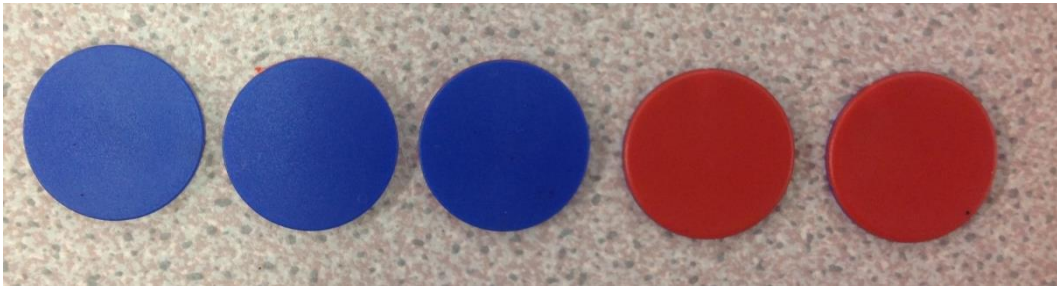


Parts and Wholes

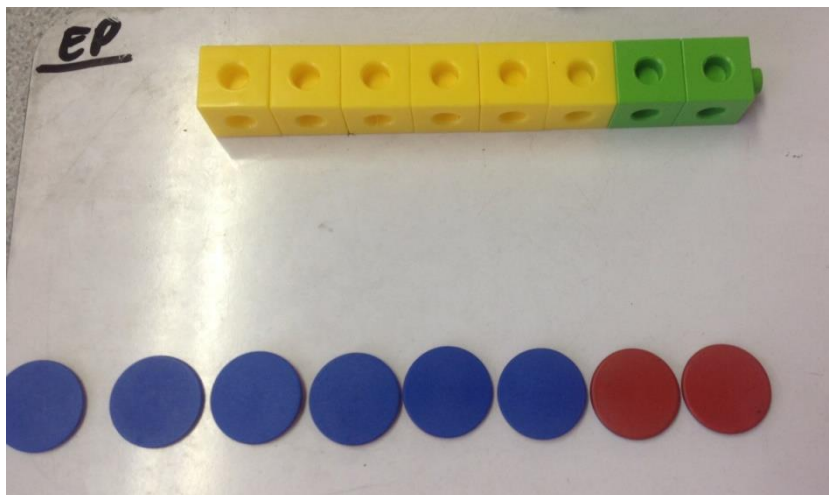
Children need to understand that fractions are equal parts that make the whole. Their understanding of the whole has to be secure.

Representations of Fractions.

Children should use physical objects to represent fractions.



This shows $\frac{3}{5}$

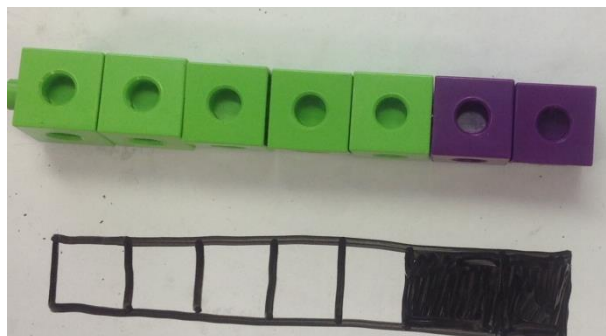


This shows $\frac{6}{8}$ and demonstrates the link between counters and cubes.



This represents $\frac{5}{7}$ as the whole has been split into 7 equal parts and 5 are green so it is $\frac{5}{7}$.

Once children are secure in the use of cubes, then they can present the fraction as a bar model alongside the cubes.



Children are then able to draw the bar model without the aid of physical resources.

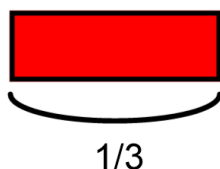


This model shows $\frac{2}{5}$.

Iteration

Iteration is when we start with the part and work out the whole.

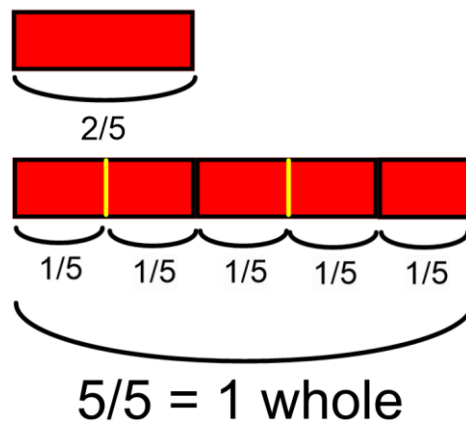
In the model below, the bar is $\frac{1}{3}$ of the whole.



If children know that $\frac{1}{3}$, they can work out the whole as $\frac{3}{3}$ make a whole.

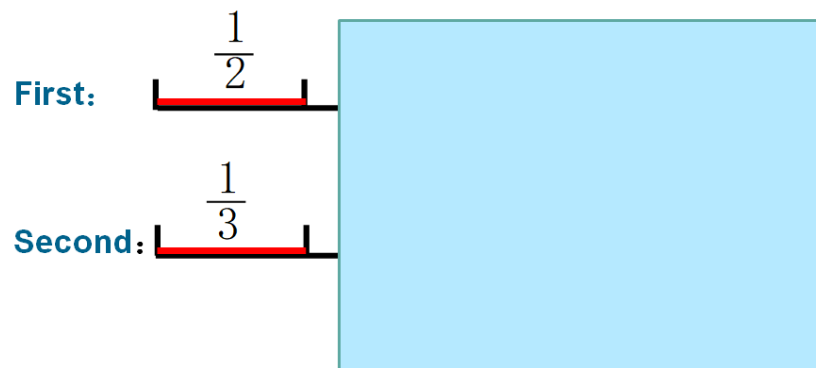


In the below example a child knows the length of $\frac{2}{5}$. They can work out $\frac{1}{5}$ and then work out the whole.

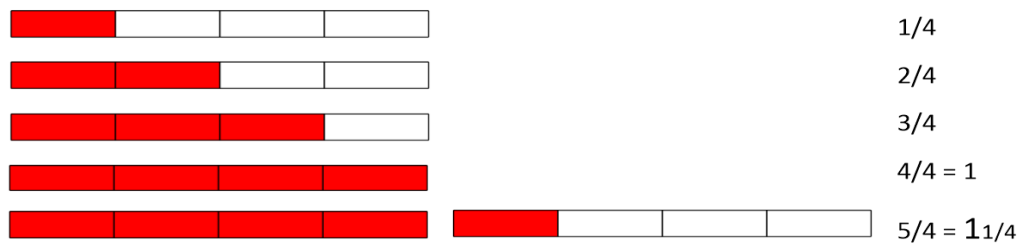


This will lead to children being able to answer questions as shown below.

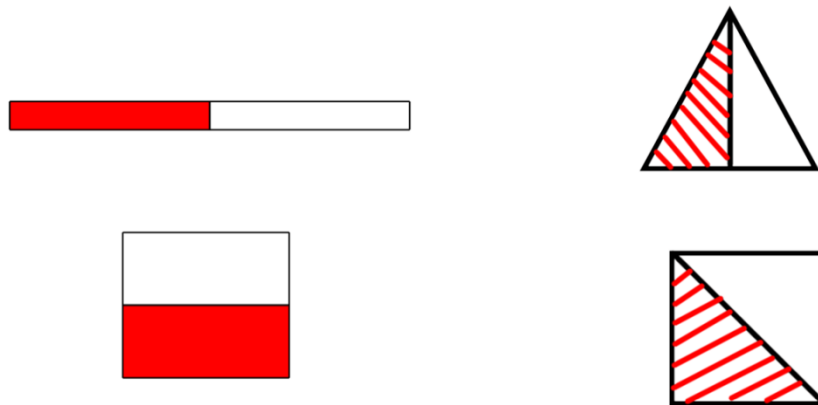
Which line is longer?



This then will enable children to represent fractions as bar models including improper and mixed fractions.

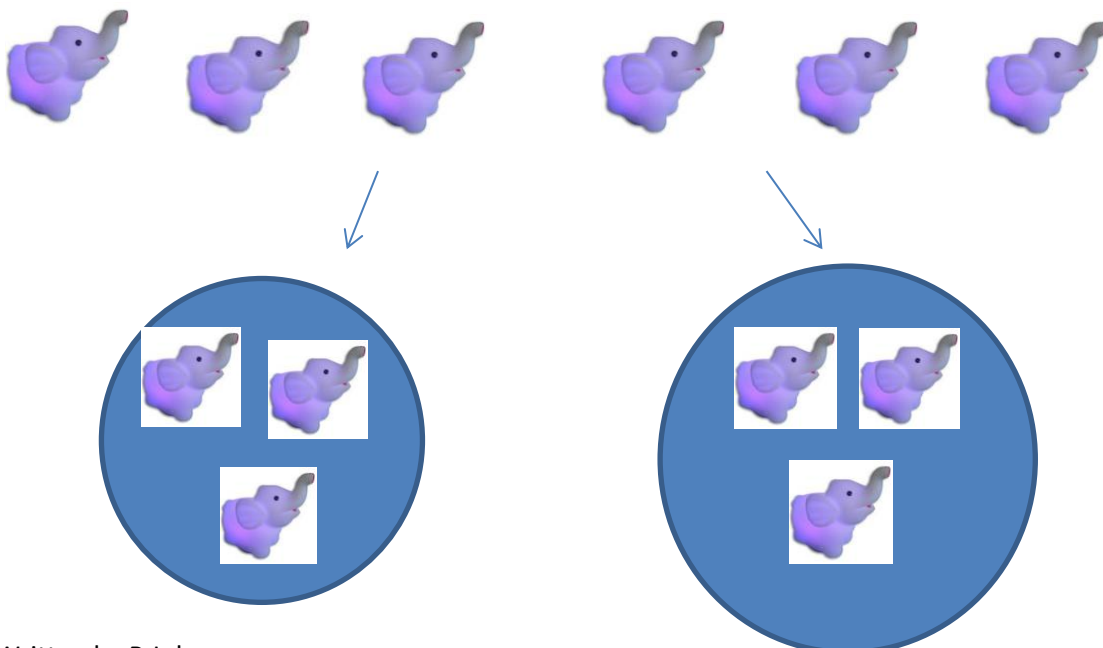


Children should also see fractions presented in a variety of ways (conceptual variation).

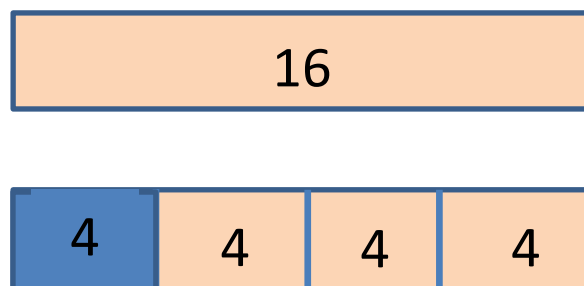


Fraction of a Quantity

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



$$\frac{1}{4} \text{ of } 16 = ?$$

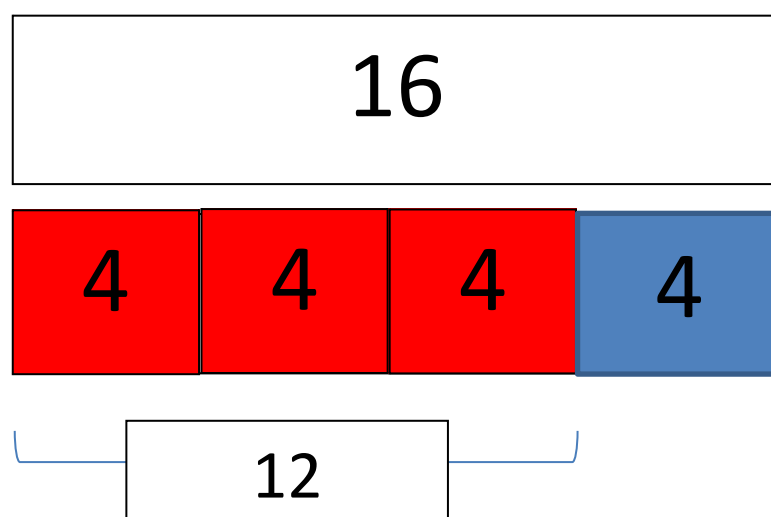


The whole is split into 4 equal pieces. 16 divided by 4 is 4, so each part is worth 4.

$$\frac{1}{4} \text{ of } 16 = 4$$

Children continue to use bar models throughout the school to work out fractions of quantities. This knowledge will enable them to solve problems such as $\frac{3}{4}$ of ? = 12

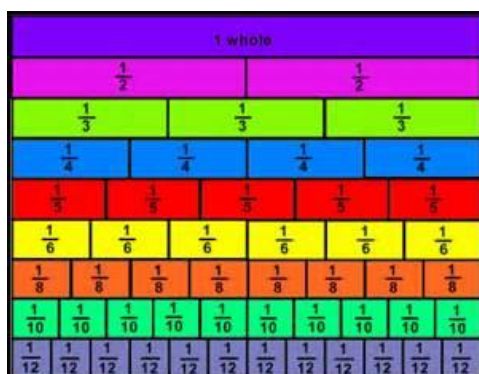
$$\frac{3}{4} \text{ of ?} = 12$$



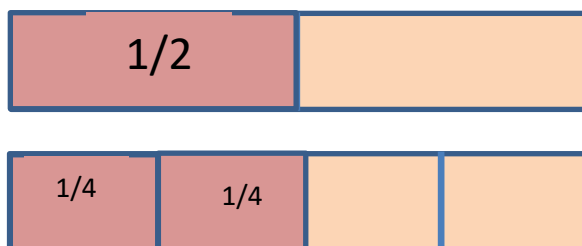
3 of the blocks (out of the 4) are worth 12 so 1 of the blocks is worth 4 so every block is worth 4. Therefore the whole number is worth 16.

Equivalence

Practical resources should be used and children place objects over the top of each other and check if they are the same.



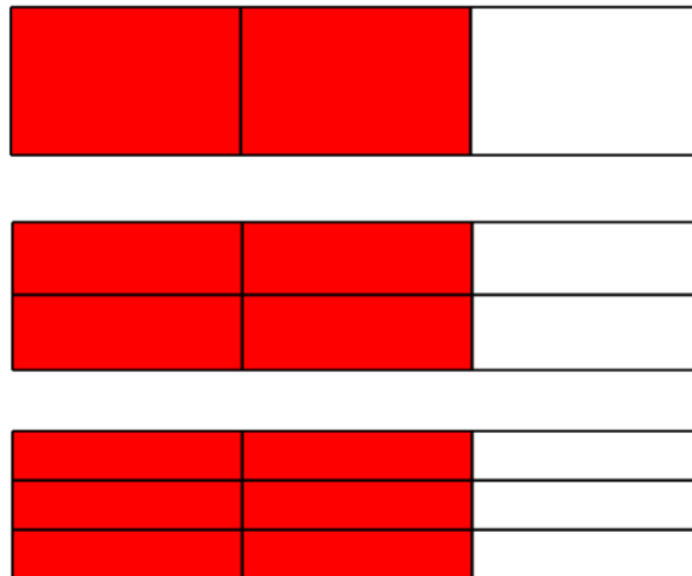
A fraction wall can be used to provide further opportunities to reinforce equivalent fractions. Children can use a visual resource or cut the fractions out and overlap them.



$$\frac{1}{2} = \frac{2}{4}$$

Bar models to be used to show equivalence of simple fractions.

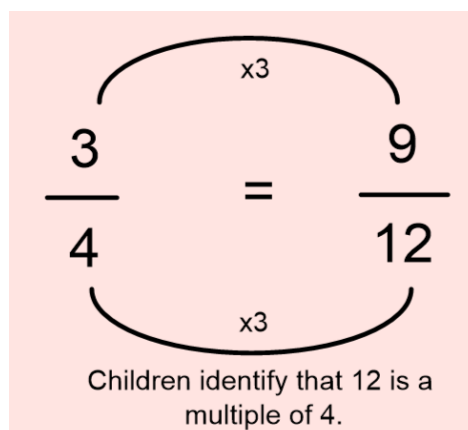
The below model shows how children can use their knowledge of equivalence to work out equivalent fractions.



The top model shows $\frac{2}{3}$.

When you place two $\frac{2}{3}$ on top of each other, you can see that $\frac{2}{3}$ of the columns are shaded. However, in total $\frac{4}{6}$ are shaded so $\frac{2}{3} = \frac{4}{6}$.

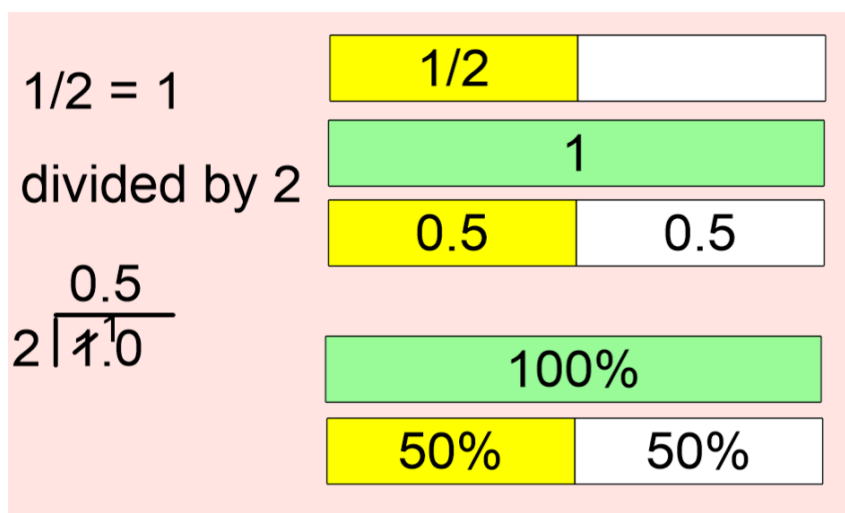
Children develop a secure knowledge, including then link between multiples before leading on to the method below.



Equivalences Between Fraction/Percentage and Decimals

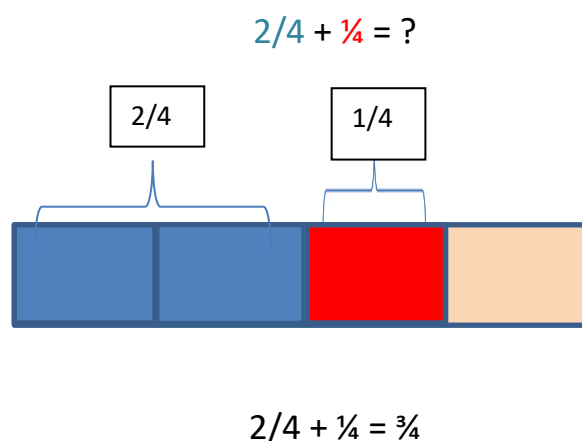
Children are to use knowledge of place value to convert between decimals and fractions that involve tenths and hundredths.

When reading the number 1.2, children should be reading the number as one and two tenths **not one point two**.



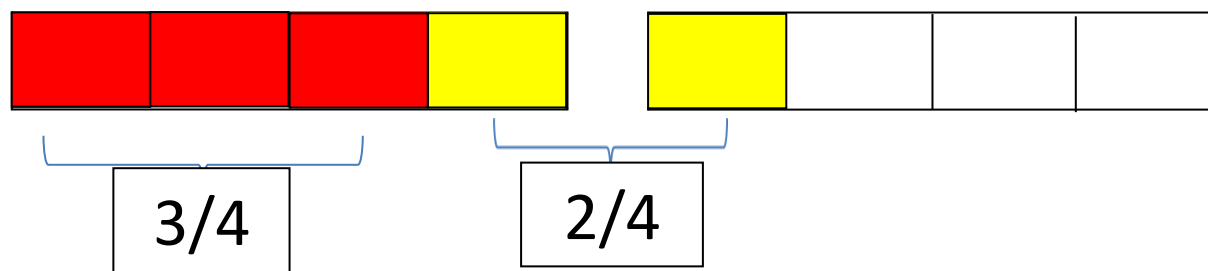
Children are to understand how fractions and decimals are equivalent first. Once children understand that percent is out of 100 they will then develop their understanding of multiply the decimal by 100 to convert to a percentage.

Adding fractions



This could progress to moving across into the ones.

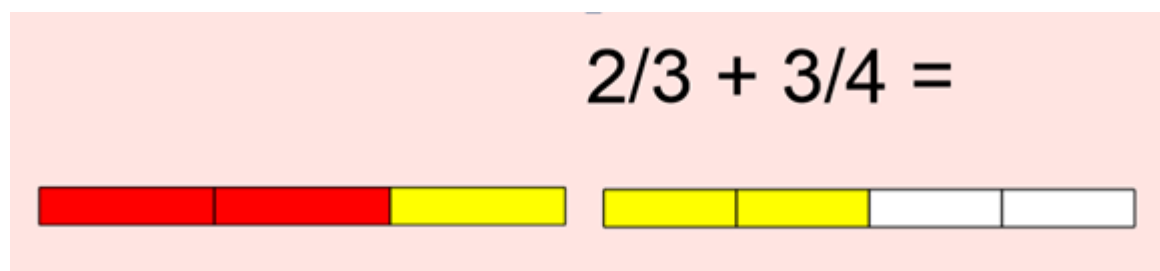
$$\frac{3}{4} + \frac{2}{4} = ?$$



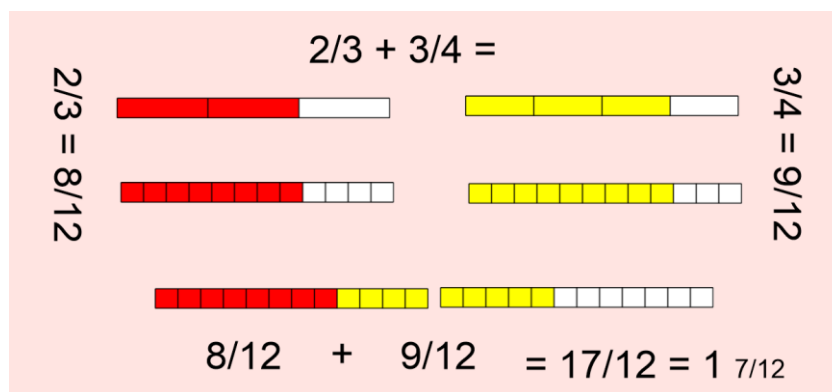
$$\frac{3}{4} + \frac{2}{4} = \frac{5}{4} = 1 \frac{1}{4}$$

Adding Fractions with a Different Denominator

Children to explore and understand why they cannot, in their current form, add two fractions with different denominators.



The diagram above shows why you cannot add fractions with different denominators. The yellow section represents $\frac{1}{4}$ s, however the first quarter is a $\frac{1}{3}$.



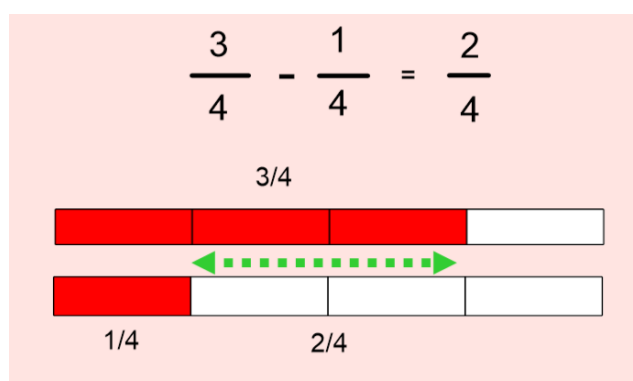
This demonstrates adding fractions with different denominators and the reasoning behind finding a common denominator.

$$\begin{array}{c} \frac{3}{4} + \frac{2}{3} \\ \times 3 \quad \times 4 \\ \hline \frac{9}{12} + \frac{8}{12} = \frac{17}{12} = 1\frac{5}{12} \end{array}$$

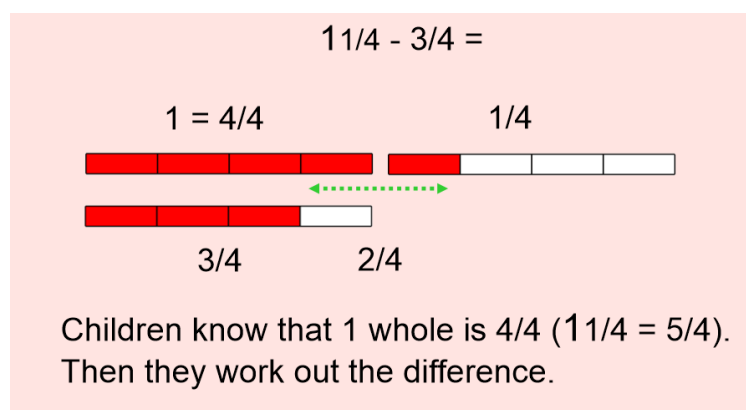
Subtracting Fractions

Children need to apply their knowledge of the concept of difference and take away and be taught both methods.

Difference



Children understand that they are finding the difference.

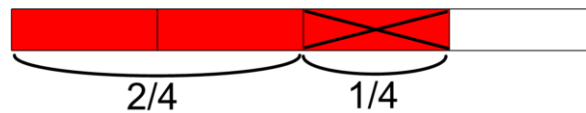


Take Away

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

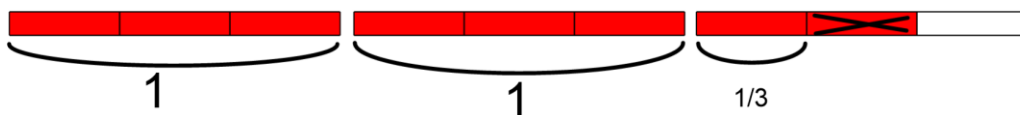


Children start with $\frac{3}{4}$ and then take $\frac{1}{4}$ away.
This will leave them with $\frac{2}{4}$.



This leads onto...

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



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

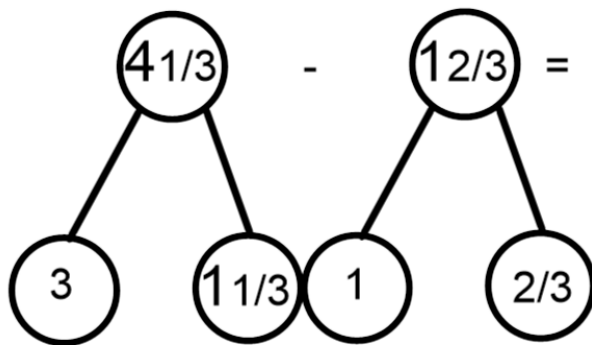
Children must have a thorough understanding of bar models before they apply their knowledge of converting a mixed fraction to an improper fractions.

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



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

In the calculation below, you need to exchange 1 one for $\frac{3}{3}$ to be able to subtract. Children recognise that $\frac{2}{3}$ is greater than $\frac{1}{3}$.



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

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

$$3 - 1 = 2$$

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

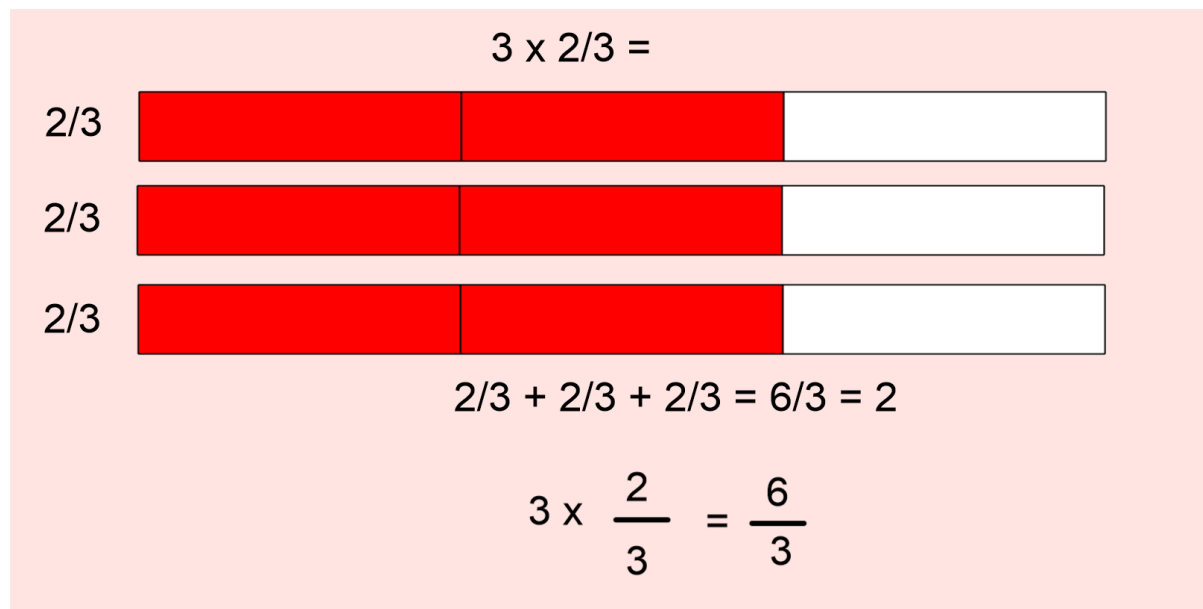
Subtracting Using a Common Denominator

$$\frac{3}{4} - \frac{2}{5} = \frac{15}{20} - \frac{8}{20} = \frac{7}{20}$$

The calculation shows the subtraction of $\frac{2}{5}$ from $\frac{3}{4}$ using a common denominator of 20. The fractions are converted to $\frac{15}{20}$ and $\frac{8}{20}$ respectively, and then subtracted to get $\frac{7}{20}$.

Multiplying Fractions – a whole number by a fraction

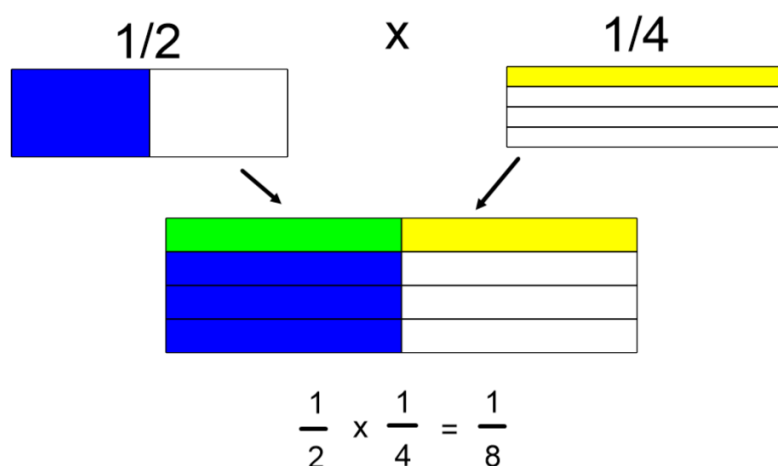
$3 \times \frac{2}{3}$ means 3 lots of $\frac{2}{3}$. The link between multiplication and repeated addition is paramount.



If a calculation is presented as $\frac{2}{3} \times 3$, our knowledge of cumulative law is applied.

Multiplying a Fraction by a Fraction

$\frac{1}{2} \times \frac{1}{4}$ means $\frac{1}{2}$ of $\frac{1}{4}$



Children need to understand why you multiply the numerators and denominators. The green colour shows where the two colours have mixed. This shows $\frac{1}{2}$ of $\frac{1}{4}$.

Division

Dividing a Whole Number by a Fraction.

2 divided by $\frac{1}{4}$ means how many $\frac{1}{4}$ s are in 2.

2 divided by $\frac{1}{4}$



Split the 2 whole ones into $\frac{1}{4}$ s



How many $\frac{1}{4}$ s are there?

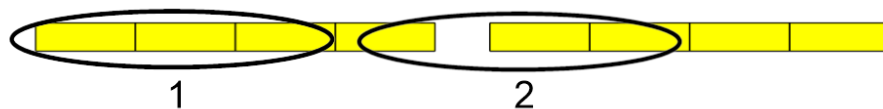
= 8

Dividing by Non-Unit Fractions

2 divided by $\frac{3}{4}$



Split the 2 whole ones into quarters.



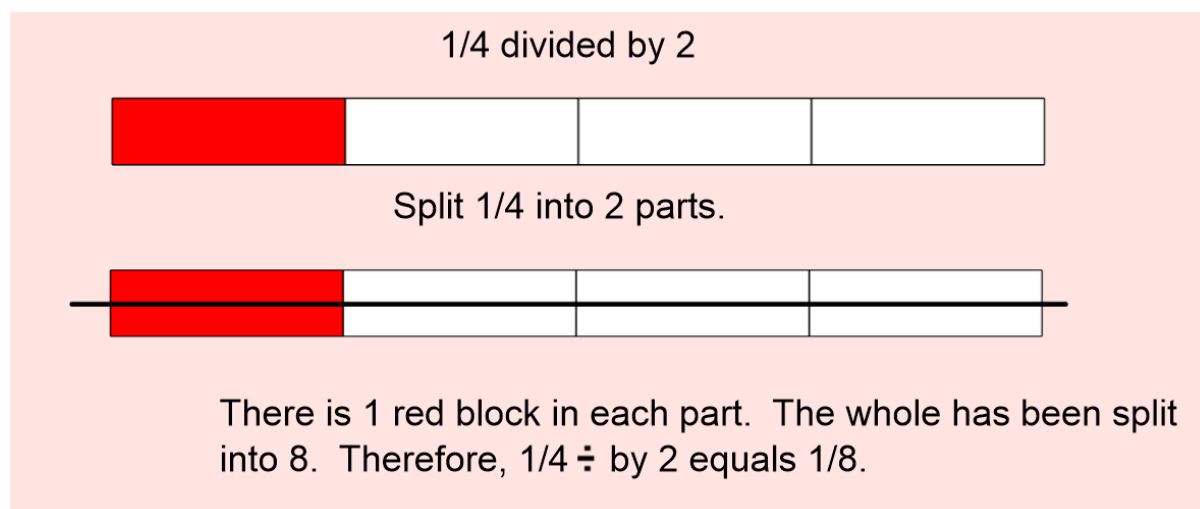
How many $\frac{3}{4}$ are there?

There are 2 lots of $\frac{3}{4}$ and then 2 out of 3 left (counting in 3).

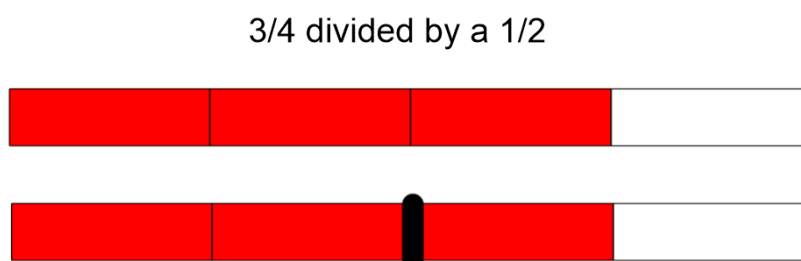
Therefore 2 divided by $\frac{3}{4} = 2 \frac{2}{3}$

Dividing a Fraction by a Whole Number

$\frac{1}{4}$ divided by 2 means $\frac{1}{4}$ split into 2 parts.



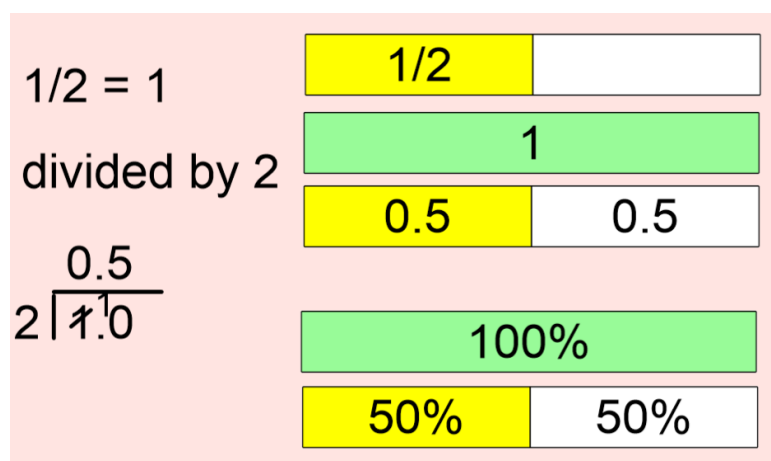
Dividing a Fraction by a Fraction



Split the model into $\frac{1}{2}$.

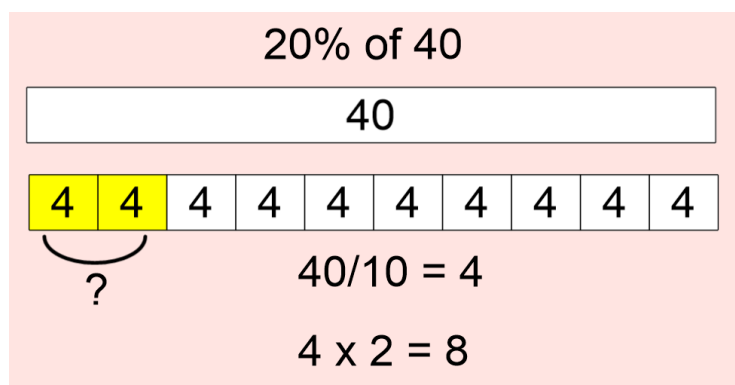
1 $\frac{1}{2}$ halves fit in $\frac{3}{4}$

Linking Fractions/Decimals/Percentages

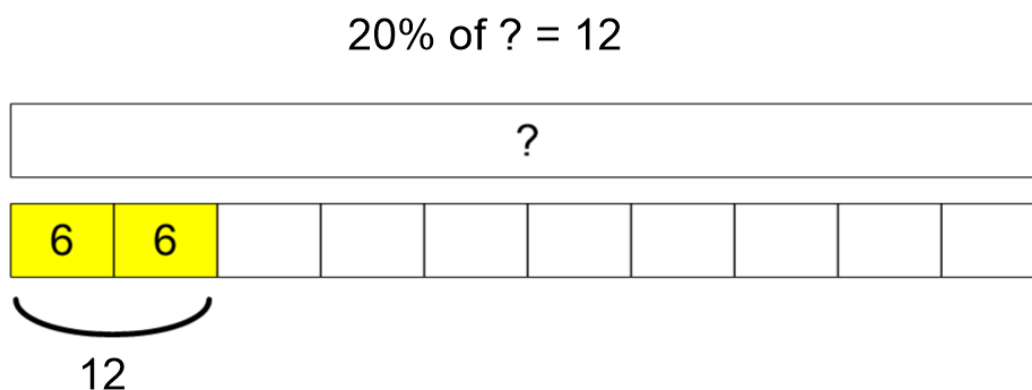


% of a Number

If the % is a multiple of 10 or 5 then always find 10% of the number. To find 10% we divided by 10 as there is 10 lots of 10% in 100%.

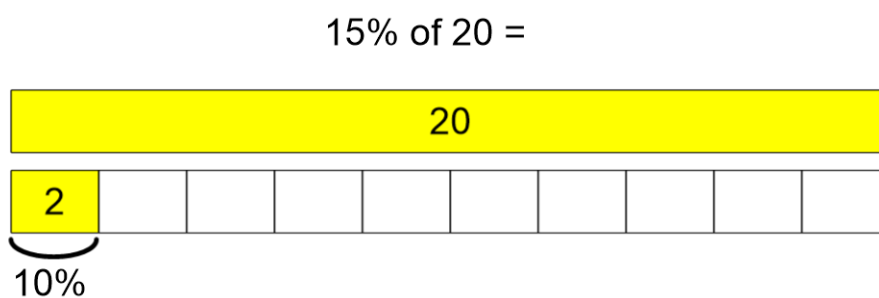


This understands leads to 20% of ? = 12.



Children understand that 10% = 6, so 100% = 60.

% of a Number that does not Involve a Multiple of 10



Once children have worked out 10%, then they can work out 5% and add 5% of the number to 10% of the number to work out 15% of the number. In this case $2 + 1 = 3$, so 15% of 20 = 3.

This knowledge and understanding leads to children knowing how to work out other percentage amounts of a number.

$$3\% \text{ of } 120 =$$

Children know that to work out 1% they divide by 100 as there is 100% in a whole. They would then multiply by 3.

$$120/100 = 1.2$$

$$1.2 \times 3 = 3.6$$