

Calculating with Fractions

Addition

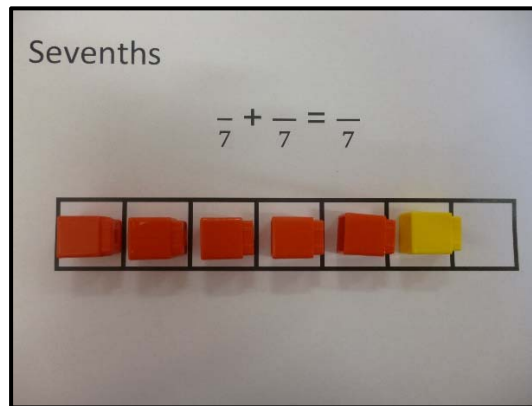
Year 3

Add fractions with the same denominator within one whole

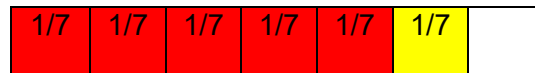
Example question:

$$\frac{5}{7} + \frac{1}{7} =$$

Concrete



Visual



Abstract

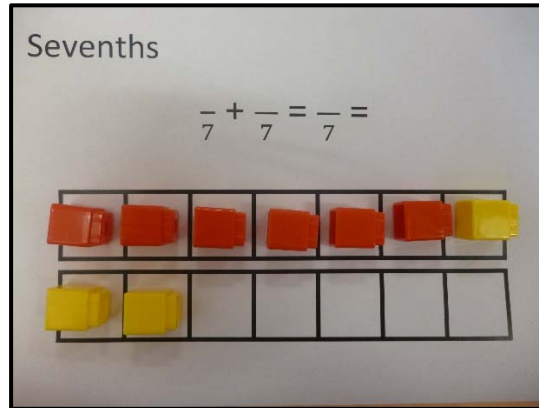
$$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$$

Year 4 Add fractions with the same denominator

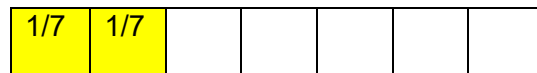
Example question:

$$\frac{6}{7} + \frac{3}{7} =$$

Concrete



Visual



Abstract

$$\frac{6}{7} + \frac{3}{7} = \frac{9}{7}$$

At this stage children will record answers as improper fractions and may begin to see that the answer is more than one whole.

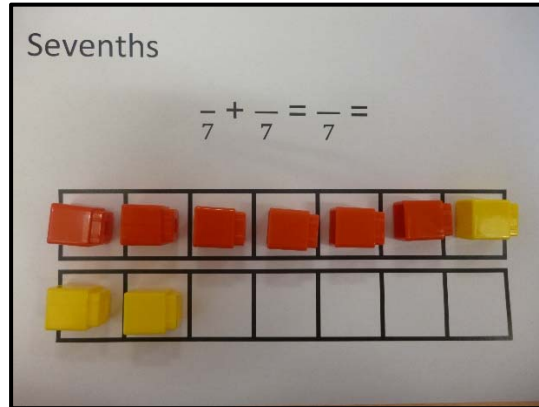
Year 5

Add fractions with the same denominator and denominators that are multiples of the same number

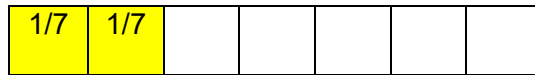
Example question:

$$\frac{6}{7} + \frac{3}{7} =$$

Concrete



Visual



Abstract

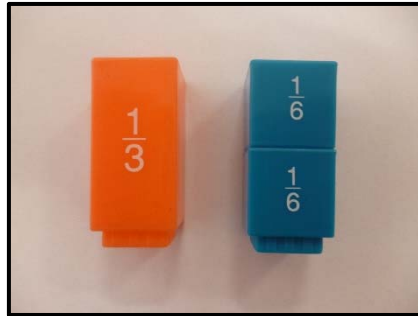
$$\frac{6}{7} + \frac{3}{7} = \frac{9}{7} = 1\frac{2}{7}$$

At this stage children will record answers as improper fractions and convert them to a mixed number.

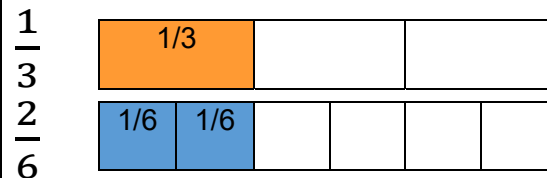
Example question:

$$\frac{1}{3} + \frac{5}{6} =$$

Concrete



Visual



Abstract

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

They will also calculate using denominators that are multiples of the same number. Children must be taught the equivalence between fractions with denominators that are multiples of the same number. Here children can see that one-third is equivalent to two-sixths.

Here children show that one-third is equivalent to two-sixths.

Each denominator must be six, multiply the numerator by two.

Year 6 Add fractions with different denominators and mixed numbers, using the concept of equivalent fractions

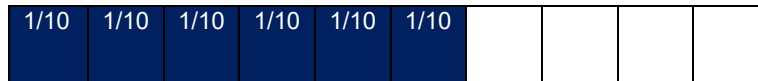
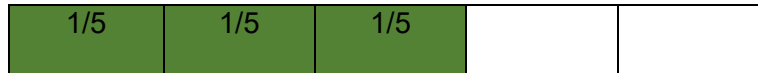
Example question:

$$5 \frac{3}{5} + 2 \frac{1}{10} =$$

Concrete



Visual



Abstract

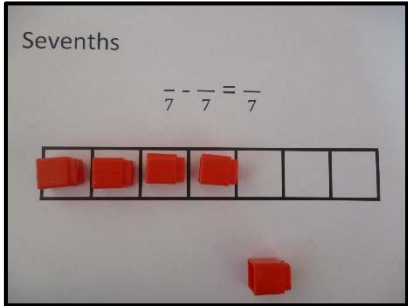
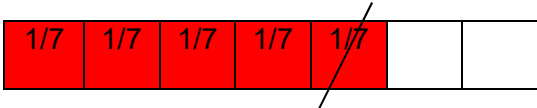
$$5 \frac{3}{5} + 2 \frac{1}{10} =$$

$$5 \frac{6}{10} + 2 \frac{1}{10} = 7 \frac{7}{10}$$

Here children can see that three-fifths is equivalent to six-tenths.

Here children show that three-fifths is equivalent to six-tenths.

Children are taught to deal with the whole numbers first then to add the fractions by converting them so they both have the same denominator.

Subtraction		
Year 3	Subtract fractions with the same denominator within one whole	<p>Example question:</p> $\frac{5}{7} - \frac{1}{7} =$ <p>Concrete</p>  <p>The image shows a number line from 0 to 1 divided into 7 equal segments. Five red blocks are placed in the first five segments, representing 5/7. One red block is placed below the number line, representing 1/7 to be subtracted. Above the number line, the equation $\frac{5}{7} - \frac{1}{7} = \frac{4}{7}$ is written.</p> <p>Visual</p>  <p>The image shows a bar model divided into 7 equal segments. The first five segments are shaded red and labeled 1/7. The sixth segment is crossed out with a diagonal line, representing the subtraction of 1/7. The remaining four segments are white.</p> <p>Abstract</p> $\frac{5}{7} - \frac{1}{7} = \frac{4}{7}$
Year 4	Subtract fractions with the same denominator	

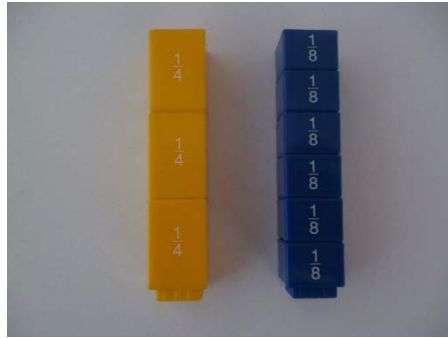
Year 5

Subtract fractions with the same denominator and denominators that are multiples of the same number

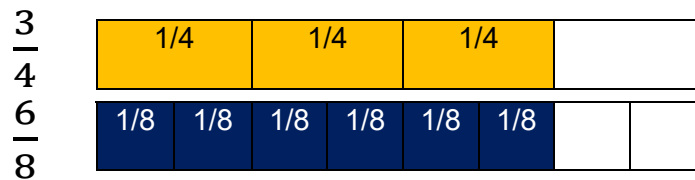
Example question:

$$\frac{7}{8} - \frac{3}{4} =$$

Concrete



Visual



Abstract

$$\frac{7}{8} - \frac{3}{4} =$$

$$\frac{7}{8} - \frac{6}{8} = \frac{1}{8}$$

They will also calculate using denominators that are multiples of the same number. Children must be taught the equivalence between fractions with denominators that are multiples of the same number.

Here children see that three-quarters is equivalent to six-eighths.

Here children show that three-quarters is equivalent to six-eighths.

Each denominator must be eight, multiply the numerator by two.

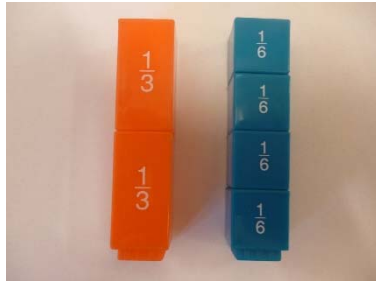
Year 6

Subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

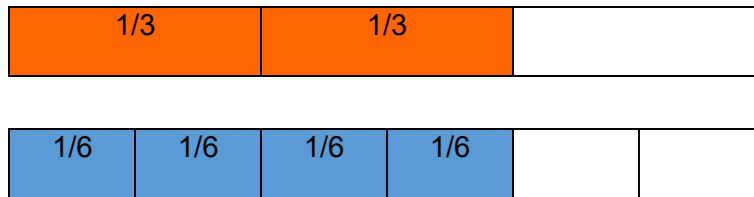
Example question:

$$5 \frac{2}{3} - 2 \frac{1}{6} =$$

Concrete



Visual



Abstract

$$5 \frac{2}{3} - 2 \frac{1}{6} =$$

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

$$3 \frac{3}{6} = 3 \frac{1}{2}$$

In this example the equivalent fraction is less than the fraction being subtracted so children are able to deal with this easily.

Here children see that two-thirds is equivalent to four-sixths.

Here children show that three-quarters is equivalent to six-eighths.

Each denominator must be six, multiply the numerator by two.

Children are taught to deal with the whole numbers first then to subtract the fractions by converting them so they both have the same denominator.

Fractions should be simplified if possible.

Here the numerator and the denominator are both multiples of three. The fraction can be simplified by dividing the numerator and the denominator by three.

Multiplication

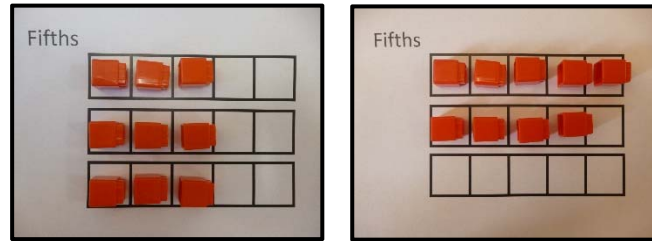
Year 5

Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

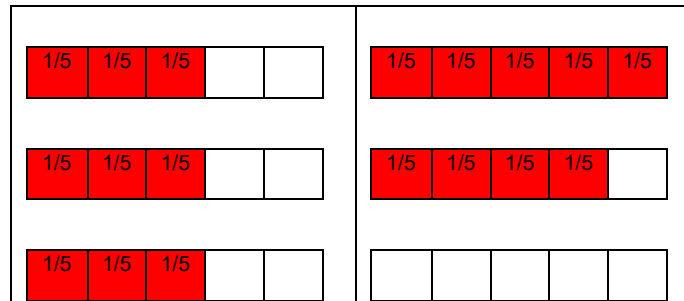
Example question:

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

Concrete



Visual



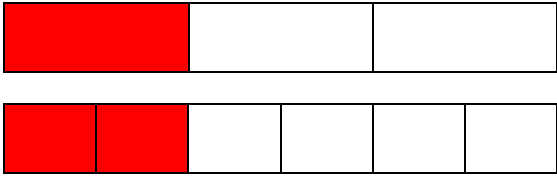
Abstract

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

In this example children are taught that three-fifths multiplied by three means there are three lots of three-fifths.

Initially layout three lots of three-fifths. These can then be recombined to 'fill up' the 'wholes'. Children can see there are nine-fifths. They may notice that this makes one whole and four-fifths.

Year 6	Multiply simple pairs of proper fractions, writing the answer in its simplest form e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$	<p>Example question:</p> $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ $\frac{3}{5} \times \frac{2}{4} = \frac{6}{20} = \frac{3}{10}$	<p>This calculation is simple because it involves little or no conceptual understanding. However, in order for children to understand the concept they must be taught that in this example they are finding half of one-quarter. The digits are simply multiplied across. The numerators and denominators are multiplied by each other.</p> $1 \times 1 = 1$ $4 \times 2 = 8$ <p>In the second example the answer can be simplified because the numerator and denominator are both multiples of 2.</p>
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Division			
Year 6	Divide proper fractions by whole numbers e.g. $\frac{1}{3} \div 2 = \frac{1}{6}$	<p>Example question:</p> $\frac{1}{3} \div 2 = \frac{1}{6}$  $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$	<p>Children must be taught that fractions are linked to division so that they understand that this example question is finding a half of one-third.</p> <p>In this example the bar is divided into thirds and one-third is shaded.</p> <p>Using the link to division the second model demonstrates finding one-half of one-third.</p> <p>The method is to invert the problem and multiply the numerator by the whole number. In this example 5×3. This can be written as $\frac{1}{3} \times \frac{1}{2}$</p>