
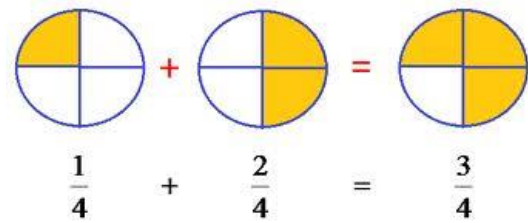
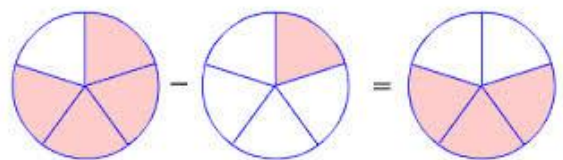
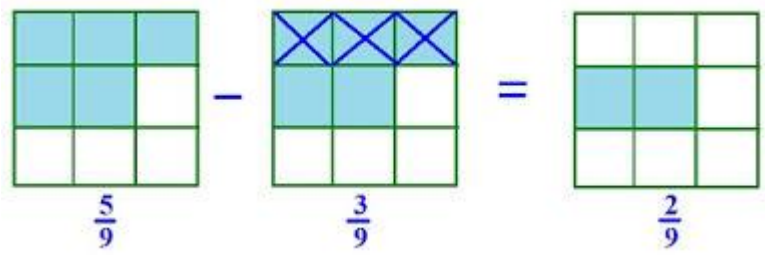


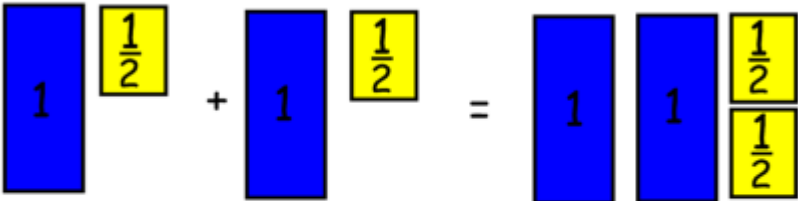
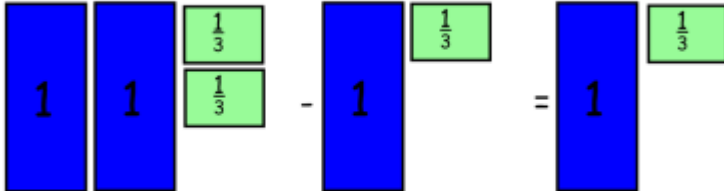
Calculation of Fractions – Year 3

Key Vocabulary: fraction, one whole, half, quarter, three-quarters, add, subtract, equal parts of a whole, numerator, denominator

Objectives	Representations	Problem Solving
<p>Add and subtract fractions with the same denominator within one whole (e.g. $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$)</p>	<p>Use a variety of resources such as number rods, paper strips, equivalence circles, cards to model what happens when you add and subtract fractions with the same denominator. Children should be using concrete objects alongside the written fractions in order to gain conceptual understanding.</p> <p>Eg addition</p>   <p>Eg subtraction</p> <p>$\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$</p>   <p>Videos (Key Stage 1 but objectives apply to Year 3):</p> <p>Representing Fractions http://vimeo.com/83486102</p> <p>Adding and subtracting fractions (Goes beyond one whole but examples can be adapted) http://vimeo.com/83486226</p> <p>Reasoning about addition and subtraction of fractions http://vimeo.com/83486224</p>	<p>Solve problems involving fractions and decimals.</p>

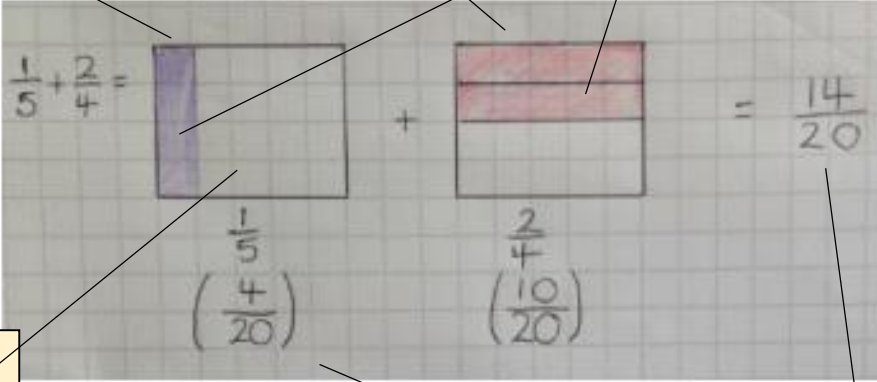
Calculation of Fractions – Year 4

Key Vocabulary: fraction, whole-one/s, half, quarter, three-quarters, numerator, denominator, add, subtract, equal parts of a whole, mixed number, equivalence, equivalent

Objectives	Representations	Problem Solving
<p>Add and subtract fractions with the same denominator</p>	<p>Continue to develop addition and subtraction of fractions as shown in Year 3 but beyond the whole one, using lots of practical resources such as number rods, equivalence circles, cards, etc to ensure conceptual understanding.</p> <p>Eg Addition</p>  $1\frac{1}{2} + 1\frac{1}{2} = 3$ <p>$1\frac{1}{2} + 1\frac{1}{2} = 2\frac{2}{2}$ (most children should recognise equivalence that 2 halves are the same as one whole, therefore the answer is 3) $= 3$</p> <p>Eg subtraction</p>  $2\frac{2}{3} - 1\frac{1}{3} = 1$ <p>Videos (Key Stage 1 but objectives apply to Year 3): Representing Fractions http://vimeo.com/83486102 Adding and subtracting fractions (Goes beyond one whole but examples can be adapted) http://vimeo.com/83486226 Reasoning about addition and subtraction of fractions http://vimeo.com/83486224 Key Stage 2 (Year 4) Developing Fluency – Counting in fractional steps http://vimeo.com/83486434 Preparing to add fractions with different denominators (has some ideas for consolidating adding with same denominator) http://vimeo.com/83486557</p>	<p>solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number</p> <p>solve simple measure and money problems involving fractions and decimals to two decimal places.</p>

Calculation of Fractions (addition and subtraction) Year 5

Key Vocabulary: fraction, whole-one/s, half, quarter, three-quarters, numerator, denominator, add, subtract, equal parts of a whole, mixed number, equivalence, equivalent, array, model, improper fraction, multiples, common denominator

Objectives	Representations	Problem Solving
<p>Add and subtract fractions with the same denominator and multiples of the same number</p> <p>Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$)</p>	<p>To gain a real secure understanding of adding and subtracting fractions with different denominators, children should be introduced to the array model so that conceptual understanding is embedded first. This array model can also be used for the multiplication and division of fractions with different denominators. As a school, this will be the only model that children should be shown so that possible misconceptions and confusion of using too many models is avoided.</p> <p>The video listed shows how to introduce the model and the example below shows the steps children need.</p> <div style="display: flex; justify-content: space-around; margin-bottom: 10px;"> <div data-bbox="353 459 645 853" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 1: create a grid that can be split into fifths and quarters (count along 5 and down 4). Ensure correct vocabulary is used: numerator, denominator, equal parts, etc)</p> </div> <div data-bbox="689 459 1108 619" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 2: draw an identical grid next to it with the + sign between.</p> </div> <div data-bbox="1142 459 1467 598" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 3: colour 1/5 of the first grid and 2/4 of the second grid.</p> </div> </div>  <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div data-bbox="392 1013 683 1444" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 4: Find the denominator by counting how many equal parts the grid has been divided into, find the numerator by counting how many equal parts are shaded.</p> </div> <div data-bbox="1377 1197 1668 1500" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 5: Now the denominators are equal (common denominator), the addition of the fraction can be carried out.</p> </div> </div>	<p>Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those with a denominator of a multiple of 10 or 25.</p>

Subtraction:

Follow steps 1 – 4 from addition. Step 5 is a subtraction calculation.

Example:

$$\frac{3}{4} - \frac{2}{3}$$
$$\frac{3}{4} - \frac{2}{3} = \frac{1}{12}$$
$$\left(\frac{9}{12}\right) - \left(\frac{8}{12}\right)$$

Videos:

Preparing to add fractions with different denominators (has some ideas for consolidating adding with same denominator)

<http://vimeo.com/83486557>

Adding fractions with different denominators (shows how to introduce the array model)

<http://vimeo.com/83486433>

Children exploring addition of fractions with different denominators

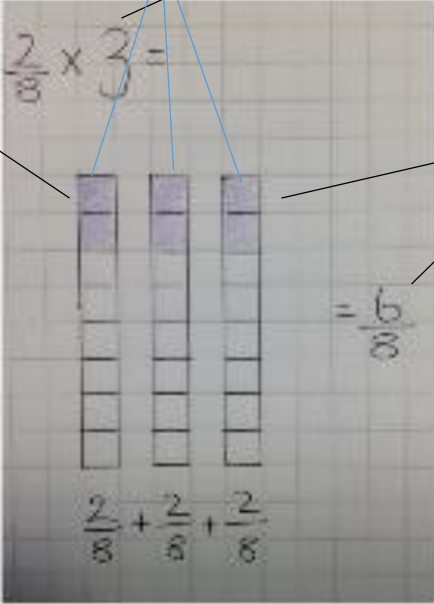
<http://vimeo.com/83486338>

Identifying Misconceptions

<http://vimeo.com/83486435>

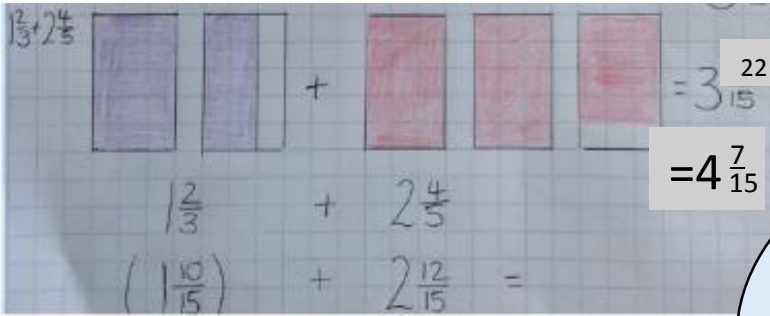
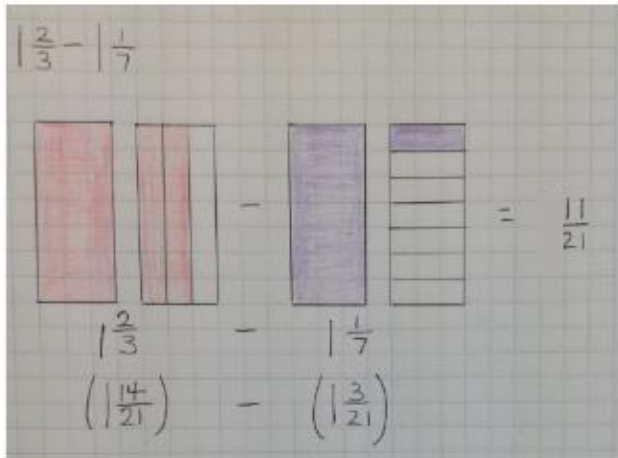
Calculation of Fractions (multiplication and division) – Year 5

Key Vocabulary: fraction, whole-one/s, half, quarter, three-quarters, numerator, denominator, equal parts of a whole, mixed number, equivalence, equivalent, array, model, improper fraction, common denominator, multiples, multiply, repeated addition

Objectives	Representations	Problem Solving
<p>Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams</p>	<p>A similar model can be used for repeated addition for multiplication of fractions and mixed numbers by whole numbers.</p> <p>Eg</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div data-bbox="389 387 656 627" style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Step 1: draw a grid that shows eighths of a whole. Shade in 2 parts of the whole ($\frac{2}{8}$).</p> </div> <div data-bbox="701 339 1279 507" style="border: 1px solid black; padding: 5px; width: 25%;"> <p>Step 2: look at the whole number that the fraction is being multiplied by (in this case 3). Draw the same grid so that it is repeated 3 times.</p> </div> <div data-bbox="1283 600 1740 767" style="border: 1px solid black; padding: 5px; width: 15%;"> <p>Step 3: count how many shaded parts of the wholes there are and add these together.</p> </div> </div> 	<p>solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those with a denominator of a multiple of 10 or 25.</p>

Calculation of Fractions (addition and subtraction) Year 6

Key Vocabulary: fraction, whole-one/s, half, quarter, three-quarters, numerator, denominator, add, subtract, equal parts of a whole, mixed number, equivalence, equivalent, array, model, improper fraction, multiples, common denominator

Objectives	Representations	Problem Solving
<p>Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions</p>	<p>Continue to use the array model taught in Year 5 to add fractions with different denominators. Introduce addition of mixed number fractions using the same array model.</p> <p>Examples:</p> <p>addition (see Y5 steps)</p>  <p>Subtraction</p> 	<p>solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those with a denominator of a multiple of 10 or 25.</p>

As children develop a conceptual understanding using the model, they may see the relationship between the model and how the common denominator can be calculated. This will also help the children establish the link between multiplication and division, and fractions.

Children should recognise equivalence between fractions.

Example:

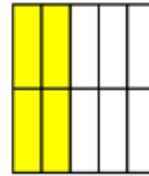
Equivalence

$$\frac{2}{5}$$



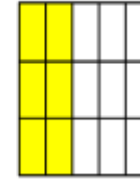
Equivalence

$$\frac{2}{5} = \frac{4}{10}$$



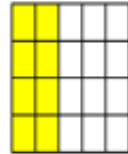
Equivalence

$$\frac{2}{5} = \frac{6}{15}$$



Equivalence

$$\frac{2}{5} = \frac{8}{20}$$



Equivalence

$$\frac{2}{5} = \frac{10}{25}$$



Videos: (Y4 but can be adapted to suit)

Adding fractions with different denominators (shows how to introduce the array model)

<http://vimeo.com/83486433>

Children exploring addition of fractions with different denominators

<http://vimeo.com/83486338>

Identifying Misconceptions

<http://vimeo.com/83486435>

Calculation of Fractions (multiplication and division) – Year 6

Key Vocabulary: fraction, whole-one/s, half, quarter, three-quarters, numerator, denominator, equal parts of a whole, mixed number, equivalence, equivalent, array, model, improper fraction, common denominator, multiples, multiply, divide, divisor, dividend, scale up/down, ...of,

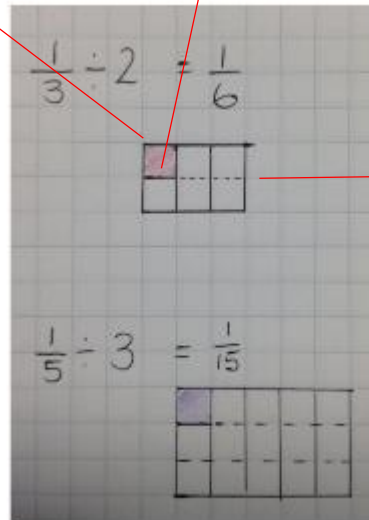
Objectives	Representations	Problem Solving
<p>Multiply simple pairs of proper fractions, writing the answer in its simplest form (e.g. $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$)</p> <p>Multiply one-digit numbers with up to two decimal places by whole numbers (see Year 6 Multiplication)</p> <p>Divide proper fractions by whole numbers (e.g. $\frac{1}{3} \div 2 = \frac{1}{6}$)</p>	<p>Multiplication</p> <p>The same array model can be used as for addition but only one grid needs to be drawn. See the example below:</p> <p>The example shows the multiplication carried out in both ways, $\frac{1}{4} \times \frac{1}{2}$ and also $\frac{1}{2} \times \frac{1}{4}$.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div data-bbox="344 544 786 788" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 1: draw a grid that shows both quarters and halves (see addition example for Y5). At this point, only draw lines that show quarters of the grid because this is what is being multiplied.</p> </div> <div data-bbox="846 628 1099 1123" style="text-align: center;"> </div> <div data-bbox="1182 523 1621 858" style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Step 3: Find the fraction that is shaded by drawing an imaginary line across the whole grid halving it also. How many equal parts are shaded? (Numerator) How many equal parts has the grid been divided into? (Denominator)</p> <p>In this example, the answer is $\frac{1}{8}$.</p> </div> </div> <div data-bbox="327 855 768 1310" style="border: 1px solid black; padding: 5px; width: 30%; margin-top: 20px;"> <p>Step 2: Look at one of the quarters and shade half of it (because we are multiplying by a half). At this point children will need to know that when multiplying by a fraction, the number does not get bigger, it actually gets smaller. Some explanation or demonstration could be given to show that anything less than 1 lot of a number makes the number smaller.</p> </div> <div data-bbox="1167 1034 1727 1251" style="border: 1px solid black; border-radius: 50%; padding: 10px; width: 30%; margin-top: 20px;"> <p>To help children gain an understanding talk about 'of', for example, $\frac{1}{2}$ of $\frac{1}{4}$.</p> </div> <div data-bbox="792 1145 1355 1481" style="border: 1px solid black; border-radius: 50%; padding: 10px; width: 30%; margin-top: 20px;"> <p>Language such as scaling up and scaling down can be used.</p> </div>	<p>solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those with a denominator of a multiple of 10 or 25.</p>

Division

Again, use a model very similar to multiplication.
Example:

Step 1: draw a grid that shows the dividend ($\frac{1}{3}$ in this case) and also the divisor (2 in this case). Draw lines down to show the dividend ($\frac{1}{3}$) but do not draw lines across to show the divisor at this point.

Step 2: look at one of the thirds and divide it by 2 (the divisor). Shade in one part of this.



Step 3: To find the answer, look at the fraction that is shaded by drawing an imaginary line across the whole grid, dividing it by 2. How many equal parts are shaded? (Numerator) How many equal parts has the grid been divided into? (Denominator). In this case the answer is $\frac{1}{6}$

Some children will begin to understand how the fractions are calculated without the need of the model. These children will develop a deeper understanding of the relationship between multiplication, division and fractions.