

Chase Side Primary School

Calculation Policy

ADOPTED BY THE GOVERNORS OF CHASE SIDE PRIMARY SCHOOL ON THE 6TH MARCH 2025

TO BE REVIEWED MARCH 2027

As for all policies we adopt within our school, all aspects of the Calculation Policy must fit with the ethos, values and vision for the school which are:

School Vision, Values and Ethos:

At Chase Side Primary School we believe that we are “stronger together”.

We want to ensure that all children are given every opportunity to thrive throughout their time with us. We see everyone as a lifelong learner and we hope that none of us will ever lose the enthusiasm and excitement that learning provides. We embrace and value our diverse community. As a school we aim to make a positive impact on our community.

Chase Side’s Vision is to:

- Develop confident lifelong learners
- Embrace and value our diversity
- Make a positive impact in our community.
-

The shared Values of our School include:

- Kindness
- Respect
- Friendship
- Honesty
- Resilience

Our Ethos encompasses being welcoming, inclusive, friendly, caring and ensuring that working together underpins everything we do.

Everyone has the right to expect and benefit from this ethos and these values are demonstrated in all aspects of school life. Everyone who is part of our learning community is asked to adhere to our values and ethos.

The following calculation policy has been adapted from the White Rose Calculation Policy with further material added. It has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school. Planning and implementation of the curriculum is guided by the 2014 National Curriculum programme for maths and we use the White Rose resources for planning and lesson delivery, all of which are adapted by teaching staff to suit the needs of the children at Chase Side.

Age stage expectations

The calculation policy is organised to show the progressions from different levels of modelling through concrete, pictorial, and abstract representations to enable understanding through conceptual variation. The policy follows the expectations as set out in the National Curriculum 2014, **however it is vital that pupils are taught according to the stage that they are currently working at**, being moved onto the next stage once they show varied conceptual understanding, or working at a lower stage until they are secure enough to move on.

Mathematics Mastery

At the centre of the mastery approach to the teaching of mathematics is the belief that **all children have the potential to succeed**. They should have access to the same curriculum content and, rather than being extended with new learning, they should **deepen their conceptual understanding by tackling challenging and varied problems**. Similarly, with calculation strategies, children must not simply rote learn procedures but demonstrate their understanding of these procedures through the use of concrete materials and pictorial representations. This policy outlines the different calculation strategies that should be taught and used from EYFS to Year 6 in line with the requirements of the 2014 Primary National Curriculum.

Mathematical Language

The 2014 National Curriculum is explicit in articulating the importance of children using the correct mathematical language as a central part of their learning (reasoning). Indeed, in certain year groups, the non-statutory guidance highlights the requirement for children to extend their language around certain concepts. It is therefore essential that teaching using the strategies outlined in this policy is accompanied by the use of **appropriate and precise mathematical vocabulary**. New vocabulary should be introduced in a suitable context (for example, with relevant real objects, manipulatives, pictures or diagrams) and explained carefully. **High expectations of the mathematical language used are essential, with teachers only accepting what is correct.**

Context and modelling

It is important that any type of calculation is given a **real-life context or problem solving approach** to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons. Just as important, is the provision of manipulatives and the teaching of appropriate models. The policy reflects our recently adopted approach to the use of bar modelling to support understanding in a wide range of mathematical problems. The bar model should be introduced to children in EYFS and used throughout KS1 and KS2; following the 'concrete, pictorial, abstract' progression.

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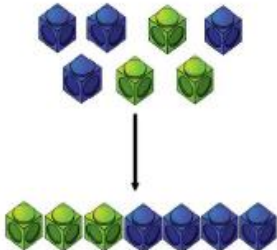
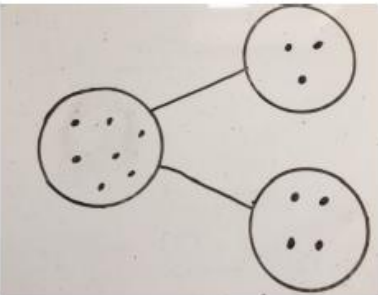
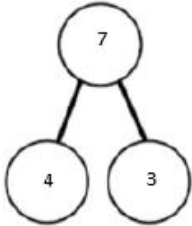
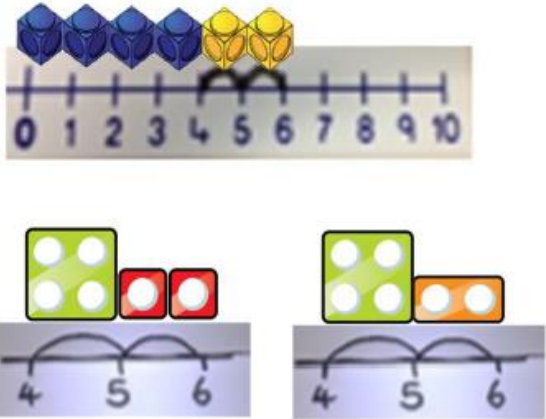
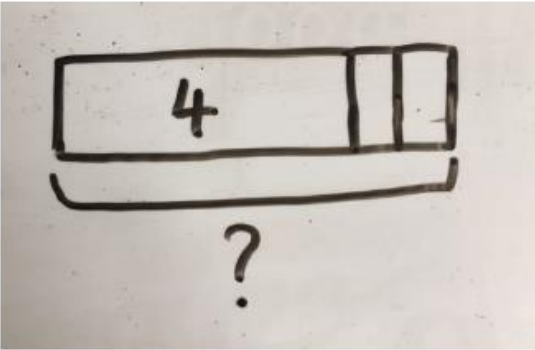

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1. National Curriculum age expectations for addition and subtraction

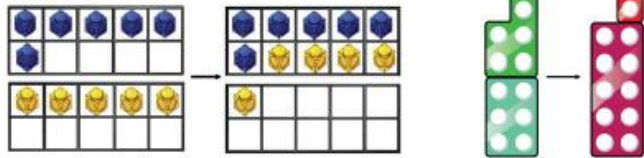
	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	<p>Combining two parts to make a whole: part whole model.</p> <p>Starting at the bigger number and counting on- using cubes.</p> <p>Regrouping to make 10 using ten frame.</p>	<p>Adding three single digits.</p> <p>Use of base 10 to combine two numbers.</p>	<p>Column method- regrouping.</p> <p>Using place value counters (up to 3 digits).</p>	<p>Column method- regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method- regrouping.</p> <p>Use of place value counters for adding decimals.</p>	<p>Column method- regrouping.</p> <p>Abstract methods.</p> <p>Place value counters to be used for adding decimal numbers.</p>
Subtraction	<p>Taking away ones</p> <p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10 using the ten frame</p>	<p>Counting back</p> <p>Find the difference</p> <p>Part whole model</p> <p>Make 10</p> <p>Use of base 10</p>	<p>Column method with regrouping.</p> <p>(up to 3 digits using place value counters)</p>	<p>Column method with regrouping.</p> <p>(up to 4 digits)</p>	<p>Column method with regrouping.</p> <p>Abstract for whole numbers.</p> <p>Start with place value counters for decimals- with the same amount of decimal places.</p>	<p>Column method with regrouping.</p> <p>Abstract methods.</p> <p>Place value counters for decimals- with different amounts of decimal places.</p>

1.1 Progression in teaching **addition**

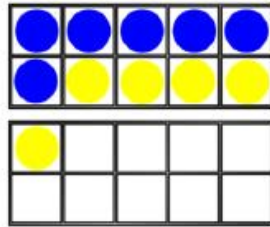
Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars).</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p>$4 + 3 = 7$ Four is a part, 3 is a part and the whole is seven.</p> 
<p>Counting on using number lines using cubes or Numicon.</p> 	<p>A bar model which encourages the children to count on, rather than count all.</p> 	<p>The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? $4 + 2$</p> 

Regrouping to make 10; using ten frames and counters/cubes or using Numicon.

6 + 5



Children to draw the ten frame and counters/cubes.



Children to develop an understanding of equality e.g.

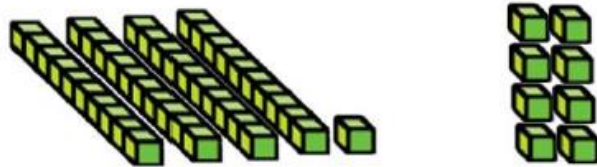
$$6 + \square = 11$$

$$6 + 5 = 5 + \square$$

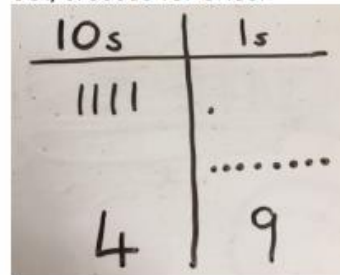
$$6 + 5 = \square + 4$$

TO + O using base 10. Continue to develop understanding of partitioning and place value.

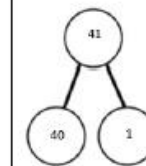
41 + 8



Children to represent the base 10 e.g. lines for tens and dot/crosses for ones.

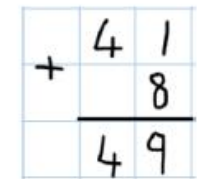


41 + 8



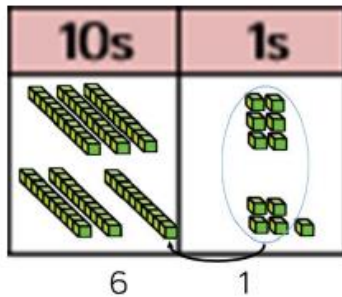
$$1 + 8 = 9$$

$$40 + 9 = 49$$

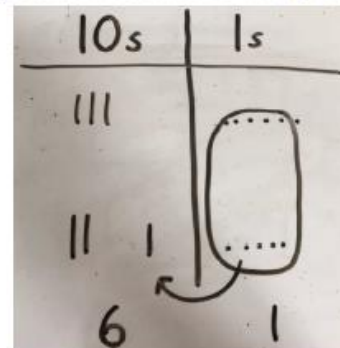


TO + TO using base 10. Continue to develop understanding of partitioning and place value.

36 + 25



Children to represent the base 10 in a place value chart.



Looking for ways to make 10.

36 + 25 =

1 5

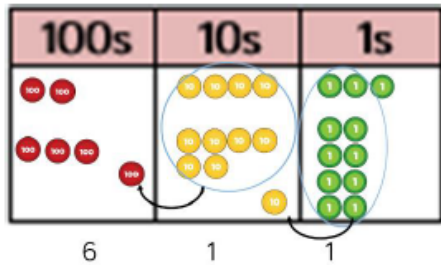
Formal method:

$$\begin{array}{r} +25 \\ 36 \\ \hline 61 \\ 1 \end{array}$$

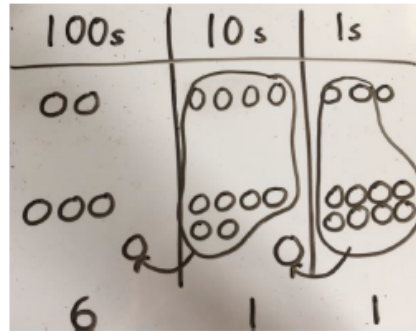
30 + 20 = 50
5 + 5 = 10
50 + 10 + 1 = 61

36

Use of place value counters to add HTO + TO, HTO + HTO etc. When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred.

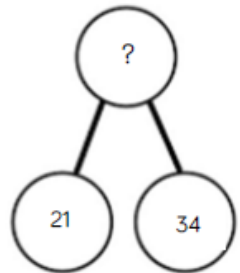


Children to represent the counters in a place value chart, circling when they make an exchange.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 11 \end{array}$$

Conceptual variation; different ways to ask children to solve 21 + 34



Word problems:
In year 3, there are 21 children and in year 4, there are 34 children.
How many children in total?

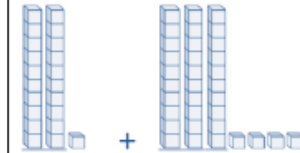
$21 + 34 = 55$. Prove it

$$\begin{array}{r} 21 \\ +34 \\ \hline \end{array}$$

$21 + 34 =$

$\square = 21 + 34$

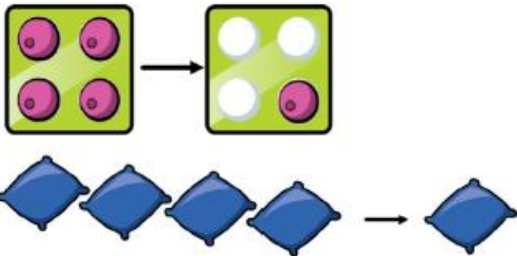
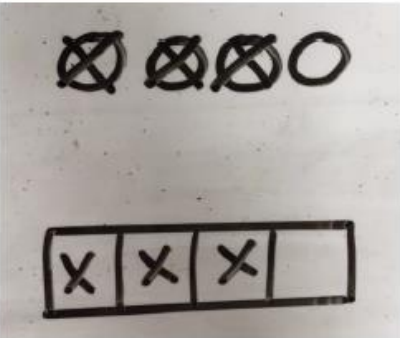

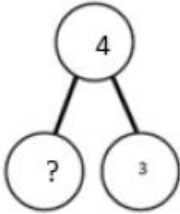
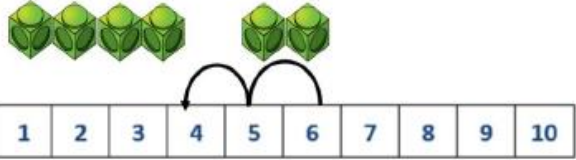
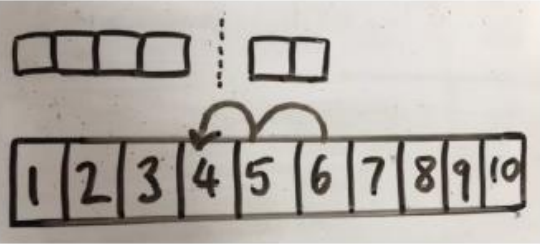
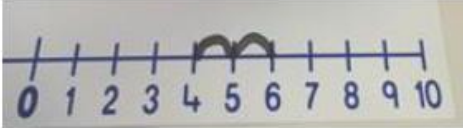
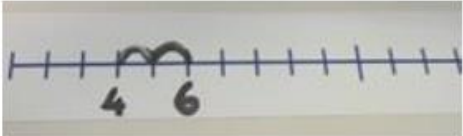
Calculate the sum of twenty-one and thirty-four.



Missing digit problems:

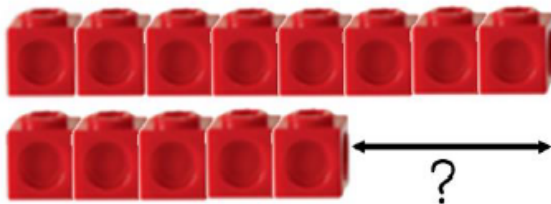
10s	1s
10 10	1
10 10 10	?
?	5

1.2 Progression in teaching subtraction

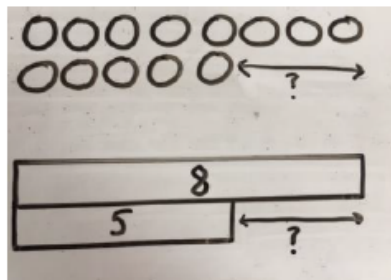
Concrete	Pictorial	Abstract				
<p>Physically taking away and removing objects from a whole (ten frames, Numicon, cubes and other items such as beanbags could be used).</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used.</p> 	<p>$4 - 3 =$</p> <p> = $4 - 3$</p> <table border="1" data-bbox="1608 646 1908 721"> <tr> <td colspan="2">4</td> </tr> <tr> <td>3</td> <td>?</td> </tr> </table> 	4		3	?
4						
3	?					
<p>Counting back (using number lines or number tracks) children start with 6 and count back 2.</p> <p>$6 - 2 = 4$</p> 	<p>Children to represent what they see pictorially e.g.</p> 	<p>Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line</p>  				

Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used).

Calculate the difference between 8 and 5.



Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate.



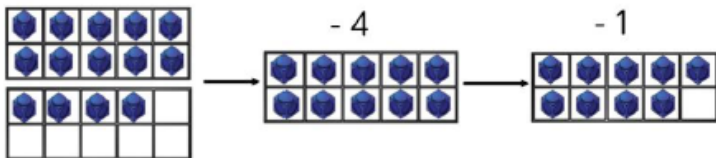
Find the difference between 8 and 5.

8 - 5, the difference is

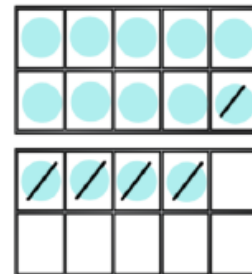
Children to explore why
 $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.

Making 10 using ten frames.

14 - 5



Children to present the ten frame pictorially and discuss what they did to make 10.



Children to show how they can make 10 by partitioning the subtrahend.

$$14 - 5 = 9$$

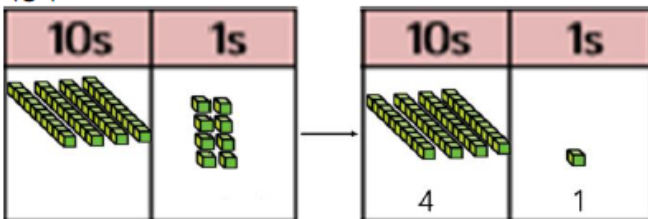
$$\begin{array}{c} 4 \quad 1 \end{array}$$

$$14 - 4 = 10$$

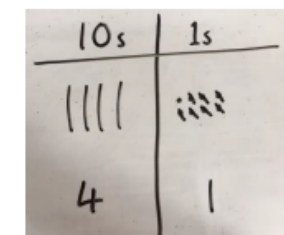
$$10 - 1 = 9$$

Column method using base 10.

48-7



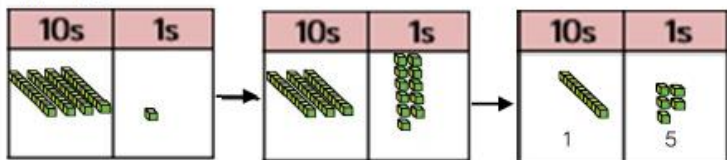
Children to represent the base 10 pictorially.



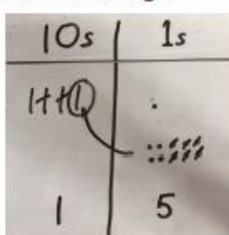
Column method or children could count back 7.

	4	8
-		7
	4	1

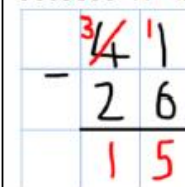
Column method using base 10 and having to exchange.
41 - 26



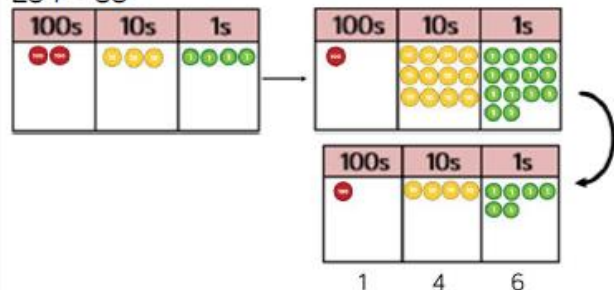
Represent the base 10 pictorially, remembering to show the exchange.



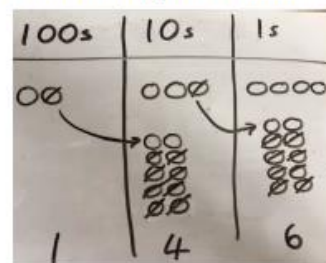
Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because $41 = 30 + 11$.



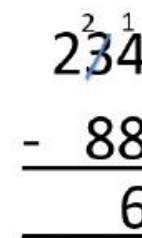
Column method using place value counters.
234 - 88



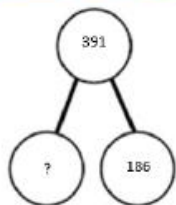
Represent the place value counters pictorially; remembering to show what has been exchanged.



Formal column method. Children must understand what has happened when they have crossed out digits.



Conceptual variation; different ways to ask children to solve 391 - 186



391	
186	?

Raj spent £391, Timmy spent £186.
How much more did Raj spend?

Calculate the difference between 391 and 186.

$$\square = 391 - 186$$

$$\begin{array}{r} 391 \\ -186 \\ \hline \end{array}$$

What is 186 less than 391?

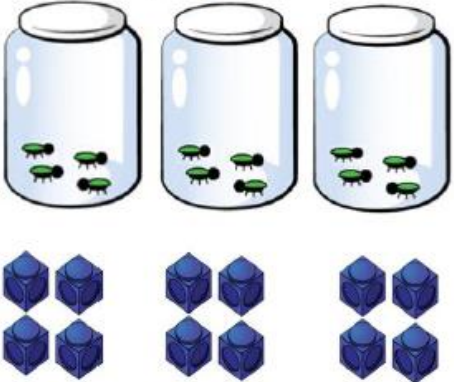
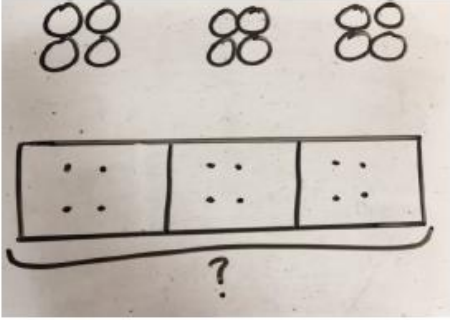
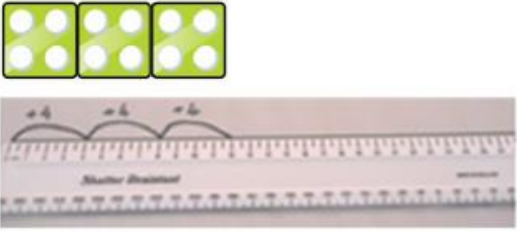
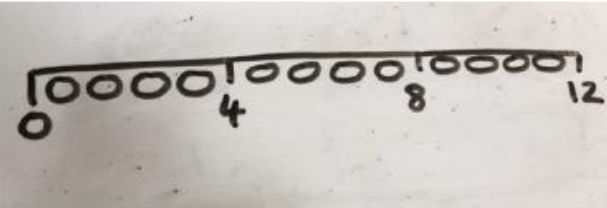
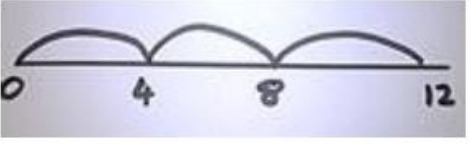
Missing digit calculations

$$\begin{array}{r} 39\square \\ -\square\square 6 \\ \hline \square 0 5 \end{array}$$

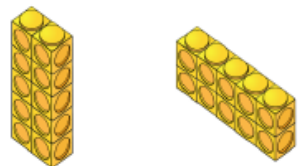
2. National Curriculum age expectations for multiplication and division

	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Multiplication	<p>Recognising and making equal groups.</p> <p>Doubling</p> <p>Counting in multiples Use cubes, Numicon and other objects in the classroom</p>	<p>Arrays- showing commutative multiplication</p>	<p>Arrays</p> <p>$2d \times 1d$ using base 10</p>	<p>Column multiplication- introduced with place value counters.</p> <p>(2 and 3 digit multiplied by 1 digit)</p>	<p>Column multiplication</p> <p>Abstract only but might need a repeat of year 4 first (up to 4 digit numbers multiplied by 1 or 2 digits)</p>	<p>Column multiplication</p> <p>Abstract methods (multi-digit up to 4 digits by a 2 digit number)</p>
Division	<p>Sharing objects into groups</p> <p>Division as grouping e.g. I have 12 sweets and put them in groups of 3, how many groups?</p> <p>Use cubes and draw round 3 cubes at a time.</p>	<p>Division as grouping</p> <p>Division within arrays- linking to multiplication</p> <p>Repeated subtraction</p>	<p>Division with a remainder-using lollipop sticks, times tables facts and repeated subtraction.</p> <p>$2d$ divided by $1d$ using base 10 or place value counters</p>	<p>Division with a remainder</p> <p>Short division (up to 3 digits by 1 digit- concrete and pictorial)</p>	<p>Short division</p> <p>(up to 4 digits by a 1 digit number including remainders)</p>	<p>Short division</p> <p>Long division with place value counters (up to 4 digits by a 2 digit number)</p> <p>Children should exchange into the tenths and hundredths column too</p>

2.1 Progression in teaching multiplication

Concrete	Pictorial	Abstract
<p>Repeated grouping/repeated addition 3×4 $4 + 4 + 4$ There are 3 equal groups, with 4 in each group.</p> 	<p>Children to represent the practical resources in a picture and use a bar model.</p> 	<p>$3 \times 4 = 12$ $4 + 4 + 4 = 12$</p>
<p>Number lines to show repeated groups- 3×4</p>  <p>Cuisenaire rods can be used too.</p>	<p>Represent this pictorially alongside a number line e.g.:</p> 	<p>Abstract number line showing three jumps of four.</p> <p>$3 \times 4 = 12$</p> 

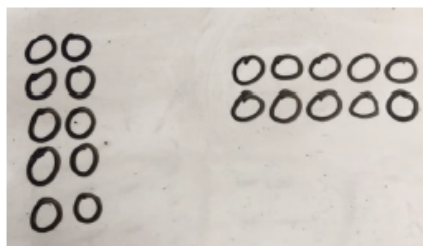
Use arrays to illustrate commutativity counters and other objects can also be used.
 $2 \times 5 = 5 \times 2$



2 lots of 5

5 lots of 2

Children to represent the arrays pictorially.



Children to be able to use an array to write a range of calculations e.g.

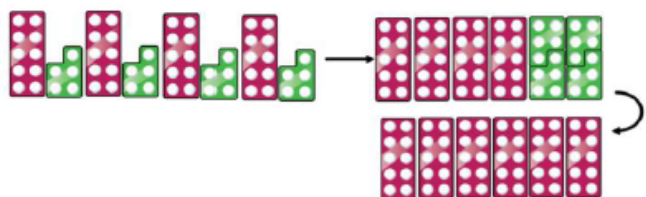
$$10 = 2 \times 5$$

$$5 \times 2 = 10$$

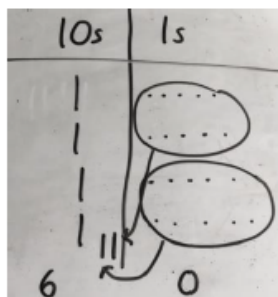
$$2 + 2 + 2 + 2 + 2 = 10$$

$$10 = 5 + 5$$

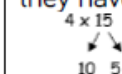
Partition to multiply using Numicon, base 10 or Cuisenaire rods.
 4×15



Children to represent the concrete manipulatives pictorially.



Children to be encouraged to show the steps they have taken.

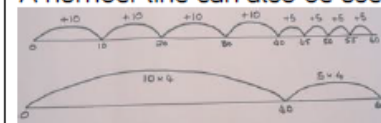


$$10 \times 4 = 40$$

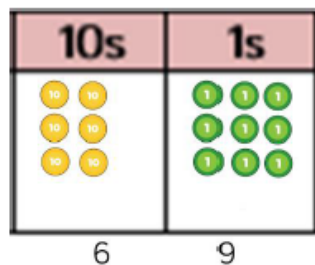
$$5 \times 4 = 20$$

$$40 + 20 = 60$$

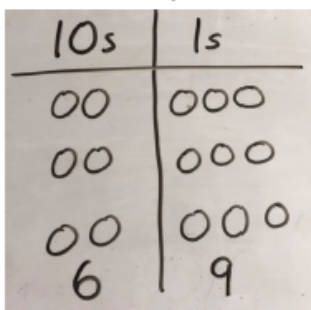
A number line can also be used



Formal column method with place value counters (base 10 can also be used.) 3×23



Children to represent the counters pictorially.



Children to record what it is they are doing to show understanding.

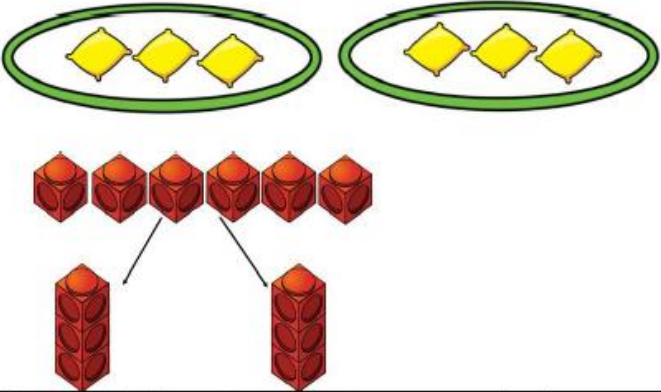
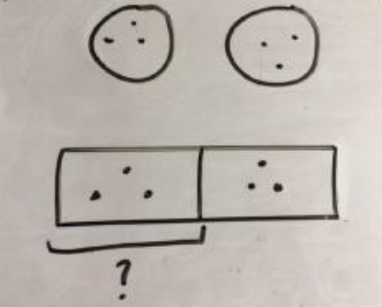
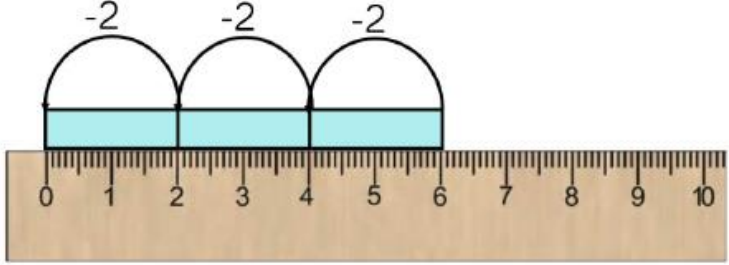
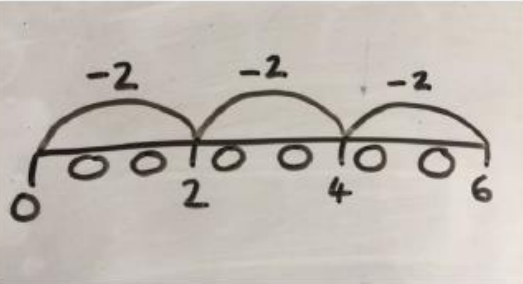
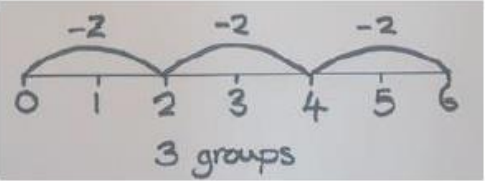
$$3 \times 23 \quad 3 \times 20 = 60$$

$$20 \quad 3 \quad 3 \times 3 = 9$$

$$60 + 9 = 69$$

$$\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$$

2.2 Progression in **division**

Concrete	Pictorial	Abstract		
<p>Sharing using a range of objects. $6 \div 2$</p> 	<p>Represent the sharing pictorially.</p> 	<p>$6 \div 2 = 3$</p> <table border="1" data-bbox="1518 552 1951 620"> <tr> <td>3</td> <td>3</td> </tr> </table> <p>Children should also be encouraged to use their 2 times tables facts.</p>	3	3
3	3			
<p>Repeated subtraction using Cuisenaire rods above a ruler. $6 \div 2$</p>  <p>3 groups of 2</p>	<p>Children to represent repeated subtraction pictorially.</p> 	<p>Abstract number line to represent the equal groups that have been subtracted.</p> 		

2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used.

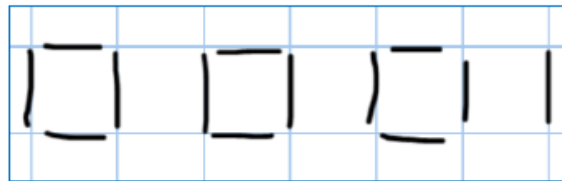
$$13 \div 4$$

Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.



There are 3 whole squares, with 1 left over.

Children to represent the lollipop sticks pictorially.

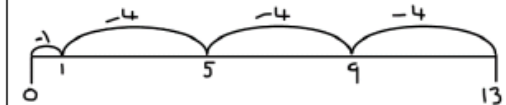


There are 3 whole squares, with 1 left over.

$$13 \div 4 = 3 \text{ remainder } 1$$

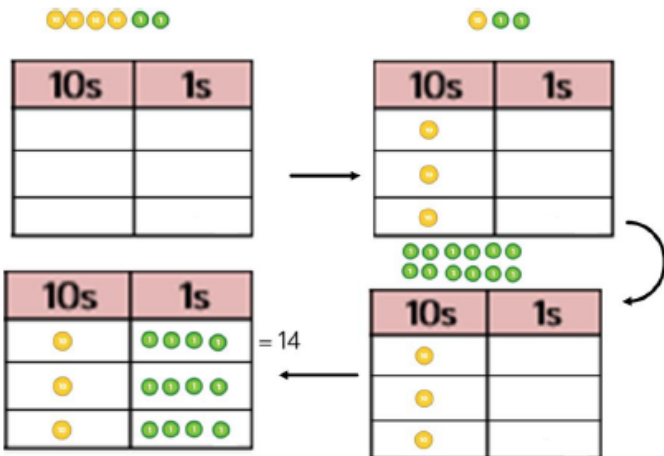
Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line.

'3 groups of 4, with 1 left over'

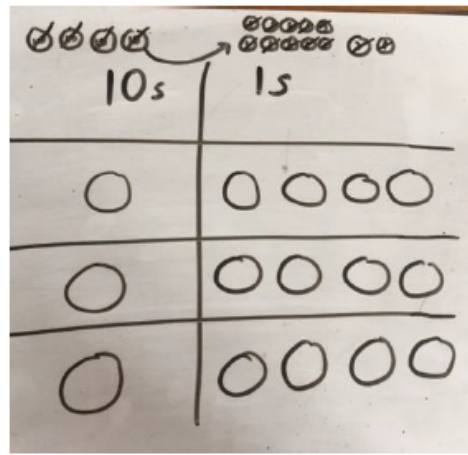


Sharing using place value counters.

$$42 \div 3 = 14$$



Children to represent the place value counters pictorially.



Children to be able to make sense of the place value counters and write calculations to show the process.

$$42 \div 3$$

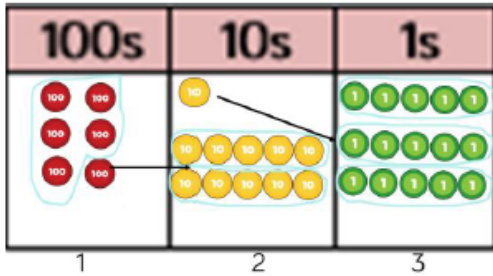
$$42 = 30 + 12$$

$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

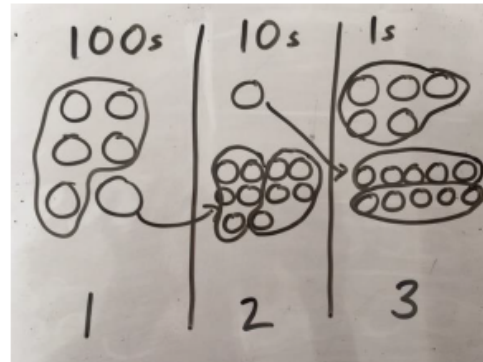
$$10 + 4 = 14$$

Short division using place value counters to group.
 $615 \div 5$



1. Make 615 with place value counters.
2. How many groups of 5 hundreds can you make with 6 hundred counters?
3. Exchange 1 hundred for 10 tens.
4. How many groups of 5 tens can you make with 11 ten counters?
5. Exchange 1 ten for 10 ones.
6. How many groups of 5 ones can you make with 15 ones?

Represent the place value counters pictorially.



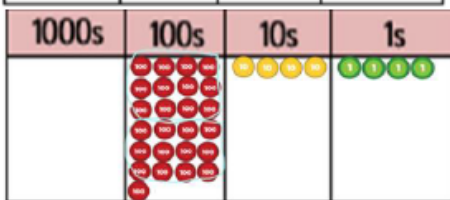
Children to the calculation using the short division scaffold.

$$\begin{array}{r}
 123 \\
 5 \overline{) 615} \\
 \underline{5 } \\
 11 \\
 \underline{10 } \\
 15 \\
 \underline{15} \\
 0
 \end{array}$$

Long division using place value counters
 $2544 \div 12$

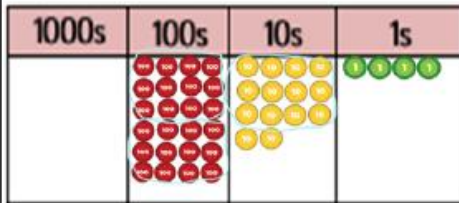


We can't group 2 thousands into groups of 12 so will exchange them.



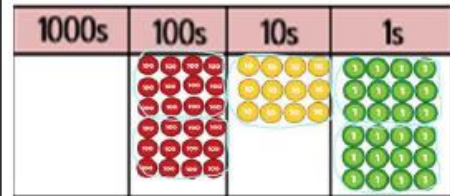
We can group 24 hundreds into groups of 12 which leaves with 1 hundred.

$$\begin{array}{r}
 02 \\
 12 \overline{) 2544} \\
 \underline{24 } \\
 1
 \end{array}$$



After exchanging the hundred, we have 14 tens. We can group 12 tens into a group of 12, which leaves 2 tens.

$$\begin{array}{r} 021 \\ 12 \overline{)2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 2 \end{array}$$

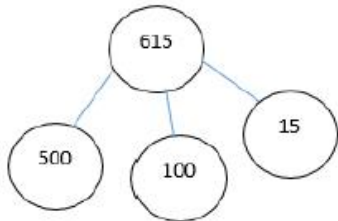


After exchanging the 2 tens, we have 24 ones. We can group 24 ones into 2 groups of 12, which leaves no remainder.

$$\begin{array}{r} 0212 \\ 12 \overline{)2544} \\ \underline{24} \\ 14 \\ \underline{12} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

Conceptual variation; different ways to ask children to solve $615 \div 5$

Using the part whole model below, how can you divide 615 by 5 without using short division?



I have £615 and share it equally between 5 bank accounts. How much will be in each account?

615 pupils need to be put into 5 groups. How many will be in each group?

$$5 \overline{)615}$$

$$615 \div 5 =$$


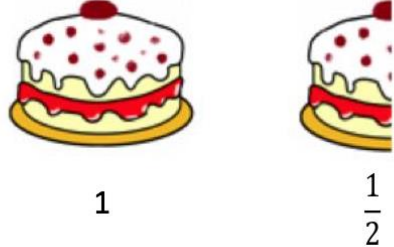
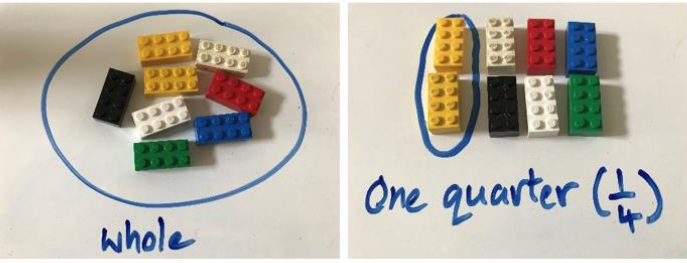
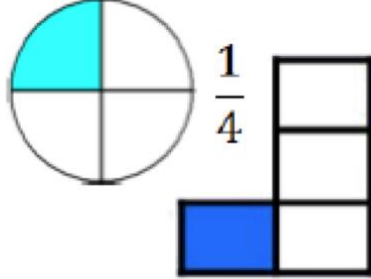
$$\square = 615 \div 5$$

What is the calculation?
What is the answer?

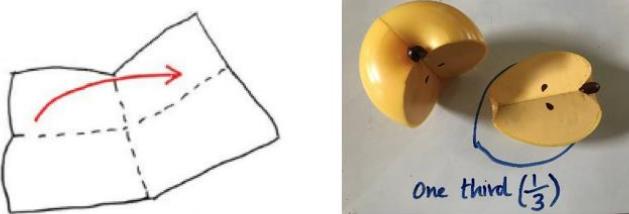
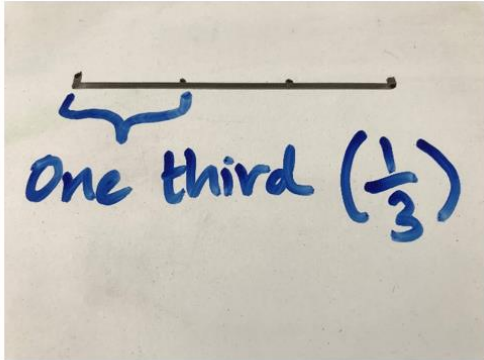
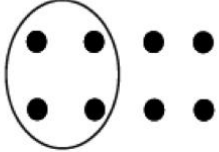
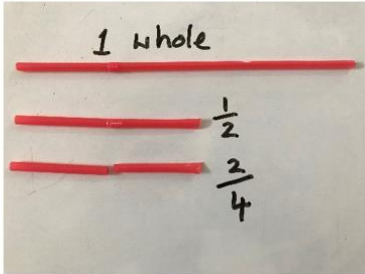

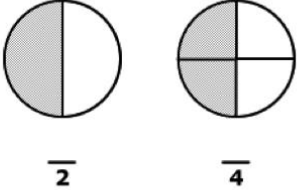


3. Progression with fractions, decimals and percentages

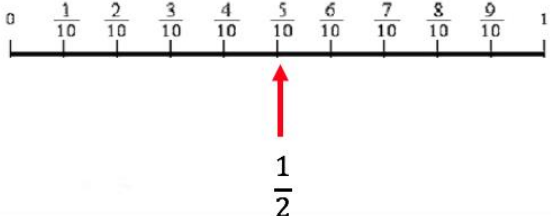
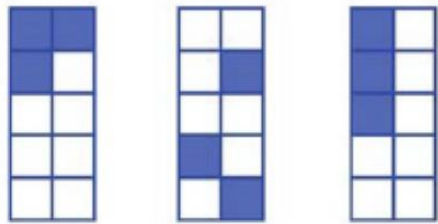
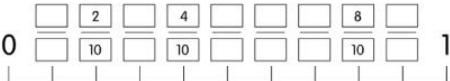
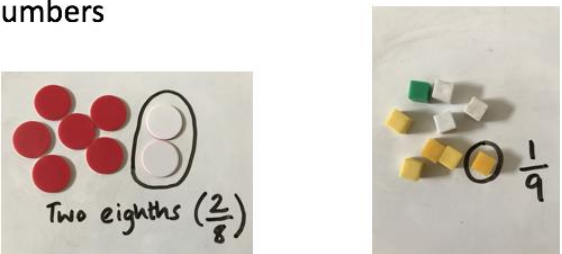
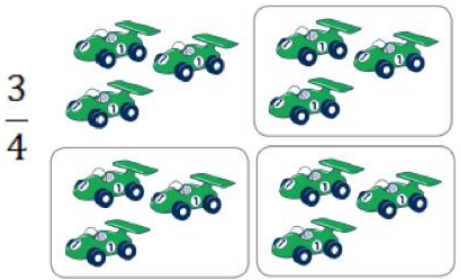
3.1 - Teaching fractions in Year 1


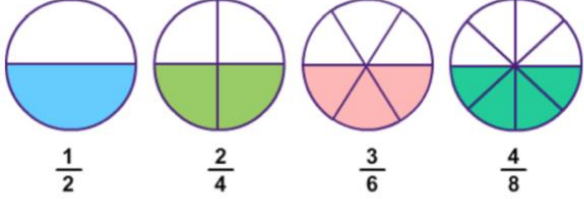

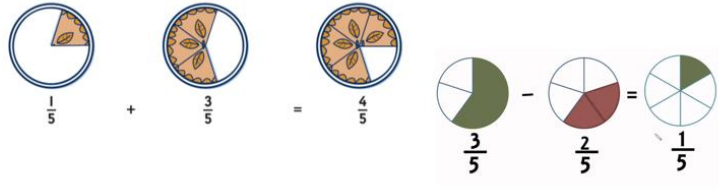
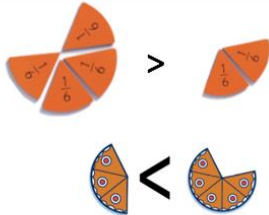
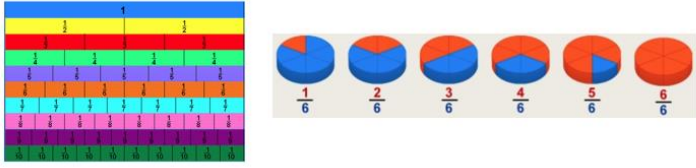
Concrete	Pictorial	Abstract
<p>Recognise, find and name a half as one of two equal parts of an object, shape or quantity</p> 	<p>A whole cake 1 half of the cake</p> 	<p>Half of 2 is... <input type="text"/></p> <p>Half of 6 is... <input type="text"/></p> <p>Half of 10 is... <input type="text"/></p> <p>Half of 12 is... <input type="text"/></p>
<p>Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity</p> 		<p>A quarter of 4 is... <input type="text"/></p> <p>A quarter of 8 is <input type="text"/></p> <p>A quarter of 12 is <input type="text"/></p> <p>A quarter of 20 is <input type="text"/></p>

3.2 – Teaching fractions in Year 2

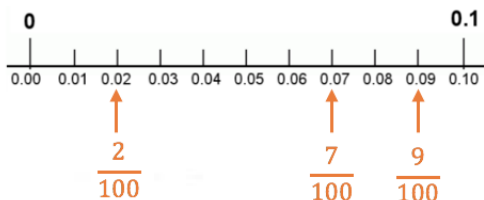
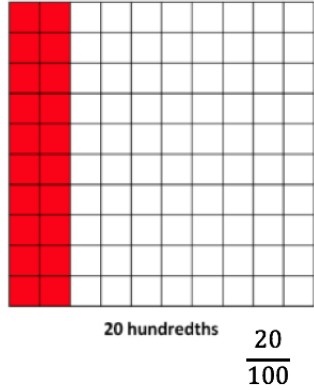
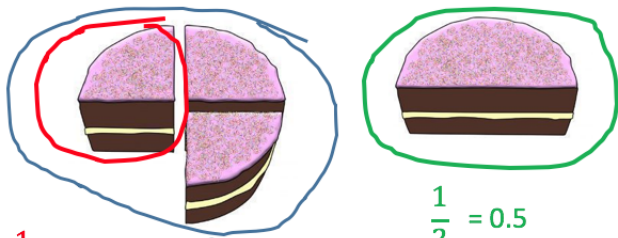
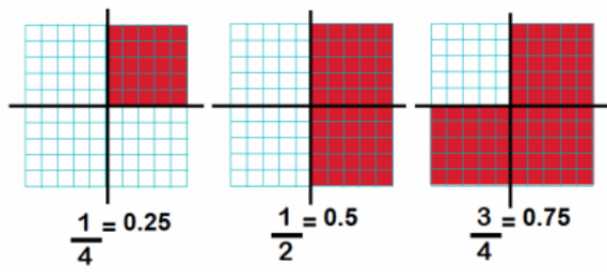
Concrete	Pictorial	Abstract
<p>Recognise, find, name and write fractions $\frac{1}{3}$ $\frac{1}{4}$ $\frac{2}{4}$ $\frac{3}{4}$ of a length, shape, set of objects or quantity</p> 		<p>$\frac{2}{4}$ of 8 = <input type="text"/></p> 
<p>Write simple fractions and recognise the equivalence of $\frac{1}{2}$ and $\frac{2}{4}$</p> 	 <p>I have $\frac{1}{2}$ a pie You have $\frac{2}{4}$ of a pie</p>	<p>$\frac{1}{2} = \frac{2}{4}$</p>  <p>$\frac{1}{2}$ $\frac{2}{4}$</p>

3.4 – Teaching fractions and decimals in Year 3

Concrete	Pictorial	Abstract
<p>Count up and down in tenths: recognise that tenths arise from dividing an object into ten equal parts and in dividing one-digit numbers or quantities by ten</p> 	 <p style="text-align: center;">$\frac{3}{10}$ $\frac{3}{10}$ $\frac{3}{10}$</p>	<p>$\frac{1}{10}$ of 6 is 0.6 because $6 \div 10 = 0.6$</p> 
<p>Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions and use fractions as numbers</p> 	<p>$\frac{3}{4}$</p> 	<p>$\frac{1}{5}$ of 15 sweets is 3 because $15 \div 5 = 3$</p> <p>$\frac{2}{5}$ of 15 sweets is 6 because $15 \div 5 = 3$ and there are two fifths so we multiply the answer by 2 which gives the answer 6</p>

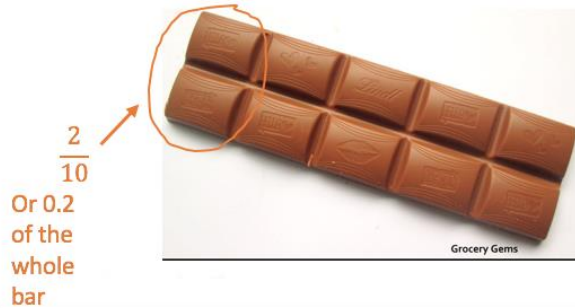
Concrete	Pictorial	Abstract
<p>Recognise and show, using diagrams equivalent fractions with small denominators</p>  <p>$\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$</p>	 <p>$\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{6}$ $\frac{4}{8}$</p>	<p>Sally says that asking for two quarters of a cake is the same as asking for one half? Is she correct? Explain.</p>
<p>Add and subtract fractions with the same denominator</p>  <p>$\frac{1}{2} + \frac{1}{2} = \frac{2}{2}$ Or 1 whole</p>	 <p>$\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$ $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$</p>	<p>$\frac{1}{5} + \frac{2}{5} = \frac{(1+2)}{5}$</p> <p>Common Denominator</p> <p>Add the numerators</p> <p>No change to Denominator</p>
<p>Compare and order unit fractions with the same denominators</p> 	 <p>$\frac{1}{6}$ $\frac{2}{6}$ $\frac{3}{6}$ $\frac{4}{6}$ $\frac{5}{6}$ $\frac{6}{6}$</p>	<p>$\frac{2}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$</p>

3.5 – Teaching fractions and decimals in Year 4

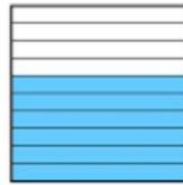
Concrete	Pictorial	Abstract																					
<p>Count up and down in hundredths: recognise that hundreds arise when dividing an object by 100 and dividing tenths by 10</p> 	 <table border="1" data-bbox="1198 438 1523 614"> <thead> <tr> <th colspan="3">Whole</th> <th>&</th> <th colspan="3">Parts</th> </tr> <tr> <th>thousands</th> <th>hundreds</th> <th>tens</th> <th>ones</th> <th>decimal point</th> <th>tenths</th> <th>hundredths</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td>0</td> <td>.</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>1 hundredth = $0.01 = \frac{1}{100}$</p>	Whole			&	Parts			thousands	hundreds	tens	ones	decimal point	tenths	hundredths				0	.	0	1	<p>$\frac{1}{100}$ of 60 = 0.6 because $60 \div 100 = 0.6$</p> <p>$\frac{1}{10}$ of 70 = 0.7 so $\frac{1}{100}$ of 70 = 0.07</p>
Whole			&	Parts																			
thousands	hundreds	tens	ones	decimal point	tenths	hundredths																	
			0	.	0	1																	
<p>Recognise and write decimal equivalents to $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{3}{4}$</p>  <p>$\frac{1}{4} = 0.25$ $\frac{3}{4} = 0.75$ $\frac{1}{2} = 0.5$</p>	 <p>$\frac{1}{4} = 0.25$ $\frac{1}{2} = 0.5$ $\frac{3}{4} = 0.75$</p>	<p>$\frac{1}{2} = 0.5$ $\frac{1}{4} = 0.25$ $\frac{3}{4} = 0.75$</p>																					

Concrete

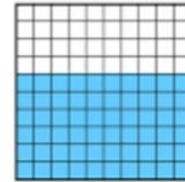
Recognise and write decimal equivalents of any number of tenths or hundredths



Pictorial



0.6
six tenths



0.60
sixty hundredths

Abstract

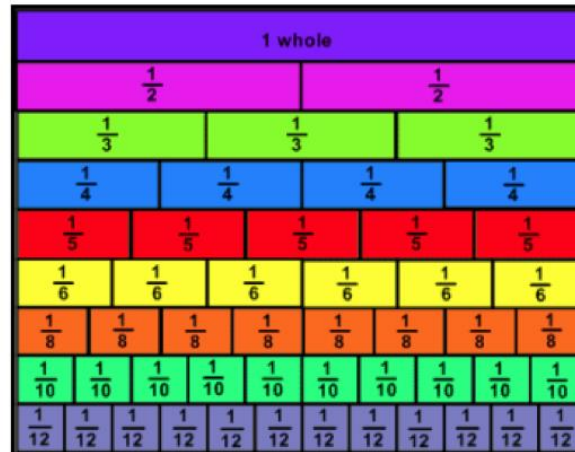
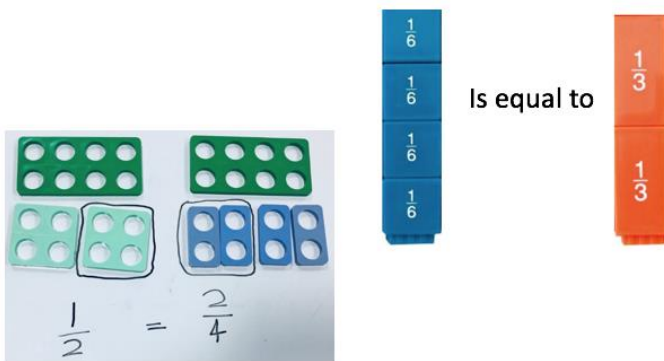
Two tenths is 0.2 which is shown as the fraction $\frac{2}{10}$

$$\frac{4}{10} = 0.4$$

$$\frac{5}{10} = \frac{1}{2} = 0.5$$

$$\frac{8}{100} = 0.08$$

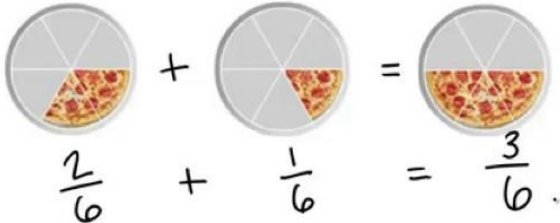
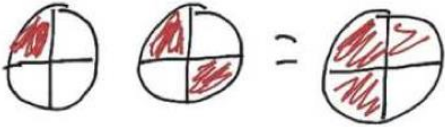
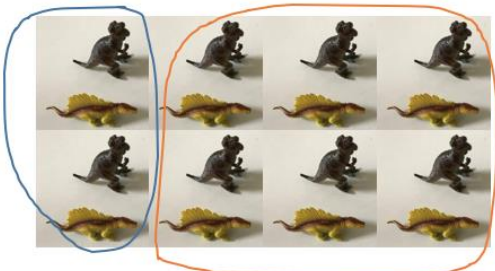

Recognise and show using diagrams, families of common equivalents



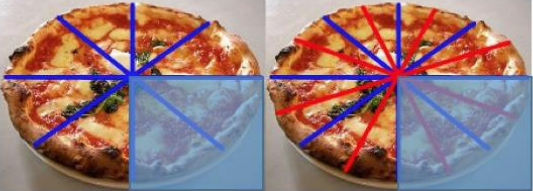
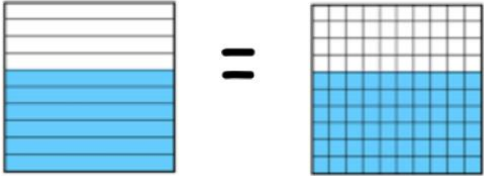
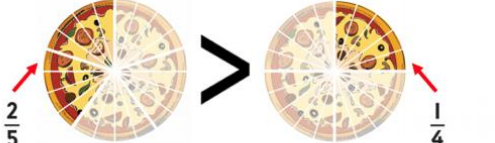
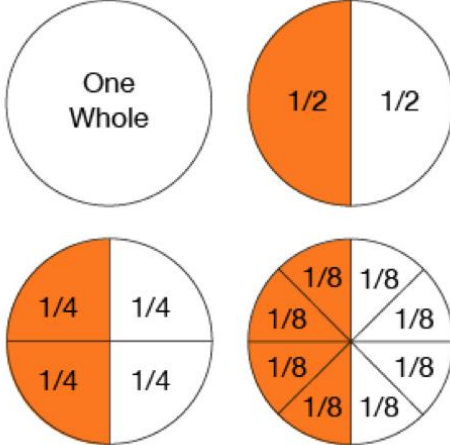
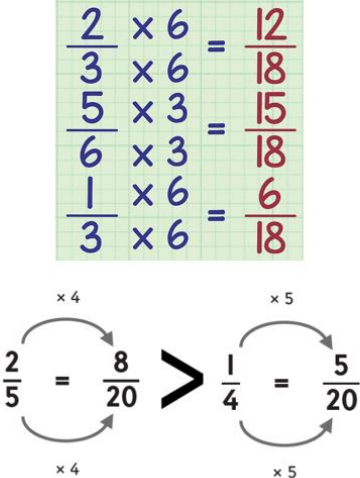
$$\frac{2}{3} = \frac{4}{6}$$

$$\frac{3}{5} = \frac{6}{10}$$

$$\frac{2}{12} = \frac{1}{6}$$

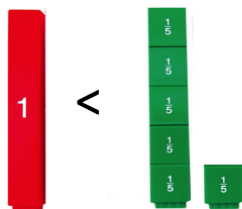
Concrete	Pictorial	Abstract
<p>Add an subtract fractions with the same denominator</p>  <p>$\frac{2}{6} + \frac{1}{6} = \frac{3}{6}$</p>	$\frac{1}{4} + \frac{2}{4} = \frac{1+2}{4} = \frac{3}{4}$ 	<p>Hasan eats $\frac{2}{7}$ of his birthday cake. How much does he have left?</p> <p>Jess and Emily both eat $\frac{3}{8}$ of a cake. How much have the eaten in total?</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</p>  <p>$\frac{1}{4}$ $\frac{3}{4}$</p>	 <p>$\frac{1}{4}$ $\frac{3}{4}$</p>	<p>$\frac{3}{4}$ of £16 is £12</p> <p>$£16 \div 4 = £4$</p> <p>$£4 \times 3 = £12$</p>

3.6 – Teaching fractions, decimals and percentages in Year 5

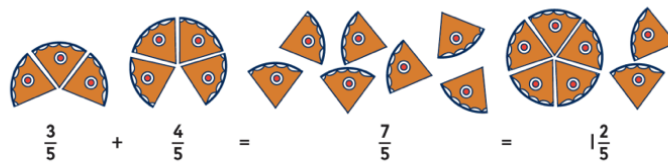
Concrete	Pictorial	Abstract
<p>Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths</p>  <p>$\frac{6}{8}$ is equivalent to $\frac{12}{16}$</p>	 <p>$\frac{6}{10} = \frac{60}{100}$</p>	$\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$ $\frac{3}{4} = \frac{75}{100}$ $\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$
<p>Compare and order fractions whose denominators are all multiples of the same number</p>  <p>$\frac{2}{5}$ has become $\frac{8}{20}$</p> <p>$\frac{1}{4}$ has become $\frac{5}{20}$</p>		 $\frac{2}{3} \times 6 = \frac{12}{18}$ $\frac{5}{5} \times 3 = \frac{15}{18}$ $\frac{6}{6} \times 3 = \frac{18}{18}$ $\frac{1}{3} \times 6 = \frac{6}{18}$ $\frac{2}{5} = \frac{8}{20} > \frac{1}{4} = \frac{5}{20}$

Concrete

Recognise mixed numbers and improper fractions. Convert from one form to the other and write mathematical statements as a mixed number



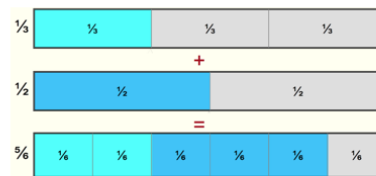
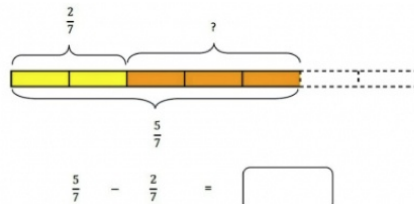
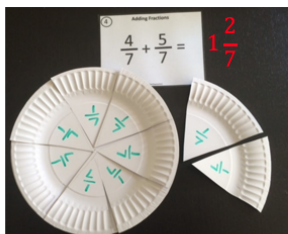
Pictorial



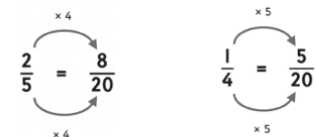
Abstract

$\frac{7}{5} = 1\frac{2}{5}$ because 5 goes into 7 once to make a whole ($\frac{5}{5}$) and $\frac{2}{5}$ are left over

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



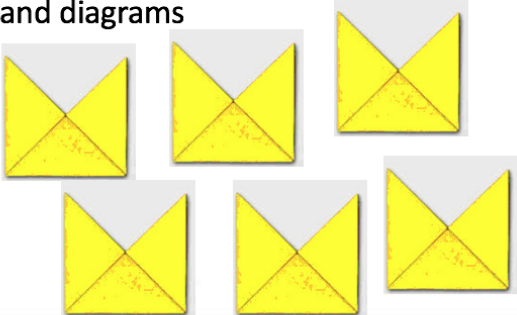

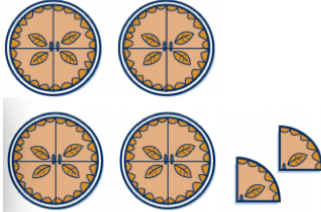
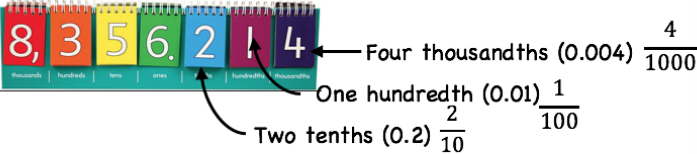
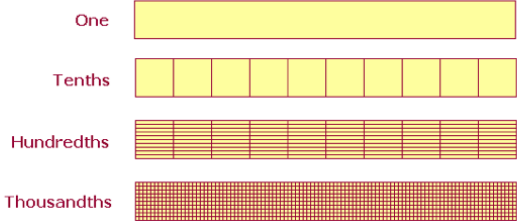

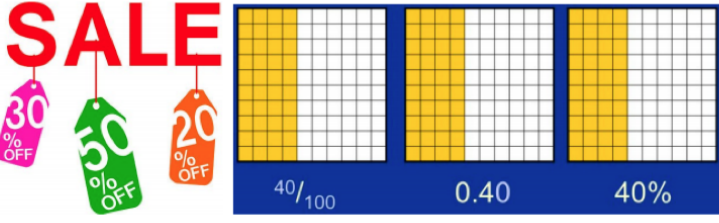
$$\frac{2}{5} - \frac{1}{4}$$



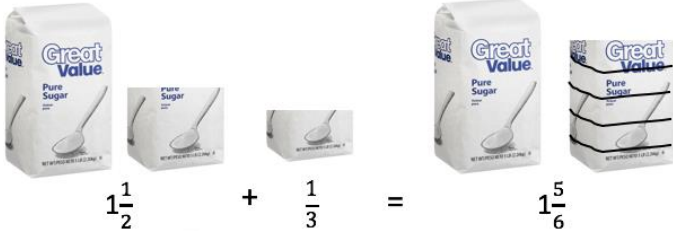
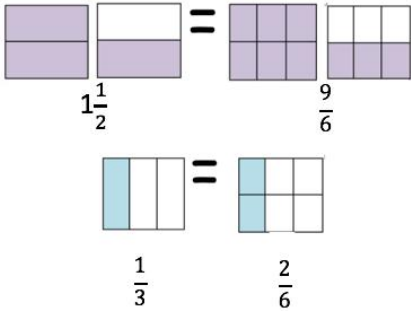
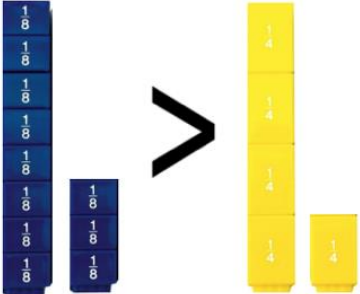
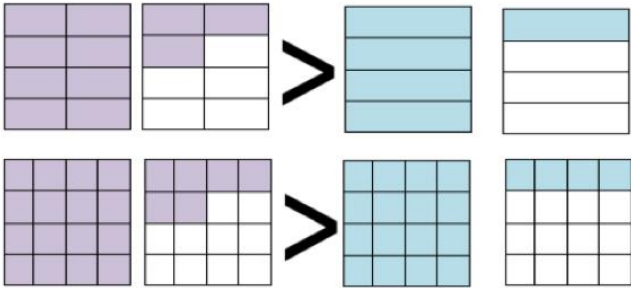
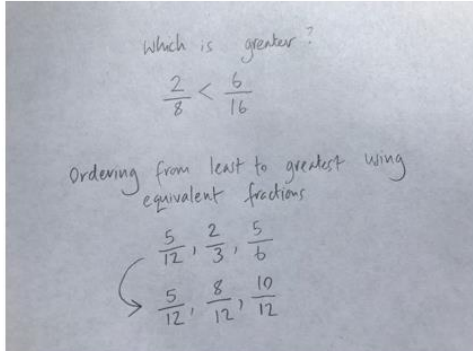
So,

$$\frac{8}{20} - \frac{5}{20} = \frac{3}{20}$$

$$\frac{2}{5} - \frac{1}{4} = \frac{3}{20}$$

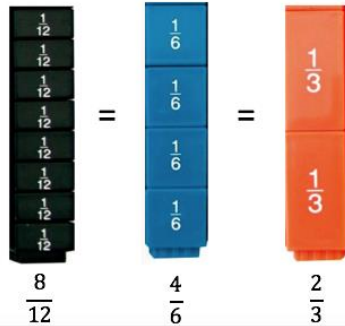
Concrete	Pictorial	Abstract
<p>Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams</p>  <p>How much paper do we have in total as a fraction/mixed number?</p>	 $6 \text{ lots of } \frac{3}{4} = 4\frac{2}{4}$ 	<p>Multiply a proper fraction by a whole number</p> $\frac{3}{4} \times 6 = \frac{18}{4}$ <p>Convert the improper fraction to a mixed number</p> $\frac{18}{4} = 4\frac{2}{4}$
<p>Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents</p> 		<p>67.153</p> <p>How many thousandths does this number have? How many more thousandths do you need to add to make 67.16?</p>
<p>Recognise the % symbol and understand the meaning: write % as a fraction, decimal and percentage</p> 		$\frac{4}{10} = 40\% = 0.4$ $\frac{32}{100} = 32\% = 0.32$ $\frac{75}{100} = 75\% = 0.75$ $\frac{2}{25} = \frac{8}{100} = 8\% = 0.08$

3.7 – Teaching fractions, decimals and percentages in Year 6

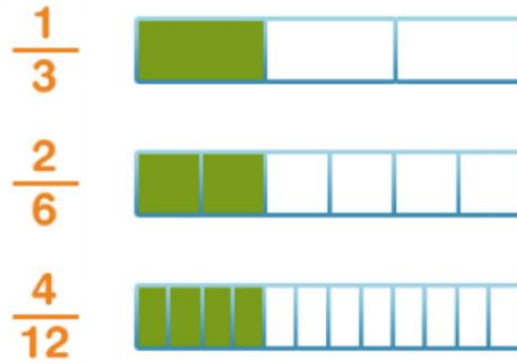
Concrete	Pictorial	Abstract
<p>Add and subtract fraction with different denominators and mixed numbers using the concept of equivalent fractions</p>  <p>$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$</p>	 <p>$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$</p> <p>$\frac{1}{3} = \frac{2}{6}$</p>	$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$ <p>because $1\frac{1}{2} = \frac{3}{2}$</p> $\frac{3}{2} = \frac{9}{6} \text{ and } \frac{1}{3} = \frac{2}{6}$ <p>so $\frac{9}{6} + \frac{2}{6} = \frac{11}{6} = 1\frac{5}{6}$</p>
<p>Compare and order fractions including fractions > 1</p> 		 <p>Which is greater?</p> $\frac{2}{8} < \frac{6}{16}$ <p>Ordering from least to greatest using equivalent fractions</p> $\frac{5}{12}, \frac{2}{3}, \frac{5}{6}$ $\frac{5}{12}, \frac{8}{12}, \frac{10}{12}$

Concrete

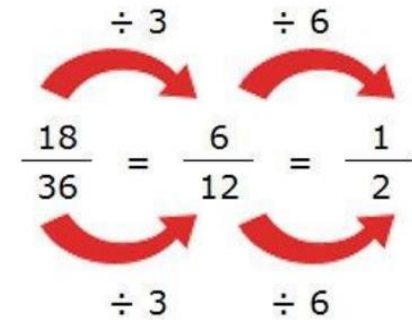
Use common factors to simplify fractions; use common multiples to express fractions in the same denomination



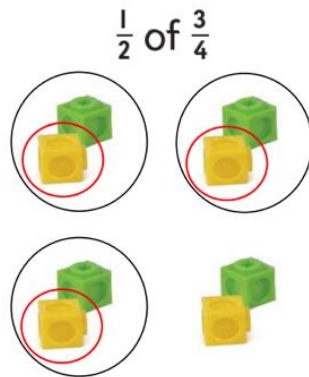
Pictorial



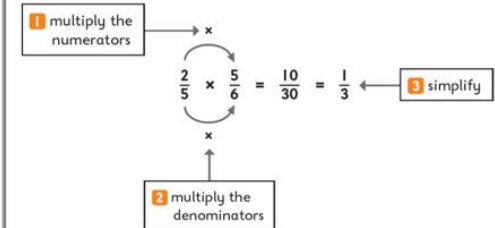
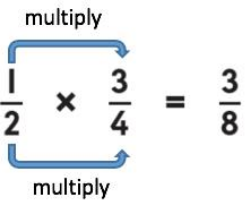
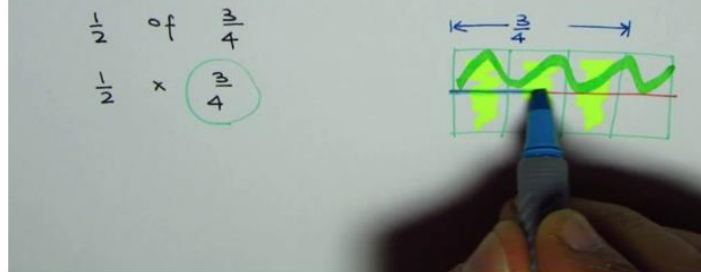
Abstract



Multiply simple pairs of proper fractions, writing the answer in the simplest form

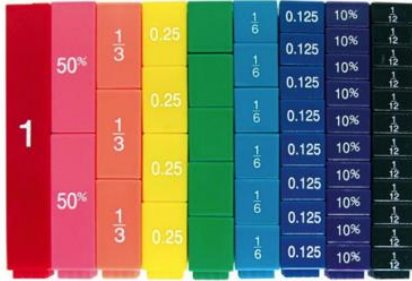


Draw an area model to find half of three-fourths.



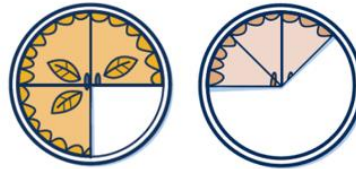
Concrete

Recall and use equivalences between simple fractions, decimals and percentages including in different contexts



Pictorial

Which would you prefer 75% or $\frac{3}{8}$ of a pie?



75%

$\frac{3}{8}$

Abstract

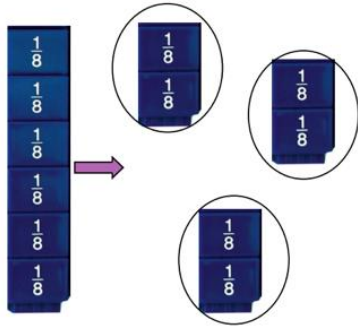
John scored 40/60 in his test and Hannah scored 40%. Who got the greatest score?

$$\text{John} = \frac{40}{60} = 66.6\%$$

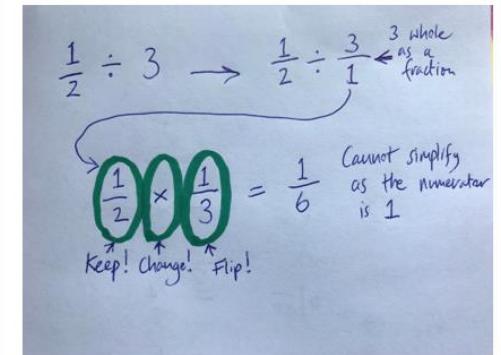
$$\text{Hannah} = 40\%$$

Divide proper fractions by whole numbers

$$\frac{6}{8} \text{ divided by } 3 = \frac{2}{8} \text{ or } \frac{1}{4}$$



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



Concrete

Recall and use equivalences between simple fractions, decimals and percentages including in different contexts

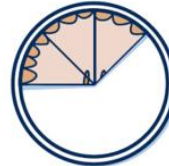


Pictorial

Which would you prefer 75% or $\frac{3}{8}$ of a pie?



75%



$\frac{3}{8}$

Abstract

John scored 40/60 in his test and Hannah scored 40%. Who got the greatest score?

$$\text{John} = \frac{40}{60} = 66.6\%$$

$$\text{Hannah} = 40\%$$

4. Appendix

Appendix 1 – Key vocabulary

Number and place value

EYFS

Counting

number
 zero, one, two, three... to twenty and beyond
 twenty... one hundred
 none
 how many...?
 count, count (up) to
 count on (from, to) / count back (from, to)
 count in ones, twos... tens...
 more, less, many, few
 odd, even
 every other
 how many times?
 pattern, pair
 guess how many, estimate
 nearly, close to, about the same as
 just over, just under
 too many, too few, enough, not enough
 between

Comparing and ordering numbers

the same number as, as many as
Of two objects/amounts:
 greater, more, larger, bigger
 less, fewer, smaller
Of three or more objects/amounts:
 greatest, most, biggest, largest
 least, fewest, smallest
 one more, ten more
 one less, ten less
 compare
 order
 size
 first, second, third... tenth
 last, last but one
 before, after
 next

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
[Numbers from zero to twenty and beyond] none, count (on/up/to/from/down), before, after more, less, many, few, fewer, least, fewest, smallest, greater, lesser, equal to, the same as, odd, even, pairs, tens/ones, ten more/ten less, digit, numeral, figure(s), compare (In) order/a different order, size, value, between, halfway between, above, below	[Numbers to a hundred] hundred, partition, recombine Hundred more/less	[Numbers to one thousand]	Tenths, hundredths, decimal (places), round (to nearest) thousand more/less than, negative, integers, count through zero Roman numerals (I to C)	Powers of 10	[Numbers to ten million]

Addition and subtraction

EYFS

add, more, and
 make, sum, total
 altogether
 score
 double
 one more, two more, ten more...
 how many more to make... ?
 how many more is... than...?
 take (away), leave
 how many are left/left over?
 how many have gone?
 one less, two less... ten less...
 how many fewer is... than...?
 difference between
 is the same as

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Number bonds, number line, add, more, plus, make, sum, total, altogether, inverse, double, near double, half, halve, equals, is the same as (including equals sign), difference between, How many more to make..?, how many more is...than..?, how much more is..? Subtract, take away, minus How many fewer is...than..?, how much less is..?		Column addition and subtraction		Efficient written method	Order of operations, BIDMAS/BODMAS Indices

Multiplication and division

EYFS

Two/ten more/less, double
 Half of/halve
 Lots of, groups of, odd,
 even
 Count in twos
 Count in tens (forwards
 from/backwards from)

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<p>Odd, even count in twos, threes, fives, count in tens (forwards from/backward s from) How many times? Lots of, groups of, once, twice, three times, five times, multiple of, times, multiply, multiply by, repeated addition, array, row, column, double, halve, share, share equally, group in pairs, threes, etc. Equal groups of Divide, divided by, left, left over</p>		<p>Product, Multiples of four, eight, fifty and one hundred, scale up</p>	<p>Multiplication facts (up to 12x12) Division facts, inverse, derive multiplicand, multiplier, divisor, dividend, quotient</p>	<p>Composite numbers, prime number, prime factors, square number, cubed number, formal written method, common factors, common multiples</p>	<p>Factor pairs, order of operations BIDMAS/BODMAS,</p>

Fractions, decimals and percentages

EYFS

See Year 1 vocabulary to help extend the more able in EYFS.

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Whole, equal parts, four equal parts, one half, two halves, a quarter, two quarters	Three quarters, one third, a third, equivalence, equivalent	Numerator, denominator, Unit fraction, non-unit fraction, compare and order tenths, simplify	Equivalent decimals and fractions	Proper fractions, improper fractions, mixed numbers, percentage, Ratio, proportion	Degree of accuracy

Data/statistics

Year 3	Year 4	Year 5	Year 6
Chart, bar chart, frequency table, Carroll diagram, Venn diagram, axis, axes, diagram	Continuous data, line graph		Mean, pie chart, construct

Geometry (position and direction)

EYFS

Position, over, under, above,
Below, top, bottom, side, on, in,
outside, inside, around, in front,
behind, front, back, before, after,
beside, next to, opposite, apart,
between, middle, edge, corner,
direction
left, right
up, down
forwards, backwards, sideways
across
close, far, near
along
through
to, from, towards, away from
movement
slide
roll
turn
stretch, bend

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Over, under, underneath, above, below, top, bottom, side on, in, outside, inside around, in front, behind, front, back, before, after beside, next to, opposite, apart, between, middle, edge, centre, corner, direction, journey left, right, up, down, forwards, backwards, sideways, across close, far, near along, through to, from, towards, away from movement slide, roll, turn, whole turn, half turn stretch, bend	Rotation, clockwise, anticlockwise straight line, ninety degree turn, right angle	Greater/less than ninety degrees, orientation (same orientation, different orientation)	Coordinates, translation, quadrant, x-axis, y-axis, perimeter and area	Reflex angle, dimensions	Four quadrants (for coordinates)

Geometry (properties of shape)

EYFS

Exploring patterns, shape and space

Shape, pattern, flat curved, straight round, hollow, solid, corner, face,

Patterns and symmetry

Size, bigger, larger, smaller, symmetrical, pattern, repeating patterns, match

2D shapes

Circle, triangle, square, rectangle, star

3D shapes

Cube, pyramid, sphere, cone

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Group, sort Cube, cuboid, pyramid, sphere, cone, cylinder, circle, triangle, square Shape Flat, curved, straight, round Hollow, solid Corner (point, pointed) Face, side, edge Make, build, draw	Size, bigger, larger, smaller, symmetrical, line of symmetry, fold, match, mirror line, reflection, pattern, repeating pattern	Horizontal, vertical, perpendicular and parallel lines, Right angle, acute and obtuse angles	Quadrilaterals	Regular and irregular Polygons	Vertically opposite (angles) circumference, radius, diameter

EYFS

Measures (general)
 measure
 size
 compare
 guess, estimate
 enough, not enough
 too much, too little
 too many, too few
 nearly, close to, about the same as
 just over, just under

Length
 length, width, height, depth
 long, short, tall
 high, low
 wide, narrow
 deep, shallow
 thick, thin
 longer, shorter, taller,
 higher... and so on
 longest, shortest, tallest,
 highest... and so on
 far, near, close

Time
 Time, *days of the week*: Monday, Tuesday...
 day, week, birthday, holiday
 morning, afternoon, evening,
 night, bedtime, dinnertime,
 playtime, today, yesterday,
 tomorrow, before, after, next,
 last, now, soon, early, late
 quick, quicker, quickest,
 quickly, slow, slower, slowest,
 slowly, old, older, oldest, new,
 newer, newest, takes longer,
 takes less time, hour, o'clock,
 clock, watch, hands

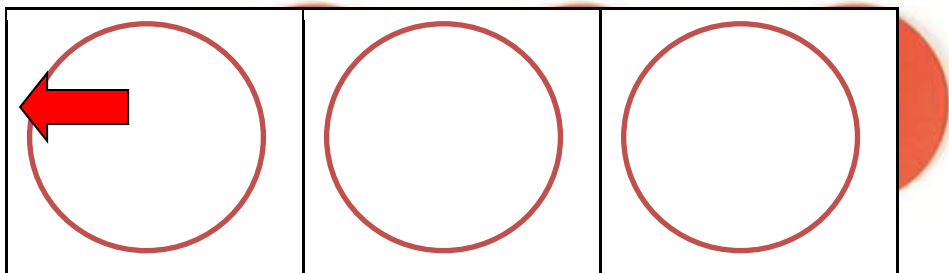
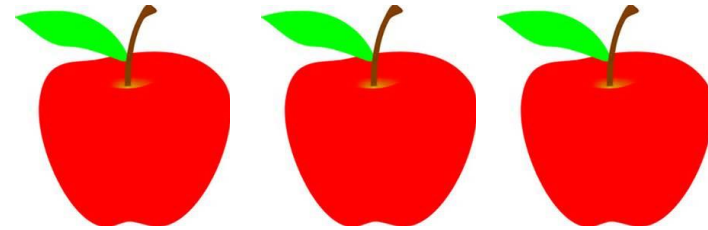
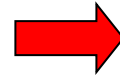
Mass
 weigh, weighs,
 balances
 heavy/light,
 heavier/lighter,
 heaviest/lightest
 balance, weight,
 scales

Capacity
 Full, half full, empty,
 holds, container

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Seasons: spring, summer, autumn, winter month, year, weekend midnight fast, faster, fastest, half past How long ago?, how long will it be to...?, how long will it take to...?, how often? Always, never, often, sometimes, usually Once, twice First, second, third, etc. Metre, ruler, metre stick <i>For measures (general), capacity, mass, time and length see EYFS</i>	Quarter past/to m/km, g/kg, ml/l Temperature (degrees)	Leap year Twelve- hour/twenty- four- hour clock Roman numerals I to XIII	Convert	Volume Imperial units, metric units	
<p>Money - Year 1</p> <p>Money, coin, penny, pence, pound, price, cost, buy, sell, spend, spent, pay, change, dear(er), costs more, costs less, cheaper, costs the same as</p> <p>How much?, how many?</p> <p>Total</p>					

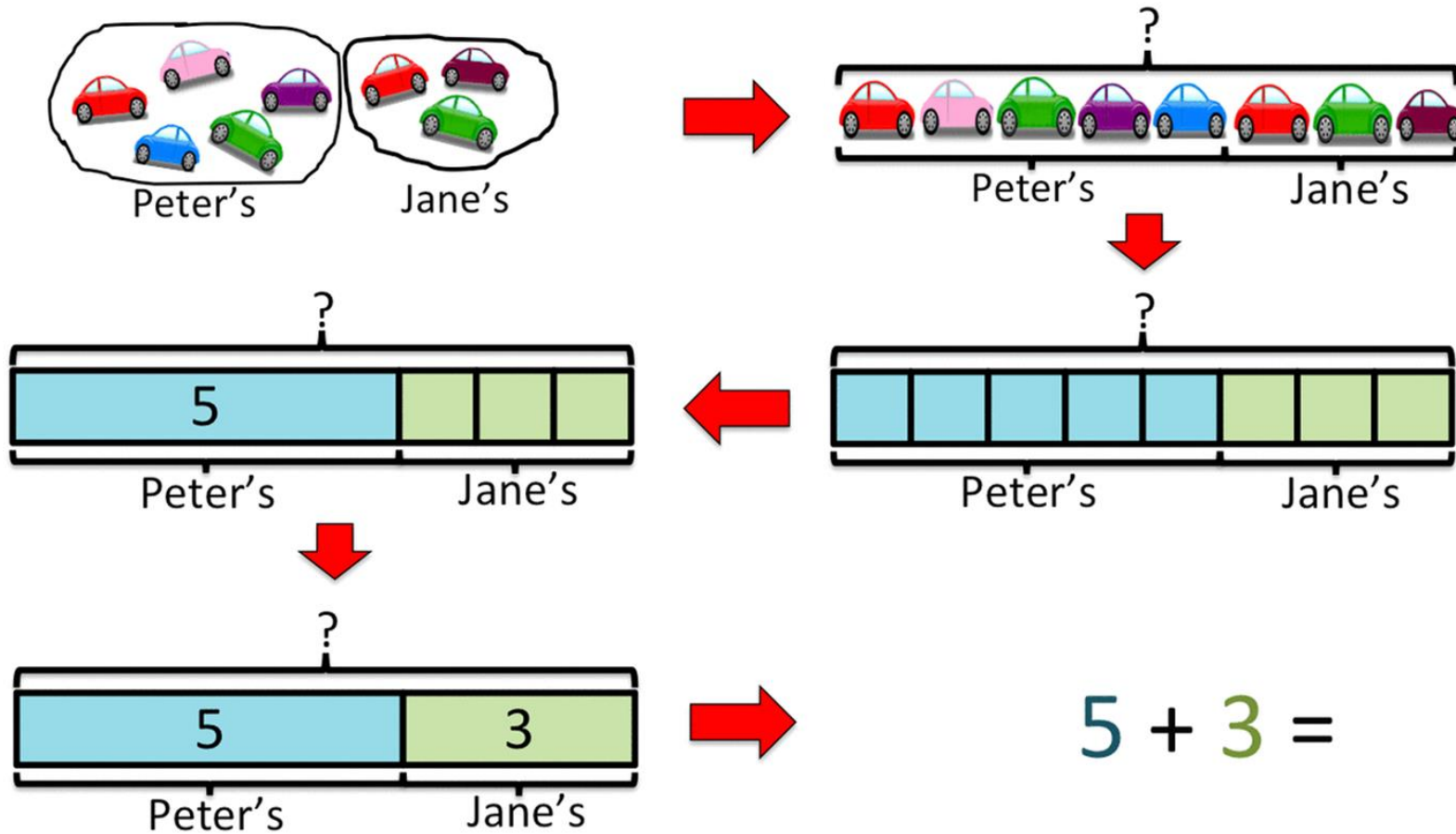
Appendix 2 - Bar modelling

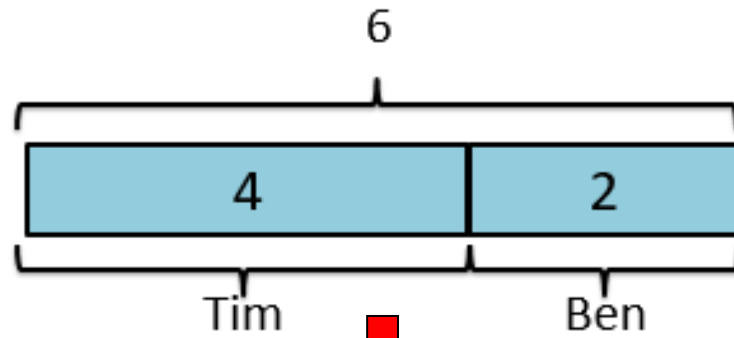
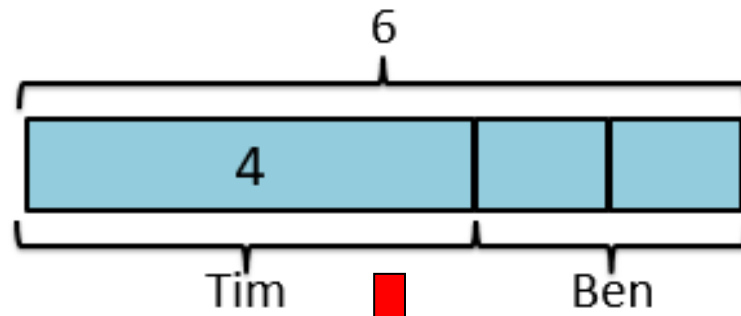
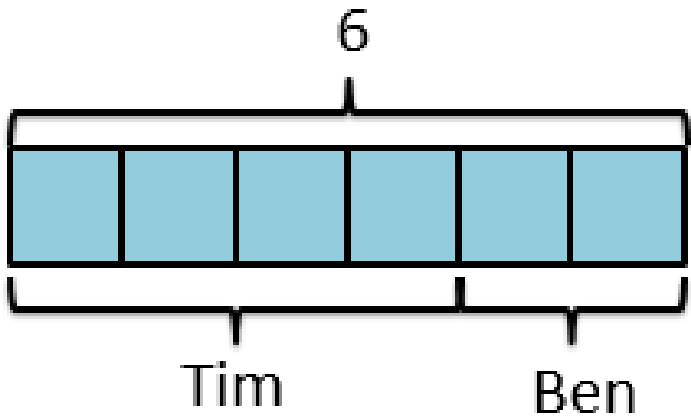
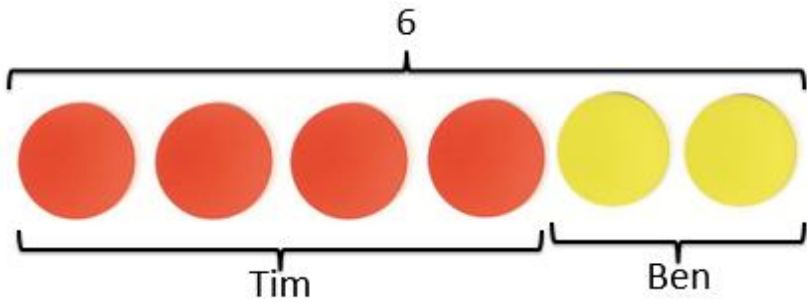
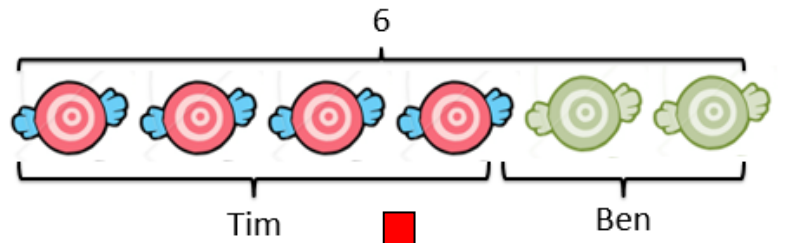
2.1 Introducing bar modelling in EYFS



2.2 Bar modelling in KS1

**Peter has 5 toy cars and Jane has 3 toy cars.
How many toy cars do they have altogether?**





$$4 + 2 = 6$$

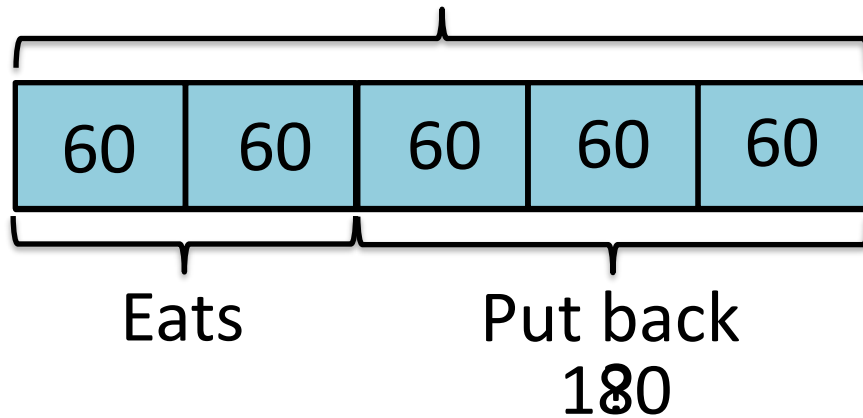
2.3 Bar modelling in KS2

Solve... Matthew has a 300g block of cheese. He eats $\frac{2}{5}$ of the cheese and puts the rest back in the fridge.

How much cheese did Matthew put back in the fridge?

Model

300g



Calculations

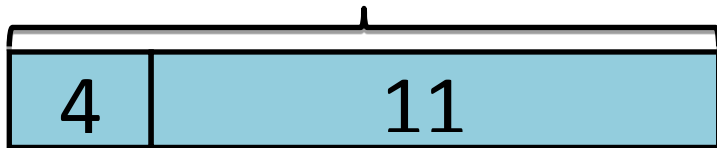
$$300 \div 5 = 60$$

$$3 \times 60 = 180$$

“It is important to ensure there is a consistency to the use of bar modelling throughout the curriculum”

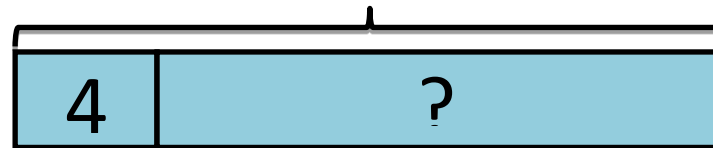
$4 + 11 = ?$

?



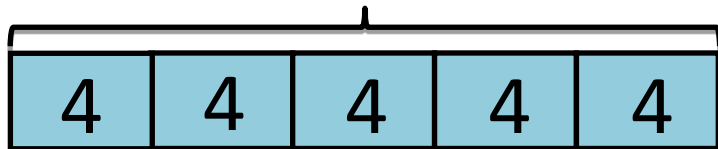
$15 - 4 = ?$

15



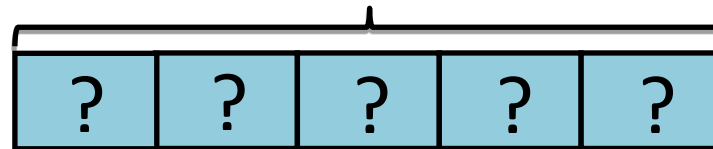
$5 \times 4 = ?$

?



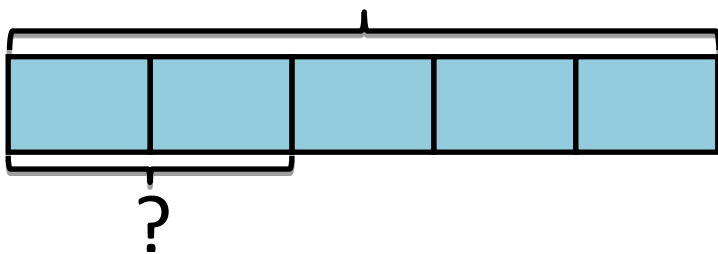
$20 \div 5 = ?$

20



$\frac{2}{5} \text{ of } 20 = ?$

20



Share 20 in the ratio 2:3

20

