Step by Step with Fractions

The Bracket Strategy

This strategy will show students how common denominators are actually found. This strategy should be done with fraction bars.

Step 1 Create a bracket

x	1	2	3	4
$\frac{5}{6}$				
$\frac{1}{4}$				

Step 2 Fill in the bracket with multiples of each fraction.

x	1	2	3	4
$\frac{5}{6}$	$\frac{5}{6}$	$\frac{10}{12}$	$\frac{15}{18}$	$\frac{20}{24}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{4}{16}$

Step 3 Look for common denominators between the two fractions

x	1	2	3	4
$\frac{5}{6}$	$\frac{5}{6}$	$\frac{10}{12}$	$\frac{15}{18}$	$\frac{20}{24}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{4}{16}$

Step 4 Now the fractions can be compared, ordered, added , or subtracted.

$$\frac{5}{6} = \frac{10}{12}$$

$$\frac{1}{4} = \frac{3}{12}$$

Adding Fraction with Unlike Denominators

Step 1 Look at the problem

$$\frac{4}{8} + \frac{2}{3}$$

*Notice the denominators are not the same

Step 2 Find a common denominator and add

$$\frac{4}{8} + \frac{2}{3} \qquad \frac{12}{24} + \frac{16}{24} =$$

*Remember that the denominators are not added.

$$\frac{4 \times 3}{8 \times 3} = \frac{12}{24}$$

$$\frac{2 \times 8}{3 \times 8} = \frac{16}{24}$$

Students can use the bracket strategy for this step.

Step 3 Check for improper fractions and simplify

$$\frac{28}{24} = 1\frac{4}{24}$$

Simplify $1\frac{1}{6}$

This is an improper fraction and should be written a mixed number.

Step 4 Record your answer

$$\frac{4}{8} + \frac{2}{3} = 1\frac{1}{6}$$

Subtracting Fractions with Unlike Denominators

Step 1 Look at the problem

$$\frac{5}{6} - \frac{1}{4}$$

*Notice the denominators are not the same

Step 2 Find a common denominator and subtract

$$\frac{5}{6} - \frac{1}{4} \qquad \frac{10}{12} - \frac{3}{12} = \frac{7}{12}$$

$$\frac{5 \times 2}{6 \times 2} = \frac{10}{12}$$

$$\frac{1 \times 3}{4 \times 3} = \frac{3}{12}$$

*Remember that the denominators are not subtracted.

Students can use the bracket strategy for this step.

Step 3 Check for improper fractions and simplify

$$\frac{7}{12}$$

You cannot simplify!

Step 4 Record your answer

$$\frac{5}{6} - \frac{1}{4} = \frac{7}{12}$$

Adding Mixed Numbers with Like Denominators

Step 1 Look at the problem

$$3\frac{4}{9} + 7\frac{4}{9}$$

*Notice the denominators are the same

Step 2 Add the whole numbers

$$\begin{array}{r} 3\ \frac{4}{9} \\ +\ 7\ \frac{4}{9} \\ \hline 10 \end{array}$$

Step 3 Add the fractions

$$\frac{4}{9} + \frac{4}{9} = \frac{8}{9}$$

*Remember that the denominators are not added

Step 4 Add whole number and the fraction

$$10 + \frac{8}{9} = 10\frac{8}{9}$$

Simplify the fractions if possible. 8 / 9 **cannot** be simplified.

Adding Mixed Numbers with Unlike Denominators

Step 1 Look at the problem

$$2\frac{3}{9} + 5\frac{3}{8}$$

*Notice the denominators are the same

Step 2 Add the whole numbers

$$\begin{array}{r} 2\ \frac{3}{9} \\ +\ 5\ \frac{3}{8} \\ \hline 7 \end{array}$$

Step 3 Find a common denominator and add

$$\frac{3}{9} + \frac{3}{8} \qquad \frac{27}{72} + \frac{27}{72} = \frac{54}{72}$$

$$\frac{3 \times 8}{9 \times 8} = \frac{27}{72} \qquad \frac{3 \times 9}{8 \times 9} = \frac{27}{72}$$

*Remember that the denominators are not added

Step 4 Add whole number and the fraction

$$7 + \frac{54}{72} = 7\frac{54}{72} = 7\frac{3}{4}$$

Simplify the fractions if possible.

$$\frac{54 \div 18}{72 \div 18} = \frac{3}{4}$$

Adding Mixed Numbers Strategy 2

Step 1 Look at the problem

$$4\frac{1}{5} + 2\frac{3}{5}$$

*Notice that 3 / 5 **cannot** be subtracted from 1 / 5.

Step 2 Change the mixed numbers to improper fractions

$$4\frac{1}{5} = \frac{21}{5}$$

$$+\ 2\frac{3}{5} = \frac{13}{5}$$

Step 3 Add the improper fractions

$$\frac{21}{5} + \frac{13}{5} = \frac{34}{5}$$

Step 4 Change to a mixed number and simplify the fraction if possible.

$$\frac{34}{5} = 6\frac{4}{5}$$

*4 / 5 **cannot** be simplified

Subtracting Mixed Numbers Strategy 1

Step 1 Look at the problem

$$4\frac{1}{5} - 2\frac{3}{5}$$

*Notice that 3 / 5 **cannot** be subtracted from 1 / 5.

Step 2 Borrow from the whole number

$$4\frac{1}{5} = \frac{5}{5} + \frac{5}{5} + \frac{5}{5} + \boxed{\frac{5}{5} + \frac{1}{5}}$$

$$-\ 2\frac{3}{5}$$

*Borrow $\frac{5}{5}$ and add it to $\frac{1}{5}$

Step 3 Rename the mixed number and subtract

$$3\frac{6}{5}$$

$$-\ 2\frac{3}{5}$$

$$1\frac{3}{5}$$

Step 4 Simplify the fractions if possible.

$$1\frac{3}{5}$$

*3 / 5 **cannot** be simplified

Subtracting Mixed Numbers Strategy 2

Step 1 Look at the problem

$$4\frac{1}{5} - 2\frac{3}{5}$$

*Notice that 3 / 5 **cannot** be subtracted from 1 / 5.

Step 2 Change the mixed numbers to improper fractions

$$4\frac{1}{5} = \frac{21}{5}$$

$$-2\frac{3}{5} = \frac{13}{5}$$

Step 3 Subtract the improper fractions

$$\frac{21}{5} - \frac{13}{5} = \frac{8}{5}$$

Step 4 Change to a mixed number and simplify the fraction if possible.

$$1\frac{3}{5}$$

*3 / 5 **cannot** be simplified

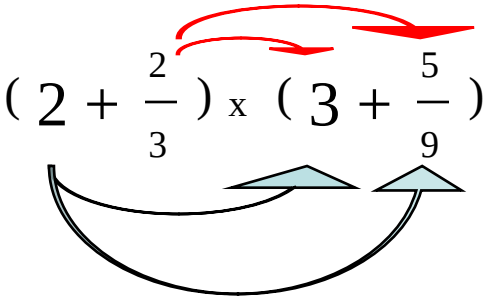
Multiplying Mixed Numbers Strategy 1

Step 1 Adjust the problem

$$2\frac{2}{3} \times 3\frac{5}{9}$$

$$\left(2+\frac{2}{3}\right) \times \left(3+\frac{5}{9}\right)$$

Step 2 Multiply



$2 \times 3 = 6$

$2 \times \frac{5}{9} = \frac{10}{9}$

$\frac{2}{3} \times 3 = \frac{6}{3} = 2$

$\frac{2}{3} \times \frac{5}{9} = \frac{10}{27}$

Step 3 Add up all of the products

$$6 + 2 + \frac{10}{9} + \frac{10}{27}$$

$$8 + \frac{40}{27}$$

$\frac{10 \times 3}{9 \times 3} = \frac{30}{27}$ Find a common denominator

$$\frac{30}{27} + \frac{10}{27} = \frac{40}{27}$$

Step 3 Bring it all together and simplify

$$8\frac{40}{27} = 8 + 1\frac{13}{27} = 9\frac{13}{27}$$

Multiplying Mixed Numbers

Strategy 2

Step 1 Create the area model boxes and fill in numbers.

$2\frac{2}{3} \times 3\frac{5}{9}$

x	3	$\frac{5}{9}$
2		
$\frac{2}{3}$		

Step 2 Multiply each whole number and fraction

x	3	$\frac{5}{9}$
2	2 x 3 = 6	2 x 5/9 = 10/9 **or** 1 1/9
$\frac{2}{3}$	2/3 x 3 = 6/3 **or** 2	2/3 x 5/9 = 10/27

Step 3 Add the partial products which includes whole numbers and fractions

Remember: The last fraction will be the common denominator.

$$
\begin{array}{rrcl}
 & 6 & & \\
 & 1 & \frac{1}{9} = & \frac{3}{27} \\
 & & \frac{2}{9} = & \frac{6}{27} \\
 & 2 & & \\
+ & & \frac{10}{27} = & \frac{10}{27} \\
\hline
 & 9 & & \frac{19}{27}
\end{array}
$$

Step 4 Simplify is possible and record the answer

$$9\ \frac{19}{27}$$

The answer cannot be simplified.

Multiplying Mixed Numbers Strategy 3

Step 1 Look at the problem

$$4\frac{1}{5} \times 2\frac{3}{7}$$

Step 2 Change the mixed numbers to improper fractions

$$4\frac{1}{5} = \frac{21}{5}$$

$$2\frac{3}{7} = \frac{17}{7}$$

Step 3 Multiply the improper fractions

$$\frac{21}{5} \times \frac{17}{7} = \frac{357}{35}$$

Step 4 Change to a mixed number and simplify the fraction if possible

$$\frac{357}{35} = 10\frac{7}{35} = 10\frac{1}{5}$$

Dividing Fractions

Step 1 Look at the problem

$$\frac{1}{5} \div \frac{3}{7}$$

Step 2 Change the mixed numbers to improper fractions

$$\frac{1}{5} \div \frac{3}{7}$$

The reciprocal of $\frac{3}{7}$ is $\frac{7}{3}$

Step 3 Multiply the fractions

$$\frac{1}{5} \times \frac{7}{3} = \frac{7}{15}$$

Step 4 Simplify the fraction if possible.

$$\frac{7}{15}$$

* $\frac{7}{15}$ **cannot** be simplified

Dividing Mixed Numbers

Step 1 Look at the problem

$$3\frac{1}{5} \div 3\frac{3}{7}$$

Step 2 Change the mixed numbers to improper fractions

$$\frac{16}{5} \div \frac{24}{7}$$

Step 3 Find the reciprocal of the second fraction (divisor) and multiply

$$\frac{16}{5} \times \frac{7}{24} = \frac{112}{120}$$

The reciprocal of $\frac{24}{7}$ is $\frac{7}{24}$

Step 4 Simplify the fraction if possible.

$$\frac{112}{120} = \frac{112}{120} = \frac{17}{20}$$

*1 / 5 **cannot** be simplified