{5}\div\frac{21}{10}\ \rightarrow\ \frac{28}{5}\bullet\frac{10}{21}\ \rightarrow\ \frac{4\cdot 7}{5\cdot 1}\bullet\frac{5\cdot 2}{3\cdot 7}\ \rightarrow\ \frac{4}{1}\bullet\frac{2}{3}\ \rightarrow\ \frac{8}{3}\ \rightarrow\ 2\frac{2}{3}$$

TRY:

Divide.

$-3\frac{1}{7}\div 2\frac{2}{21}$ $\qquad$ $-4\frac{1}{5}\div 3$

To multiply or divide a mixed number and whole number, write the whole number as an improper fraction first.

To ADD two mixed numbers:

Change each mixed number to improper fractions and follow the rules for adding fractions.

$$-5\frac{3}{5}+2\frac{1}{10} \rightarrow \frac{-28}{5}+\frac{21}{10} \rightarrow \frac{-56}{10}+\frac{21}{10} \rightarrow \frac{-35}{10} \rightarrow -3\frac{5}{10} \rightarrow -3\frac{1}{2}$$

TRY:

Add.

$$-3\frac{1}{7}+2\frac{3}{4}+1\frac{3}{14}$$

To SUBTRACT two mixed numbers:

Change each mixed number to improper fractions and follow the rules for subtracting fractions.

$$5\frac{3}{5}-2\frac{1}{10} \rightarrow \frac{28}{5}-\frac{21}{10} \rightarrow \frac{56}{10}-\frac{21}{10} \rightarrow \frac{56}{10}+\frac{-21}{10} \rightarrow \frac{35}{10} \rightarrow 3\frac{5}{10} \rightarrow 3\frac{1}{2}$$

$$5-2\frac{1}{10} \rightarrow \frac{25}{5}-\frac{21}{10} \rightarrow \frac{50}{10}-\frac{21}{10} \rightarrow \frac{50}{10}+\frac{-21}{10} \rightarrow \frac{29}{10} \rightarrow 2\frac{9}{10}$$

TRY:

Subtract.

$$3\frac{1}{7}-2\frac{2}{21}$$

$$-4-3\frac{2}{7}$$