



Hucknall National
Church of England
Primary School



Calculation Policy
2019





Contents

About our calculation policy	Page 2
Mental Strategies	Page 3
Addition	Page 7
Subtraction	Page 10
Multiplication	Page 14
Division	Page 20
Fractions	Page 23
Times tables	Page 38

About our Calculation Policy

Age-related expectations:

The calculation policy is organised according to age related 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.** In Key Stage 1 and 2, four levels of differentiation are planned, to ensure that learning is developmental and children can quickly progress from easier to more challenging work. Here is an example of how our differentiated objectives look for the same lesson:

LO: I can find fractions of amounts	
	I can find fractions of amounts using objects to help me (CONCRETE)
	I can find fractions of amounts using pictures to help me (PICTORIAL)
	I can find fractions of amounts using multiplication and division (ABSTRACT)
	I can solve problems to find fractions of amounts (MASTERY)

The simplest level of learning is CONCRETE which means the children have physical objects to help them understand the concept. The next level is PICTORIAL, where children draw diagrams or pictures to help them understand the mathematical concept. The third level is ABSTRACT which means the children understand the learning without additional support materials. The final level expects the children to apply their understanding in different contexts.

In every lesson we also expect all children to apply their learning to a problem and develop their reasoning skills.

Mental Strategies

The teaching of mental strategies are very important as they are the foundations for most of the areas of mathematics that use numbers. Without efficient mental strategies, children can often struggle to quickly and fluently calculate. Mental strategies are also the foundation of any written or formal method in mathematics. Efficient mental calculation strategies are key to success in the Key Stage 2 Mathematics assessments. In the Arithmetic paper, over 80% of questions are designed to be able to be solved mentally, or through jottings. However, many children attempt the majority of the paper using formal written methods, which leads to them running out of time and not completing the paper.

The following Mental strategies should be taught to children and be used to form part of the 6 in 5 questions the children see daily. Encourage children to use jottings to help themselves.

	Addition	Subtraction	Multiplication	Division
Year 1	<ul style="list-style-type: none"> • count on in ones • 1 more than a number • 10 more than a multiple of 10 • add by counting on from the larger number • reorder numbers in a calculation • look for pairs that make 10 • look for doubles and near doubles • begin to bridge through 10 when adding a one-digit number • use known facts and place value to add pairs of one- digit numbers • partition and recombine by breaking units of 6, 7, 8 or 9 into '5 and a bit' • Add 9 to single-digit numbers by adding 10 then subtracting 1 • use patterns of similar calculations 	<ul style="list-style-type: none"> • Count back in ones • 1 less than a number • 10 less than a multiple of 10 • take away a small number by counting back • find a small difference by counting on (using equipment) • begin to bridge through 10, when subtracting a one- digit number • use known number facts and place value to subtract one-digit numbers • use patterns of similar calculations 	<ul style="list-style-type: none"> • counting in twos, fives and tens • repeated addition • links to doubling • use arrays 	<ul style="list-style-type: none"> • counting in twos, fives and tens • links to halving • use arrays

Year 2	<ul style="list-style-type: none"> • count on in tens or ones • reorder numbers in a calculation • add three 1-digit numbers; put the largest number first, • using known facts (pairs to 10, doubles); • add by partitioning into tens and ones then recombine • bridge through a multiple of 10 • use number facts and place value to add pairs of numbers • add 9, 19, 11 or 21 by rounding and compensating; use patterns of similar calculations 	<ul style="list-style-type: none"> • count back in tens or ones • subtract mentally a 'near multiple of 10' • take away a small number by counting back • find a small difference by counting up from the smaller to the larger number (on a number line); bridge through a multiple of 10, then adjust • use knowledge of number facts and place value to subtract pairs of numbers • subtract by partitioning second number and subtracting tens then ones • use patterns of similar calculations 	<ul style="list-style-type: none"> • counting in twos, fives and tens • repeated addition • use arrays • use known facts and place value to multiply by 2, 5 or 10 • links to doubling • reorder a calculation, knowing multiplication can be done in any order (commutative) 	<ul style="list-style-type: none"> • counting in twos, fives and tens • link to arrays • use known facts and place value to divide • partition in different ways to divide • links to halving
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Year 3	<ul style="list-style-type: none"> count on in hundreds, tens or ones add mentally a 'near multiple of 10' add 3 or 4 small numbers; partition into hundreds, tens and ones and in different ways, then recombine ($724 = 700 + 20 + 4$) ($724 = 600 + 110 + 14$) reorder numbers in a calculation bridge through a multiple of 10, then adjust use known facts and place value to add use patterns of similar calculations use the relationship between addition and subtraction 	<ul style="list-style-type: none"> count back in hundreds, tens or ones subtract mentally a 'near multiple of 10' find a small difference by counting up from the smaller to the larger number (on a number line) bridge through a multiple of 10, then adjust use knowledge of number facts and place value to subtract pairs of numbers subtract a 2-digit number by partitioning it subtracting its tens then ones use patterns of similar calculations use the relationship between addition and subtraction 	<ul style="list-style-type: none"> counting in 2s, 5s, 10s, 3s, 4s and 8s repeated addition use known facts and place value to multiply by 2, 3, 4, 5, 8 or 10 use doubles to link $\times 2$, $\times 4$ and $\times 8$ tables reorder a calculation using commutativity use the rule of associativity scaling up using known facts use the relationship between multiplication and division 	<ul style="list-style-type: none"> counting in 2s, 5s, 10s, 3s, 4s and 8s use known facts and place value to divide by 2, 3, 4, 5, 8 or 10 partition in different ways to divide use halving to link $\div 8$, $\div 4$ and $\div 2$ tables scaling down using known facts use the relationship between multiplication and division
Year 4	<ul style="list-style-type: none"> count on in steps of 1, 10, 100, or 1000 reorder numbers in a calculation add 3 or 4 small numbers partition, adding the most significant digit first use known facts and place value to add add the nearest multiple of 10 or 100 then adjust use the relationship between addition and subtraction 	<ul style="list-style-type: none"> count back in steps of 1, 10, 100, or 1000 use known facts and place value to subtract find a difference by counting up through the next multiple of 10, 100 or 1000 subtract the nearest multiple of 10 or 100 then adjust use the relationship between addition and subtraction 	<ul style="list-style-type: none"> counting in 6, 7, 9, 25 and 1000 use commutativity and tables to multiply use partitioning and Distributive Law to multiply use factor pairs and the Associative Law to multiply use known facts and place value to multiply use related facts to multiply scaling up using known facts 	<ul style="list-style-type: none"> Counting in 6, 7, 9, 25 and 1000 use partitioning and the Distributive Law to divide use known facts and place value to divide use related facts to divide use factor pairs to divide scaling down using known facts use the relationship between multiplication and division include calculations with remainders

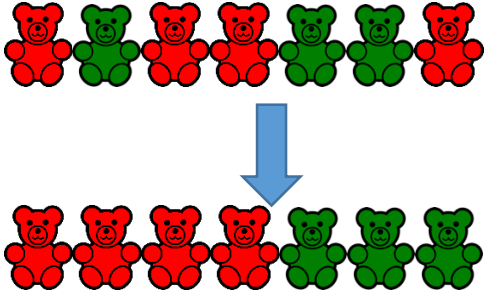
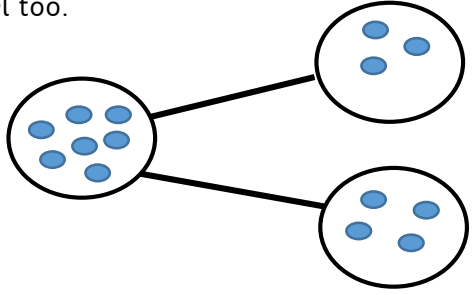
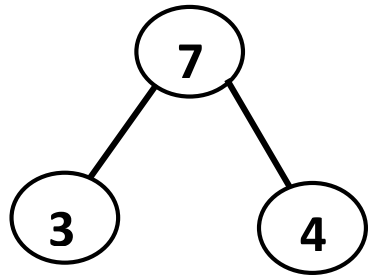
Year 5	<ul style="list-style-type: none"> • count on in steps of 0.1, 1, 10, 100, or 1000 • reorder numbers in a calculation • partition, adding the most significant digit first • use known facts and place value to add • add the nearest multiple of 1, 10 or 100 then adjust • develop further the relationship between addition and subtraction 	<ul style="list-style-type: none"> • count back in steps of 0.1, 1, 10, 100, or 1000 • use known facts and place value to subtract • find a difference by counting up through the next multiple of 10, 100 or 1000 • subtract the nearest multiple of 1, 10 or 100 then adjust • develop further the relationship between addition and subtraction 	<ul style="list-style-type: none"> • counting in steps of powers of 10 • use commutativity and tables to multiply • use partitioning and Distributive Law to multiply • use factor pairs and the Associative Law to multiply • use known facts and place value to multiply • use related facts to multiply • scaling up using known facts • use the relationship between multiplication and division • recognise and use square and cube numbers 	<ul style="list-style-type: none"> • counting in steps of powers of 10 • use partitioning and the Distributive law to divide • use known facts and place value to divide • use related facts to divide • use factor pairs to divide • scaling down using known facts • use the relationship between multiplication and division
Year 6	<ul style="list-style-type: none"> • consolidate all strategies from previous years • partition, adding the most significant digit first • use known facts and place value to add • add the nearest multiple of 0.1, 10, 100 or 1000, then adjust • continue to use the relationship between addition and subtraction 	<ul style="list-style-type: none"> • consolidate all strategies from previous years • use known facts and place value to subtract • find a difference by counting up through the next multiple of 10, 100 or 1000 • subtract the nearest multiple of 0.1, 10, 100 or 1000, then adjust • continue to use the relationship between addition and subtraction 	<ul style="list-style-type: none"> • use commutativity and tables to multiply • use partitioning and the Distributive Law to multiply • use factor pairs and the Associative Law to multiply • use known facts and place value to multiply • use related facts to multiply • scaling up using known facts • use the relationship between multiplication and division 	<ul style="list-style-type: none"> • counting in steps of powers of 10 • use partitioning and the Distributive Law to divide • use known facts and place value to divide • use related facts to divide • use factor pairs to divide • scaling down using known facts • use the relationship between multiplication and division • include calculations with remainders

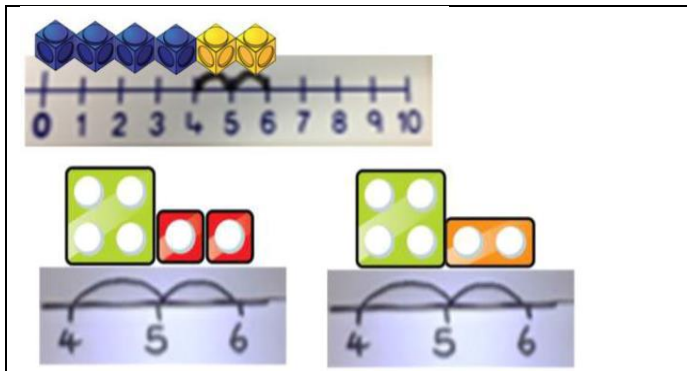
Addition

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Combining two parts to make a whole: part whole model Starting at the bigger number and counting on- using cubes and objects Regrouping to make 10 using ten frame	Combining two parts to make a whole: part whole model Starting at the bigger number and counting on- using cubes and objects Regrouping to make 10 using ten frame	Adding three 1-digit numbers Use of base 10 to combine 2 numbers	Column method with regrouping Using place value counters with up to 3-digit numbers	Column method with regrouping Using place value counters with up to 4-digit numbers	Column method with regrouping Using place value counters for adding decimals	Column method with regrouping Using place value counters for adding decimals

Key Vocabulary

sum, total, parts and wholes, plus, add, altogether, more, 'is equal to', 'is the same as'

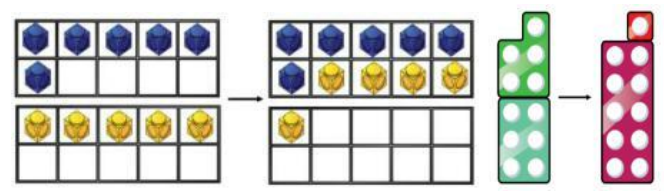
Concrete	Pictorial	Abstract
<p>Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, car etc.)</p> 	<p>Children to represent the cubes using dots or crosses. They could put each part on a part whole model too.</p> 	<p>$4 + 3 = 7$ 4 is a part, 3 is a part and the whole is 7.</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?</p>



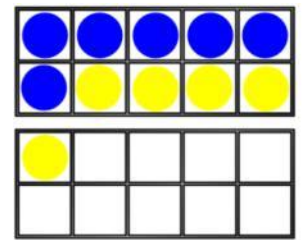
?

What is the sum of 2 and 4?
 What is the total of 4 and 2?
 $4 + 2 = ?$

Regrouping by making 10; using ten frames and counters/cubes or using Numicon. $6 + 5$



Children to draw ten frames and counters.



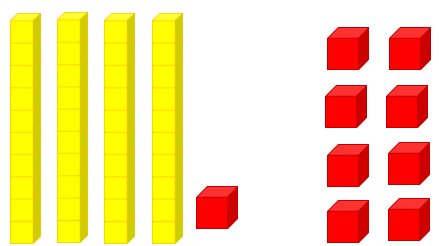
Children to develop an understanding of equality e.g.

$$6 + \square = 11$$

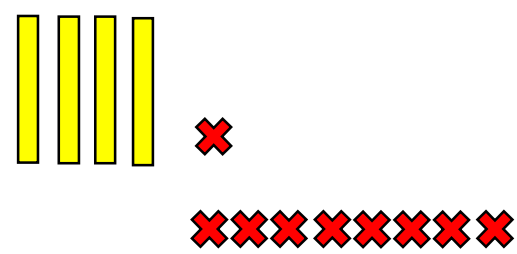
$$6 + 5 = 5 + \square$$

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

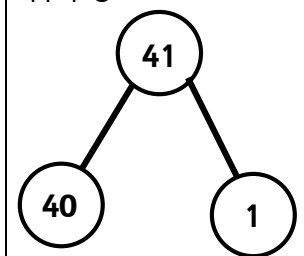
10 + 0 using base 10 or place value counters. Continue to develop understanding of partitioning and place value. $41 + 8 =$



Children to represent the base 10 or place value counters e.g. lines of tens and dots or crosses for ones.

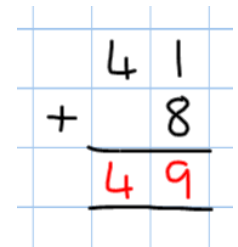


$$41 + 8 =$$



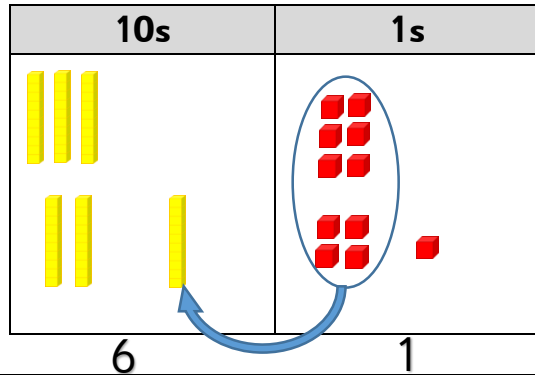
$$1 + 8 = 9$$

$$40 + 9 = 49$$



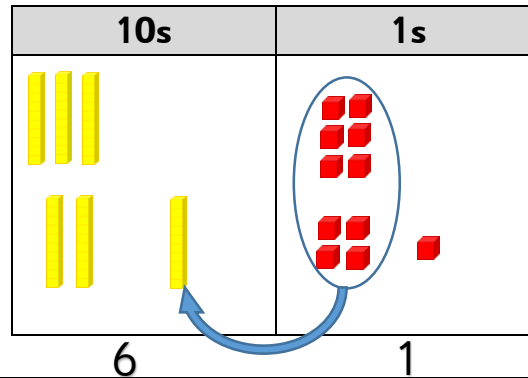
TO + TO using base 10 or place value counters. Continue to develop understanding of partitioning and place value.

$$36 + 25 =$$



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

$$36 + 25 =$$



Looking for ways to make 10.

$$36 + 25 =$$

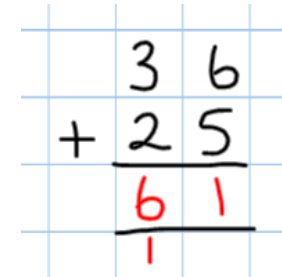


$$30 + 20 = 50$$

$$5 + 5 = 10$$

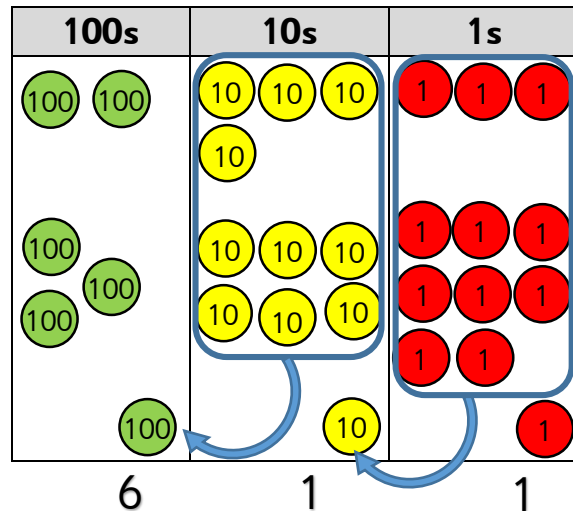
$$50 + 10 + 1 = 61$$

Formal Method:



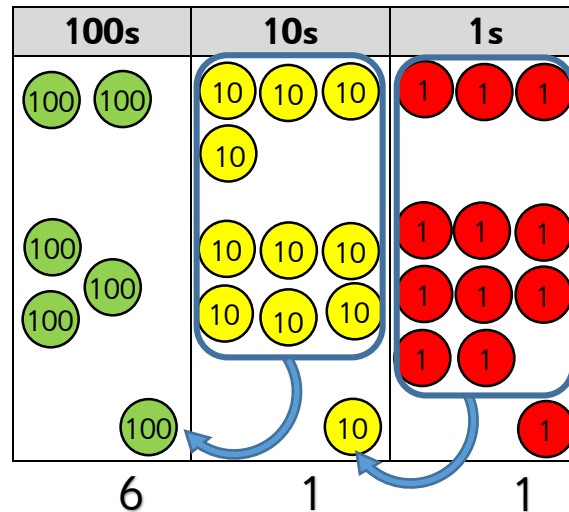
Use of place value counters to add HTO + TO, HTO + HTO etc. when there are 10 ones in the 1s column we exchange for 1 ten, when there are 10 tens in the 10s column – we exchange for 1 hundred etc.

$$243 + 368 =$$

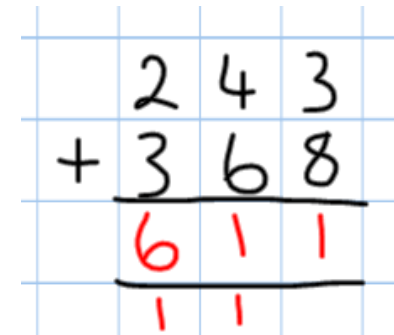


Chd to represent the counters in a place value chart, circling when they make an exchange.

$$243 + 368 =$$



Formal Method:

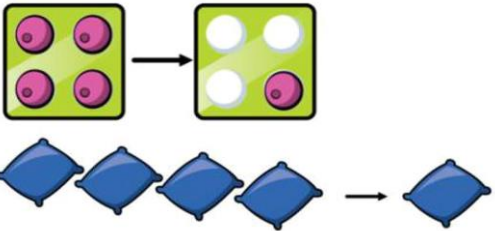

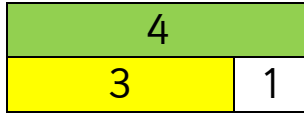
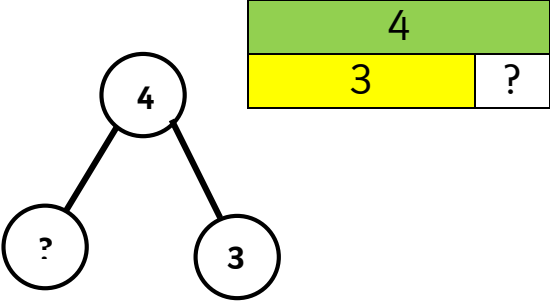


Subtraction

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Taking away ones	Taking away ones	Counting back	Column method with regrouping	Column method with regrouping	Column method with regrouping	Column method with regrouping
Counting back	Counting back	Find the difference	Using place value counters with up to 3-digit numbers	Using place value counters with up to 4-digit numbers	Abstract for whole numbers	Using place value counters for subtracting decimals
Find the difference	Find the difference	Part whole model			Using place value counters for subtracting decimals	Using place value counters for subtracting decimals with different amounts of decimal places
Part whole model	Part whole model	Make 10				
Make 10 using the ten frame	Make 10 using the ten frame	Use of base 10				

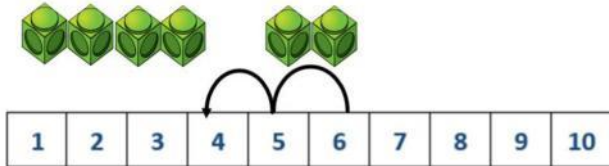
Key Vocabulary

take away, less than, the difference, subtract, minus, fewer, decrease

Concrete	Pictorial	Abstract
<p>Physically taking away and remove objects from a whole. (using ten frames, Numicon, Cubes and objects)</p> <p>$4 - 3 = 1$</p> 	<p>Children to draw the concrete resources they are using and cross out the correct amount.</p>  <p>Bar model</p> 	<p>$4 - 3 =$</p> <p><input type="text"/> = $4 - 3$</p> 

Counting back (using number lines or number tracts) children start with 6 and count back 2.

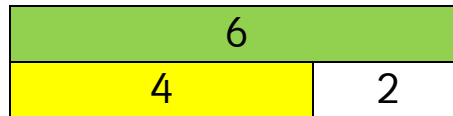
$$6 - 2 = 4$$



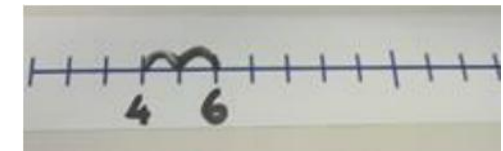
Children to represent what they see pictorially.



Bar model

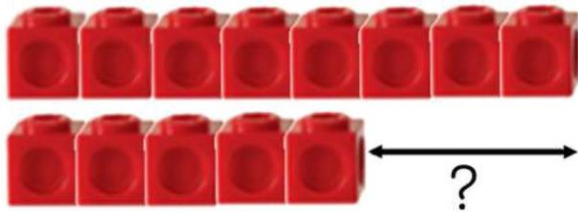


Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line.

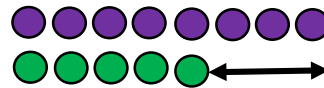


Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects)

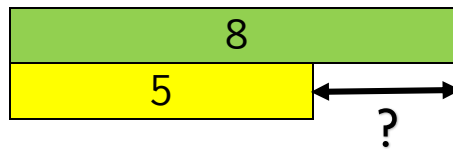
Calculate the difference between 8 and 5.



Children to draw the cubes/other concrete objects which they have used.



Bar model.



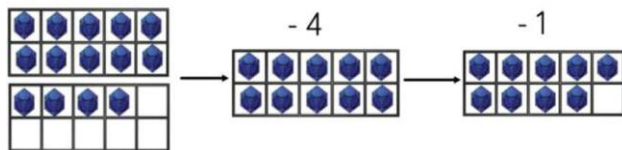
Find the difference between 8 and 5.

$8 - 5$, the difference is

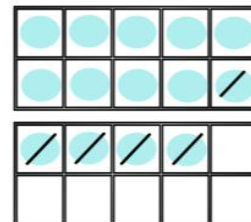
Children to explore why $9 - 6 = 8 - 5 = 7 - 4$ have the same difference.

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 2nd number.

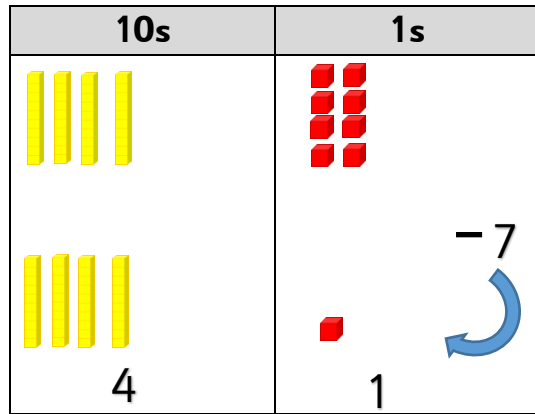
$$14 - 5 = 9$$

$$14 - 4 = 10$$

$$10 - 1 = 9$$

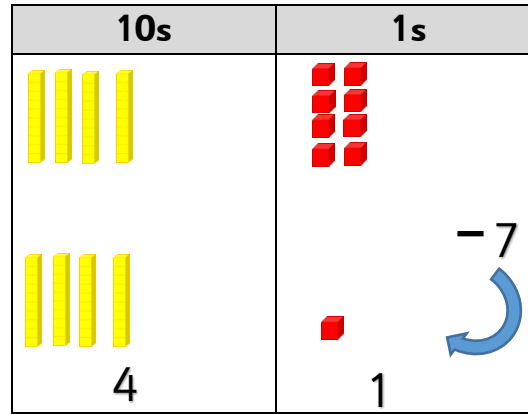
Column method using base 10 or place value counters

$48 - 7 =$

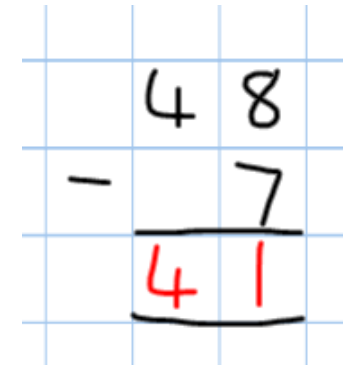


Children to represent the base 10 or place value counters pictorially.

$48 - 7 =$

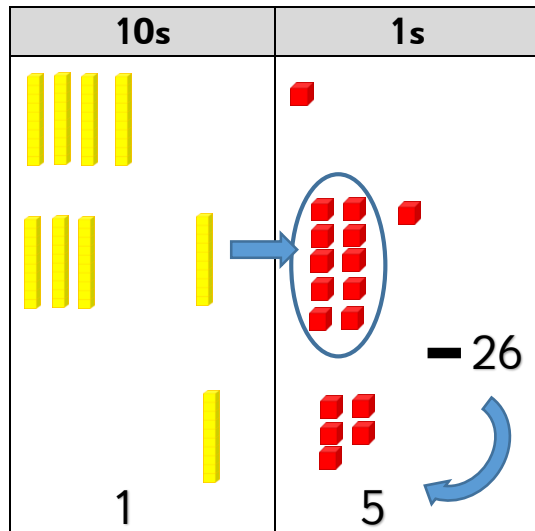


Column method or children could count back 7.



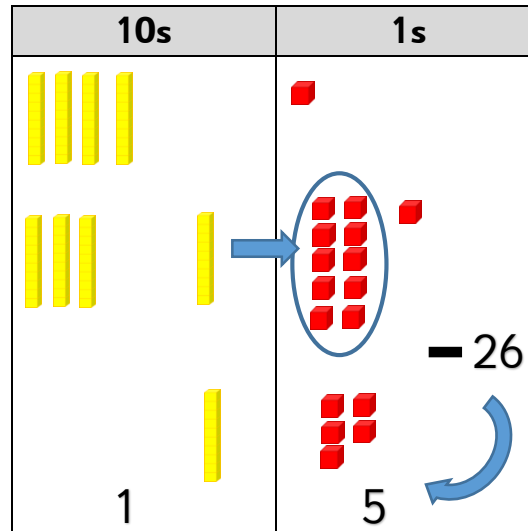
Column method using base 10 or Place Value counters and have to exchange.

$41 - 26 =$

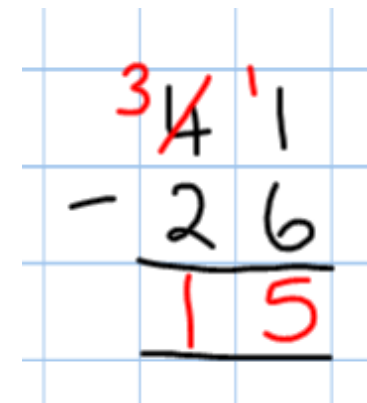


Represent the base 10 or place value counters pictorially, remembering to show the exchange.

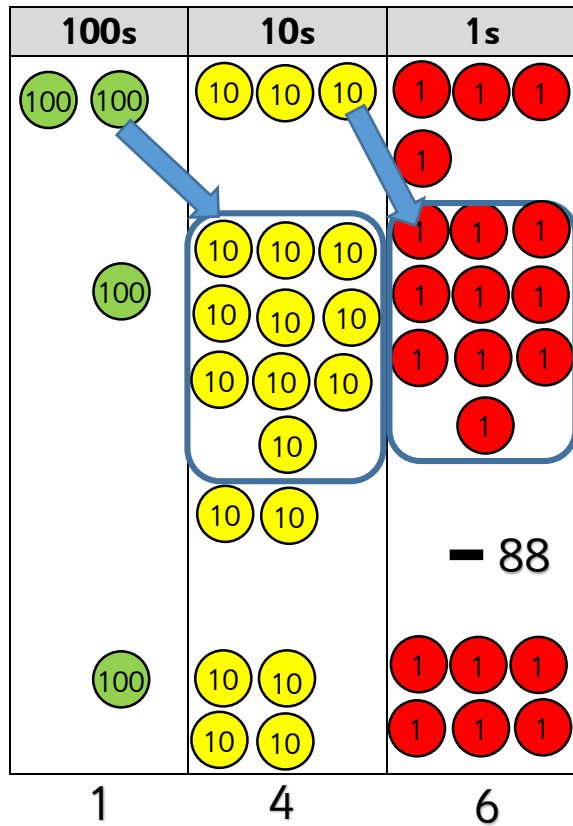
$41 - 26 =$



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

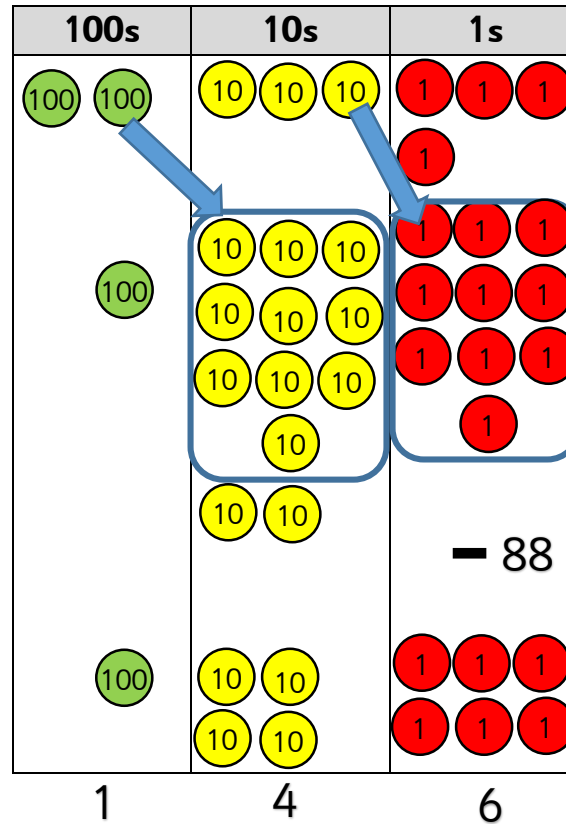


Column method using place value counters
 $234 - 88 =$

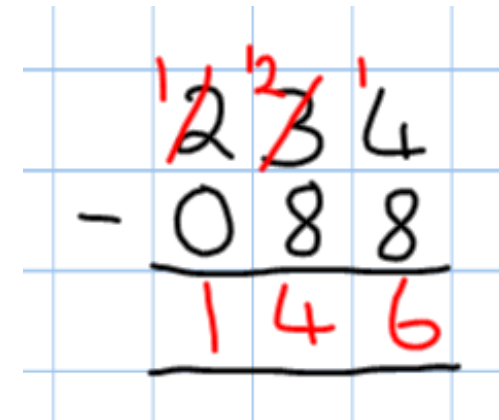


Represent the place value counters pictorially;
 remembering to show what had been exchanged.

$234 - 88 =$



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

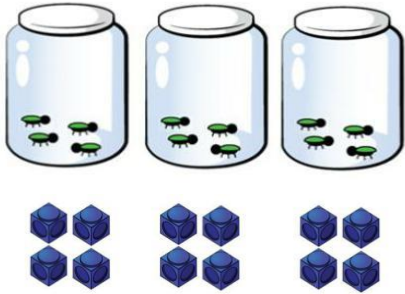
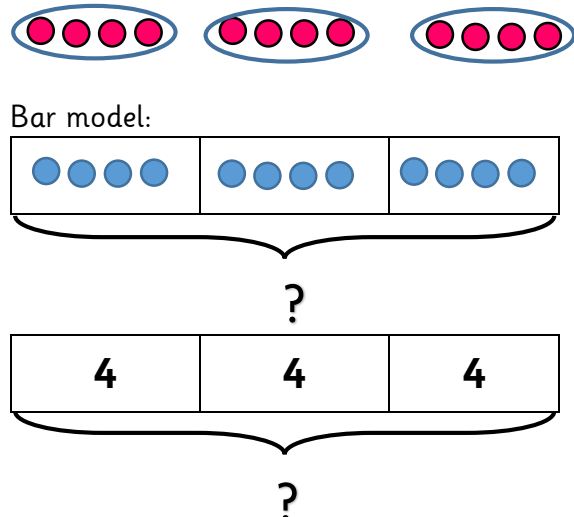


Multiplication

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Repeated grouping/ repeated addition	Repeated grouping/ repeated addition	Arrays showing commutative multiplication	Arrays using place value counters	Arrays using place value counters	Grid method using place value counters to multiply up to ThHTO x TO	Column multiplication for multi-digits up to ThHTO x TO
Doubling	Doubling		Partition to multiply TO x O	Partition to multiply HTO or TO x O		
Counting in multiples	Counting in multiples		Grid method using place value counters	Grid method using place value counters to multiply HTO or TO x O	Column multiplication for up to ThHTO x TO	

Key Vocabulary

double, times, multiplied by, the product of, groups of, lots of, equal groups

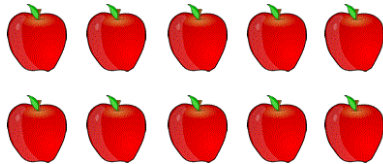
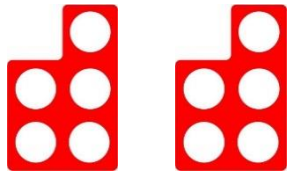
Concrete	Pictorial	Abstract
<p>Repeated grouping/ repeated addition $3 \times 4 =$ $4 + 4 + 4 =$ There are 3 equal groups, with 4 in each group.</p> 	<p>Children to represent the resources in a picture.</p>  <p>Bar model:</p>	<p>$3 \times 4 = 12$</p> <p>$4 + 4 + 4 = 12$</p>

Doubling using objects

Double 5 =

$5 \times 2 =$

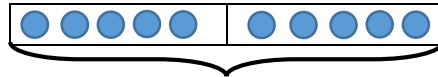
$5 + 5 =$



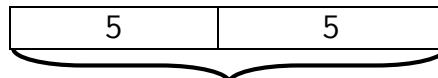
Children to represent this pictorially.



Bar model:



?



?

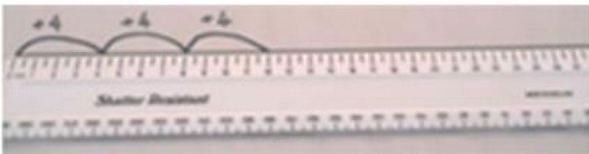
Double 1 = 2

Double 2 = 4

Double 3 = 6 etc.

Counting in multiples using equipment and number lines

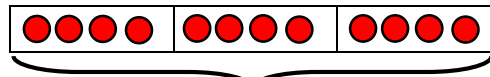
$3 \times 4 =$



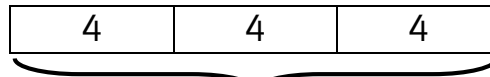
Children to represent this pictorially.



Bar model:



?

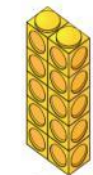


?

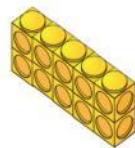
4, 8, 12, 16 etc

Arrays to show commutative multiplication using objects.

$2 \times 5 = 5 \times 2$



2 lots of 5



5 lots of 2

Children to represent this pictorially.



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

$10 = 2 \times 5$

$5 \times 2 = 10$

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

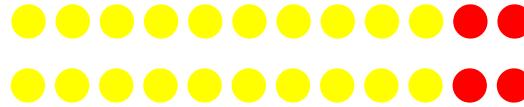
$10 = 5 + 5$

Arrays with place value counters

$2 \times 12 =$

10s	1s
10 10	1 1 1 1

Children to represent this pictorially.

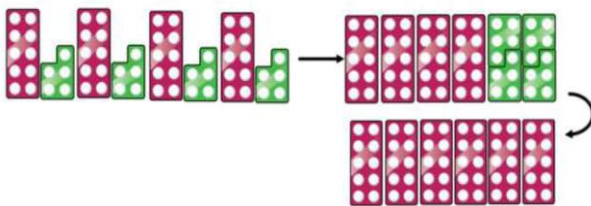


Children to be able to use an array to write a range of different calculations.

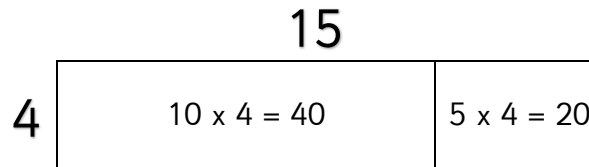
$12 = 2 \times 6$
 $6 \times 2 = 12$
 $2 + 2 + 2 + 2 + 2 + 2 = 12$
 $12 = 6 + 6$

Partition to multiply using objects, base 10, place value counters, etc.

$15 \times 4 =$



Children to represent the concrete manipulatives using bar model.



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

$4 \times 15 = 60$

 $10 \times 4 = 40$
 $5 \times 4 = 20$
 $40 + 20 = 60$

Grid method using place value counters TO x O

$14 \times 6 =$

	x	10	4
	6		
		60	24

6 0	
+ 2 4	
8 4	

Children to represent this pictorially.

	x	10	4
	6		
		60	24

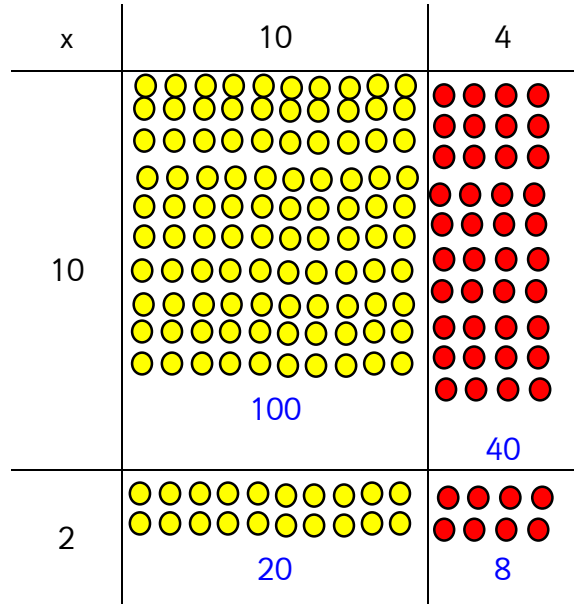
6 0	
+ 2 4	
8 4	

Children to complete the grid by multiplying the numbers and writing the answer in the grid.

x	1	0	4
6	6	0	24
	60		
	+ 24		
	84		

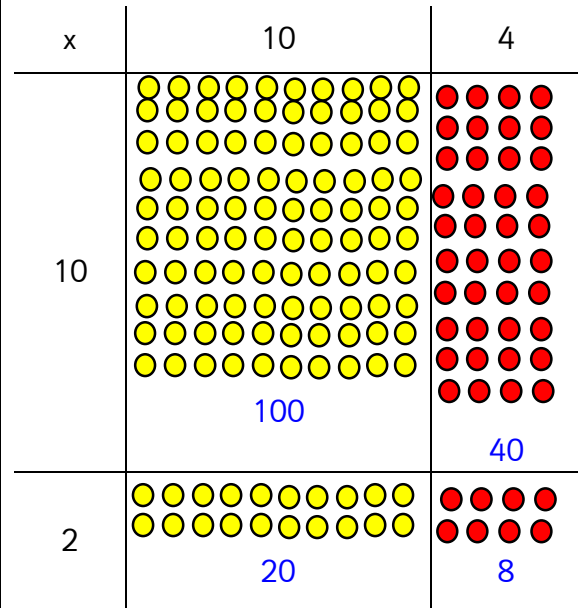
Grid method using place value counters TO x TO.

$$12 \times 14 =$$



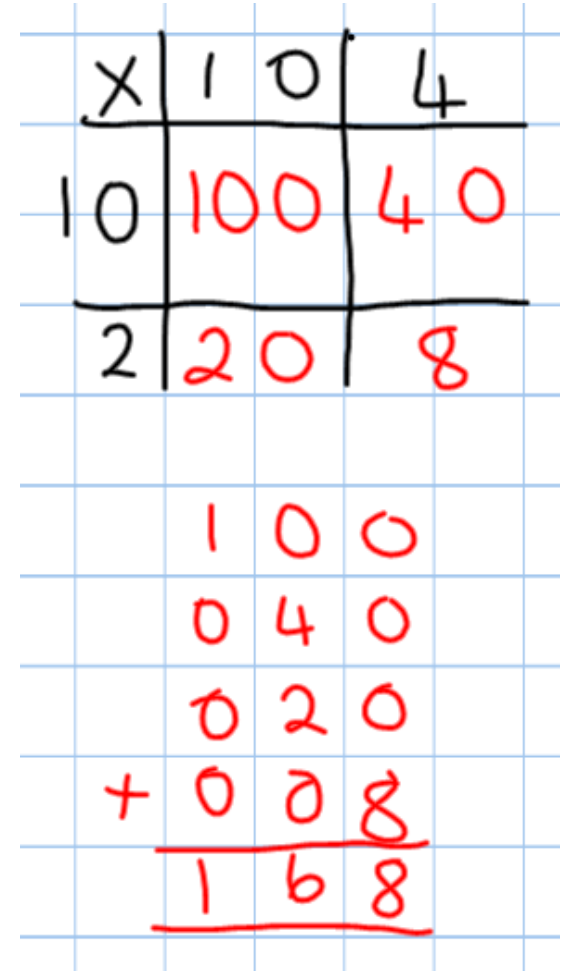
$$\begin{array}{r}
 100 \\
 40 \\
 20 \\
 + 8 \\
 \hline
 168
 \end{array}$$

Children to represent this pictorially.



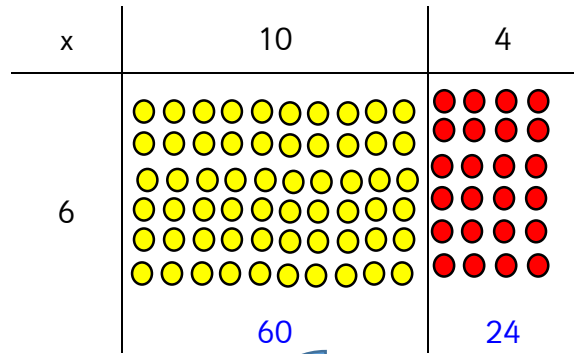
$$\begin{array}{r}
 100 \\
 40 \\
 20 \\
 + 8 \\
 \hline
 168
 \end{array}$$

Children to complete the grid by multiplying the numbers and writing the answer in the grid.



Column method using place value counters to 10×0

$14 \times 6 =$

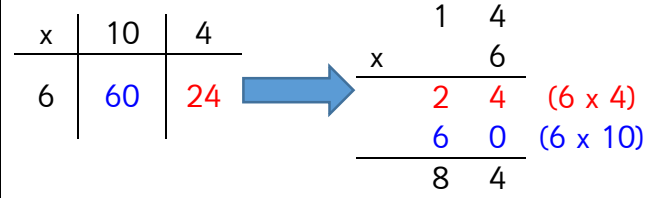


$$+ \begin{array}{r} 60 \\ 24 \\ \hline 84 \end{array}$$

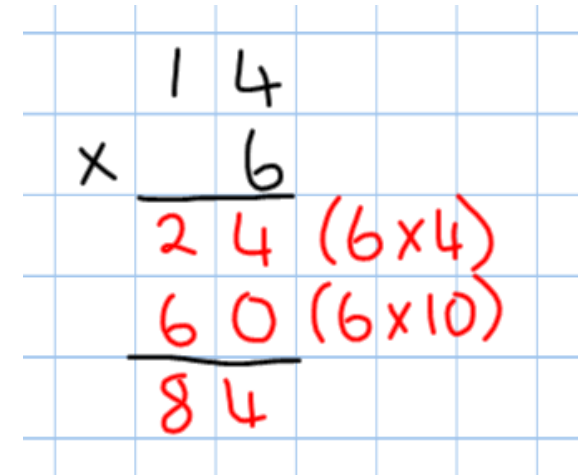


$$\begin{array}{r} 14 \\ \times 6 \\ \hline 24 \\ 60 \\ \hline 84 \end{array} \begin{array}{l} (6 \times 4) \\ (6 \times 10) \end{array}$$

Children to represent this pictorially.

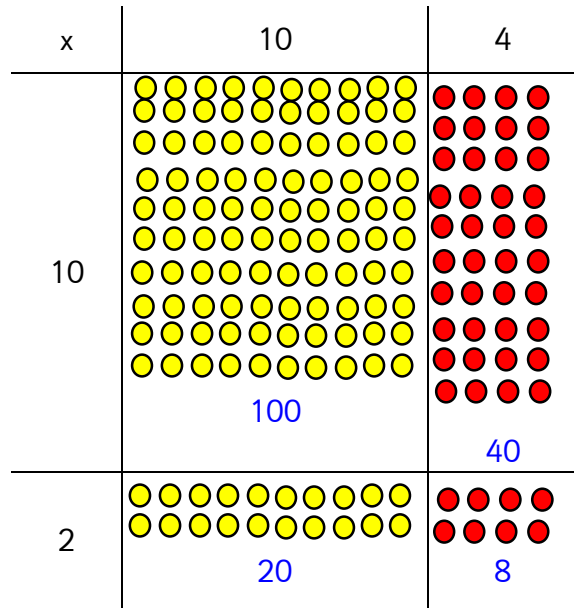


Formal written method



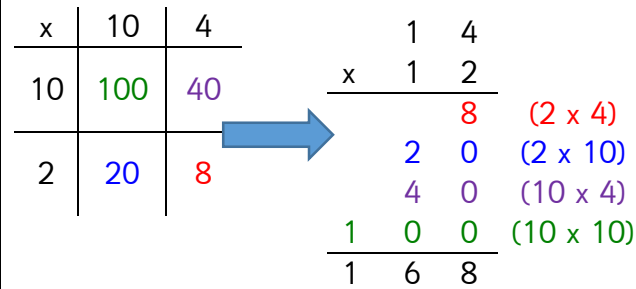
Column method using place value counters to
TO x TO

$$12 \times 14 =$$

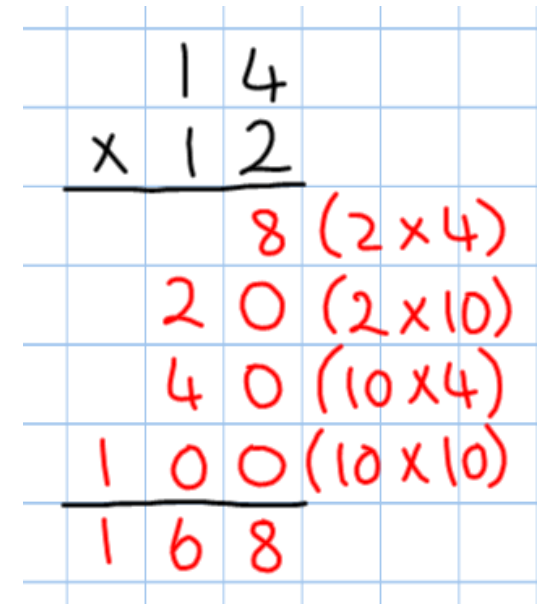


$$\begin{array}{r}
 100 \\
 40 \\
 20 \\
 + 8 \\
 \hline
 168
 \end{array}$$

Children to represent this pictorially.



Formal written method

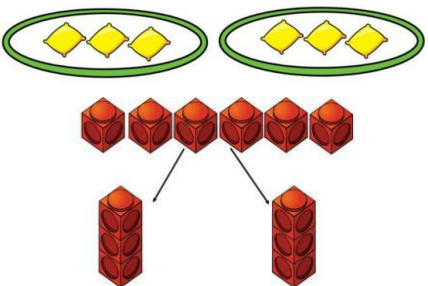
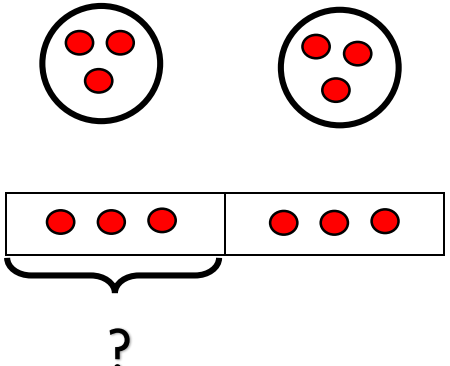



Division

EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Sharing objects into groups	Sharing objects into groups	Division as grouping	Division a remainder – using lollipop sticks, time tables facts and repeated subtraction	Division with a remainder	Short division (up to 4-division by a 1-digit numbers including remainders)	Short division
Division as grouping e.g. I have 12 sweets and put them in groups of 3 how many groups?	Division as grouping e.g. I have 12 sweets and put them in groups of 3 how many groups?	Division within arrays – linking to multiplication	2-digit divided by 1-digit using base 10 or place value counters	Short division (up to 3-digits by 1-digit – concrete and pictorial)		Long division with place value counters (up to 4-digit by a 2-digit number)
Use cubes and draw round 3 cubes at a time	Use cubes and draw round 3 cubes at a time	Repeated subtraction				Children should exchange into the 10ths and 100ths column too

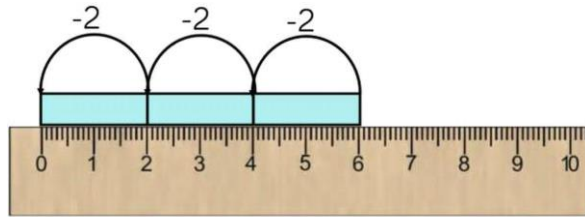
Key Vocabulary

Share, group, divide, divide by, half

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>  <p>Children should also be encouraged to use their 2 times table facts.</p>

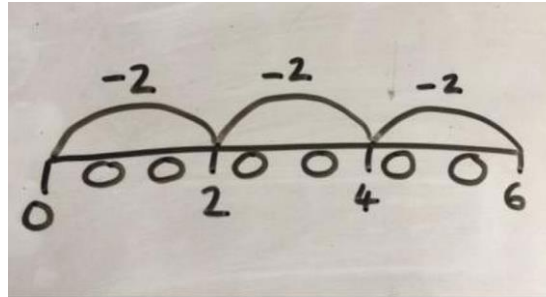
Repeated subtraction using Cuisenaire rods above a ruler.

$$6 \div 2 =$$

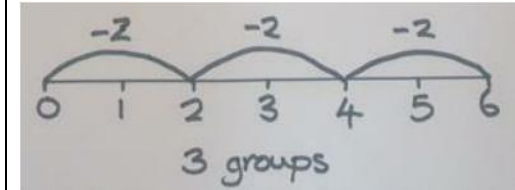


3 groups of 2

Children to represent repeated subtraction pictorially



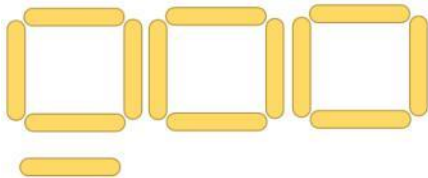
Abstract number line to represent the equal groups that have been subtracted.



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

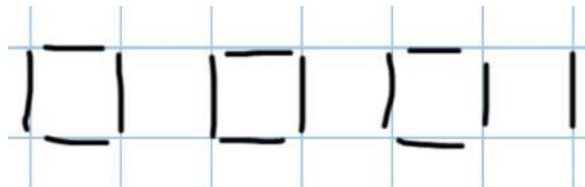
$$13 \div 4 =$$

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.

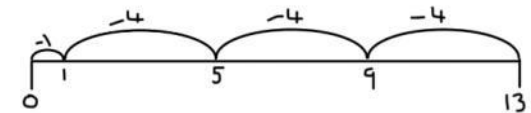


There are 3 whole squares, with 1 left over.

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

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

'3 groups of 4, with 1 left over'



Sharing using place value counters.

$$42 \div 3 = 14$$

To get exchanged for 1's



10s	1s
10	1 1 1 1
10	1 1 1 1
10	1 1 1 1

Children to represent the place value counters pictorially.

$$42 \div 3 = 14$$

To get exchanged for 1's



10s	1s
10	1 1 1 1
10	1 1 1 1
10	1 1 1 1

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

$$42 \div 3$$

$$42 = 30 + 12$$

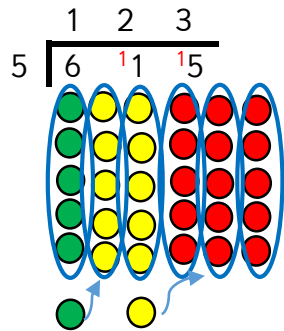
$$30 \div 3 = 10$$

$$12 \div 3 = 4$$

$$10 + 4 = 14$$

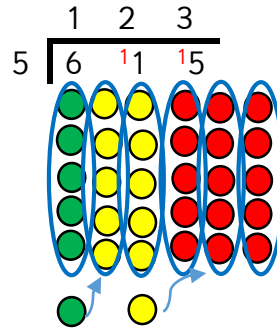
Short division (bus stop method) using place value counters to group.

$$615 \div 5 =$$



Represent the place value counters pictorially.

$$615 \div 5 =$$



Formal written method

$$\begin{array}{r} 123 \\ 5 \overline{)615} \end{array}$$

Long division using place value counters

$$2544 \div 12 =$$

Not appropriate to use practical equipment for questions with large numbers like this. Children who can't do this pictorially, using known facts, would probably be working on short division still.

Use known facts to help with division

$$\begin{array}{r} 0212 \\ 12 \overline{)2544} \end{array}$$

Key facts

$$12 \times 1 = 12$$

$$12 \times 2 = 24$$


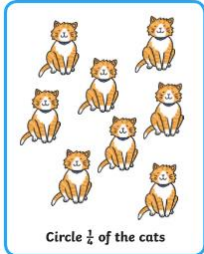
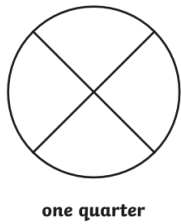
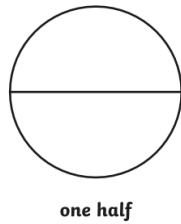
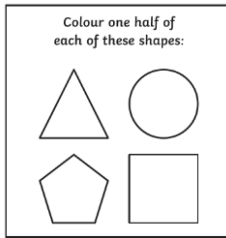

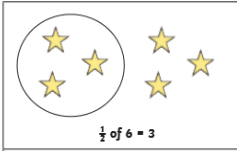
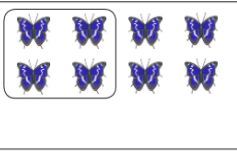
$$12 \times 5 = 60$$

$$12 \times 10 = 120$$

Fractions, Decimals, Percentages and Ratios

Key Vocabulary

half, quarter, tenths, hundredths, etc, ratio, factor multiple, decimal, percentage, out of 100

Year	Concrete	Pictorial	Abstract												
1	<p>-Recognise, find and name a half as one of two equal parts of an object, shape or quantity -Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity</p> <p>Find 1/2 and 1/4 of objects such as playdough, rice, paper shapes, string, jugs of water, pieces of fruit, metre sticks and so on</p> 	  	 <div style="border: 1px solid black; padding: 5px;"> <p>What number is half of 2? ____</p> <p>What number is half of 4? ____</p> <p>What number is half of 6? ____</p> <p>What number is half of 8? ____</p> <p>What number is half of 10? ____</p> <p>What number is half of 20? ____</p> </div>												
2	<p>-Recognise, find, name and write fractions 1/3, 1/4, 2/4 and 3/4 of a length, shape, set of objects or quantity -Write simple fractions for example, 1/2 of 6 = 3 and recognise the equivalence of 2/4 and 1/2</p> <p>Find, name and write fractions 1/3, 1/4, 2/4 and 3/4 of lengths, shapes and objects- as above Use playdough to add and subtract fractions</p> 	<p>Write a fraction sentence for each picture. The first one has been done for you.</p>   <p>Complete the fraction wall.</p> <table border="1" style="width: 100%; text-align: center;"> <tr> <td colspan="4">1</td> </tr> <tr> <td colspan="2">1/2</td> <td colspan="2"></td> </tr> <tr> <td></td> <td>1/4</td> <td></td> <td>1/4</td> </tr> </table>	1				1/2					1/4		1/4	$\frac{1}{2} = \frac{2}{4}$ $\frac{1}{2} = \frac{2}{4}$ $1 = \frac{4}{4}$ <p>Can you solve these problems?</p> <p>Priya's pencil is 12cm long. Daniel's pencil is half the length of Priya's. How long is Daniel's pencil?</p> <p>Lucy has 12 sweets. She eats one quarter of them. How many does she have left?</p>
1															
1/2															
	1/4		1/4												

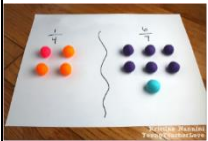
- Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10
- Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators
- Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators
- Recognise and show, using diagrams, equivalent fractions with small denominators
- Add and subtract fractions with the same denominator within one whole [for example, $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$]
- Compare and order unit fractions, and fractions with the same denominators
- Solve problems that involve all of the above.

3

See Year 1/2 for further practical ideas



Use play dough to add and subtract fractions



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

These fractions are equivalent. The rectangles are the same. The amount shaded is equivalent.

E.g. $\frac{1}{4} + \frac{3}{4} = \frac{4}{4}$

E.g. $\frac{5}{9} + \frac{4}{9} = \frac{9}{9}$
 $\frac{9}{9} - \frac{4}{9} = \frac{5}{9}$

$\frac{1}{4} > \frac{1}{5}$ $\frac{2}{4} < \frac{6}{8}$

Draw and shade shapes to show the following fractions:

- $\frac{4}{10}$
- $\frac{8}{10}$
- $\frac{9}{10}$
- $\frac{1}{10}$
- $\frac{7}{10}$

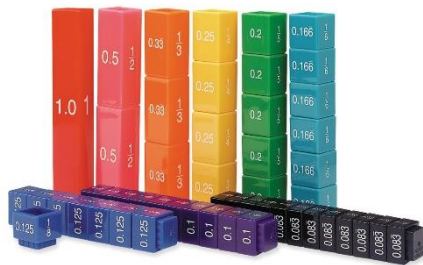
9. Peter ate $\frac{1}{2}$ of his bar of chocolate, Damian ate $\frac{2}{3}$ of his bar of chocolate and Polly ate $\frac{3}{4}$ of her bar of chocolate. Who had the most remaining?

- $\frac{2}{10}$
- $\frac{6}{10}$
- $\frac{5}{10}$
- $\frac{10}{10}$
- $\frac{3}{10}$

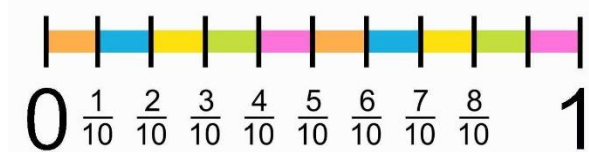
- Pupils should count in fractions This reinforce the concept of fractions as numbers and that they can add up to more than one.

4

To count physical pieces of a fraction wall



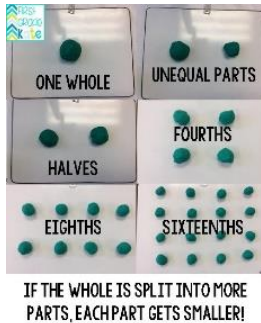
To count fractions using a number line



To count in fractions out loud

- Recognise and show, using diagrams, families of common equivalent fractions

Equivalence is still about practical and visual representations and equivalence between tenths and hundredths is especially important. Count in tenths and hundredths and make number lines with them, (not just 0-1) also labelled with decimals, and extending this to show $1/4$, $1/2$ and $3/4$. Include fractions greater than 1 on a regular basis, both in counting and activities.

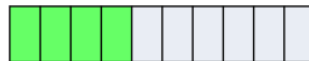


equivalent fractions

find equivalent fractions to $2/5$



"lets take each fifth and split it into two pieces (students draw in these division lines)"



"so $4/10$ is equal to $2/5$ "

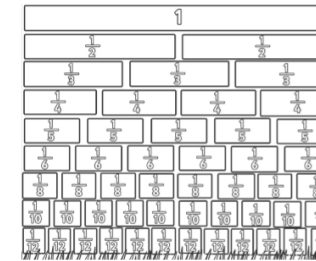


"lets take each fifth and split it into three pieces (students draw in these division lines)"



"so $6/15$ is equal to $2/5$ as well"

a) Use the fraction wall to find equivalent fractions:



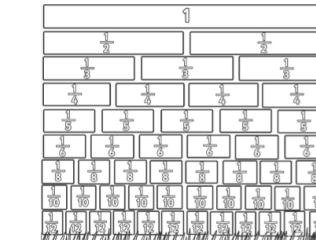
$$\frac{3}{4} = \frac{\quad}{8}$$

$$\frac{\quad}{12} = \frac{4}{6}$$

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

$$\frac{2}{3} = \frac{4}{\quad} = \frac{\quad}{12}$$

a) Use the fraction wall to find equivalent fractions:



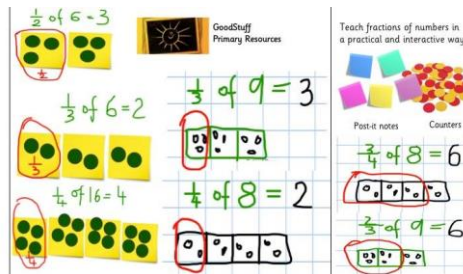
$$\frac{3}{4} = \frac{\quad}{8}$$

$$\frac{\quad}{12} = \frac{4}{6}$$

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

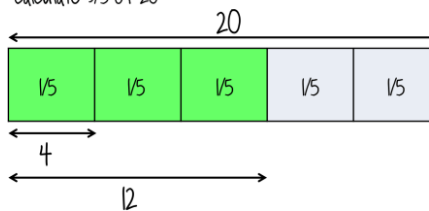
$$\frac{2}{3} = \frac{4}{\quad} = \frac{\quad}{12}$$

- 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



fraction of an amount

calculate $3/5$ of 20



draw rectangle and show its length is 20
split into fifths and shade in 3
total length of one fifth?
total length of three fifths?

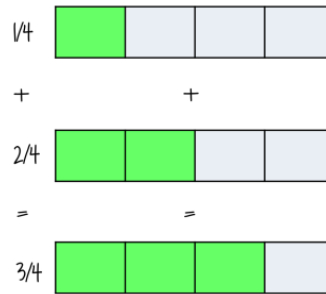
Find $3/5$ of 250

- Add and subtract fractions with the same denominator



adding fractions same denominators

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

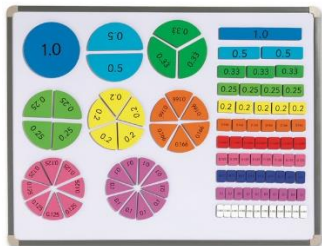


$$\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$$

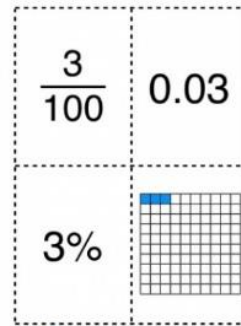
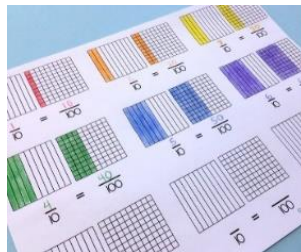
$$\frac{5}{8} - \frac{3}{8} = \frac{2}{8}$$

- Recognise and write decimal equivalents of any number of tenths or hundredths
 - Recognise and write decimal equivalents to 1/4, 1/2, 3/4

4



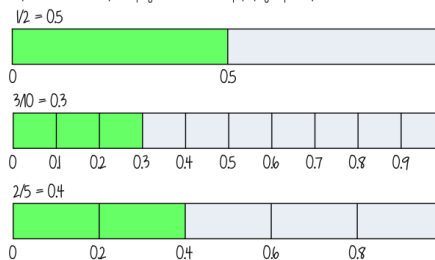
Match equivalent fraction and decimal cards.



Match or shade different representations

fractions to decimals and vice versa

now students have an understanding of the decimal number line, they can put it onto a bar model to convert between fractions and decimals. draw the bar model. fraction first then put on the decimal number line identifying the increments by dividing 1 by the denominator of the fraction

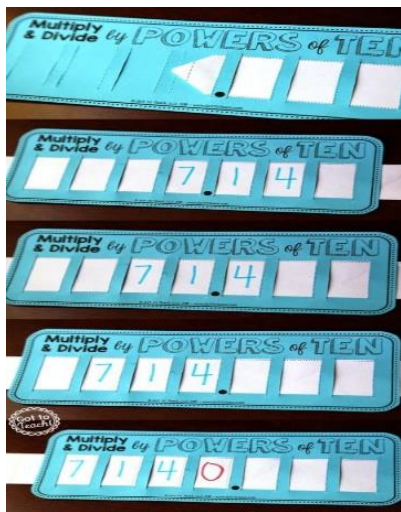


Complete the table to give the measurements in fractions and decimals.

0.3m	
	$\frac{56}{100}$ m
0.1cm	
0.91m	
	$\frac{90}{100}$ cm
0.05m	
	$\frac{87}{100}$ cm
	$3 \frac{9}{100}$ m
8.6cm	
	$13 \frac{4}{10}$ cm

Write equivalent fractions and decimals

- Find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths
- Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten



Multiplying and Dividing by 10, 100 and 1000

10 000	1000	100	10	1	●	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
					●			

Multiplying

X 10 digits move LEFT 1 space
 X 100 digits move LEFT 2 spaces
 X 1000 digits move LEFT 3 spaces



Dividing

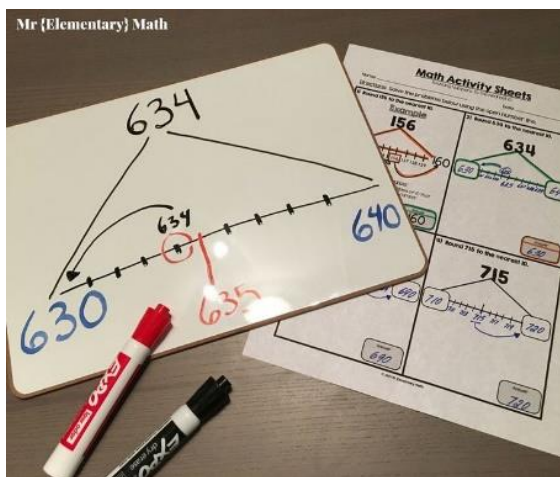
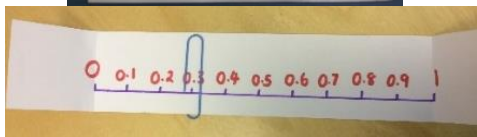
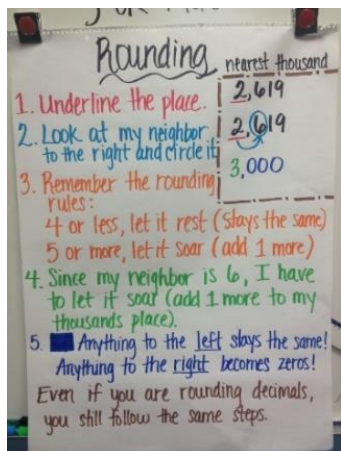
÷ 10 digits move RIGHT 1 space
 ÷ 100 digits move RIGHT 2 spaces
 ÷ 1000 digits move RIGHT 3 spaces



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fraction	decimal
$\frac{3}{10}$	
	0.5
$\frac{6}{100}$	
	0.08
$\frac{23}{100}$	
	1.38

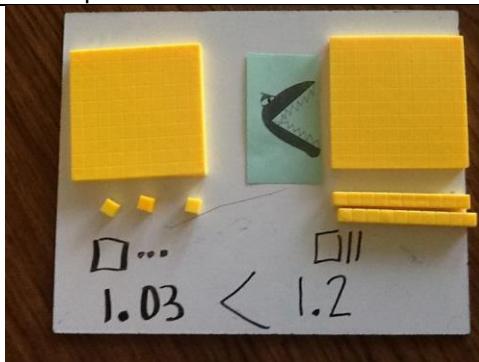
- 4 - Round decimals with one decimal place to the nearest whole number



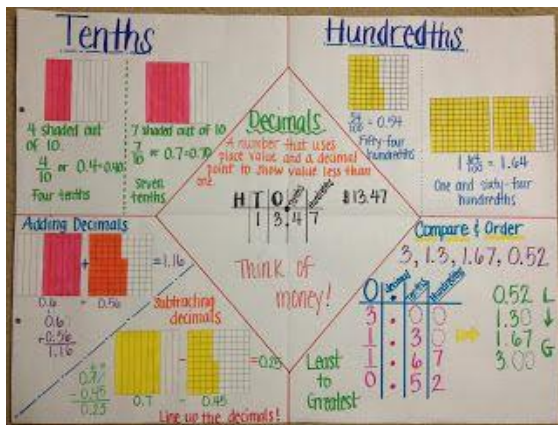
Round each of the following decimals to the nearest whole number:

6.8	
12.4	
9.5	
18.3	
128.7	

- Compare numbers with the same number of decimal places up to two decimal places



This example shows a different number of digits but the principle is the same



4. Complete the statements below using each of the numbers above only once.

34.5 32.9 32.69 34.01 32.61

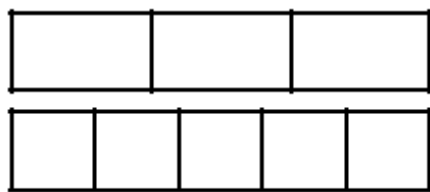
- 33.56 <
- 32.7 <
- 33.6 >
- 34.05 <
- 32.65 >

- Solve simple measure and money problems involving fractions and decimals to two decimal places using the above strategies.

- Compare and order fractions whose denominators are all multiples of the same number

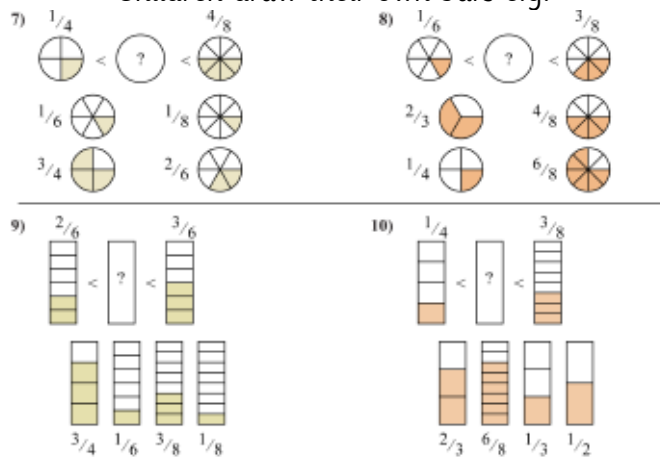
Fraction Bars

Color the fraction bars to represent each fraction...



Which fractions is the greatest?

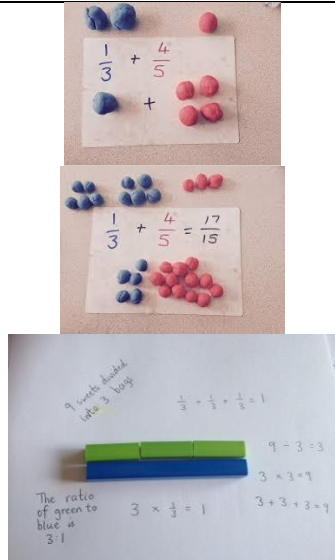
Children draw their own bars e.g.



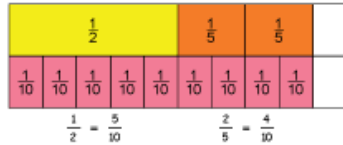
Children compare and order fractions by finding common denominators and multiplying/dividing each fraction

$$\frac{3}{4} > \frac{9}{16}$$

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

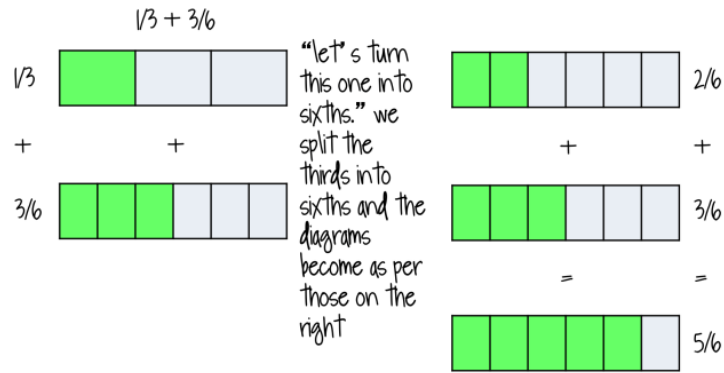


Can you find a common denominator with tiles?



$$\frac{1}{2} + \frac{2}{5} = \frac{9}{10}$$

adding fractions different denominators

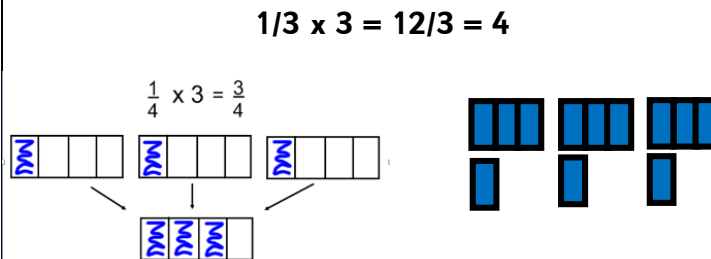


e.g. $\frac{1}{3} + \frac{3}{6} = \frac{5}{6}$

5

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

See diagram right – use play dough or counters to create

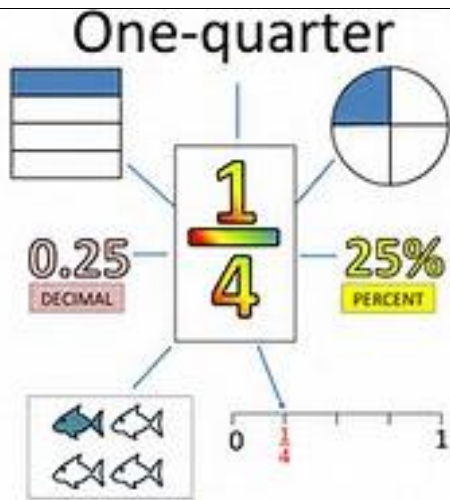


$$\frac{1}{4} \times 3 = \frac{3}{4}$$

- Read and write decimal numbers as fractions

Fraction	Decimal	Representation on a Hundredths Grid
$\frac{7}{100}$	0.07	
$\frac{27}{100}$	0.27	

Make the decimals using the Cuisenaire



Repeat with different decimals

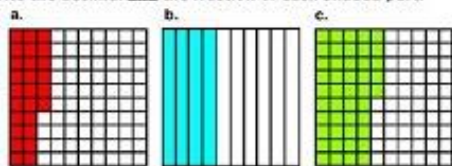
For example,
 $0.71 = 71/100$

- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents
- Read, write, order and compare numbers with up to three decimal places

5

Children use the following apparatus to recognise the value of tenths and hundredths – relate this to money

Write the decimal and the fraction of each shaded part.



place value in decimal numbers

“this is what a whole unit looks like”

units tenths hundredths

0.62

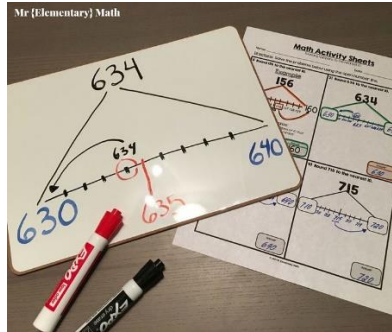
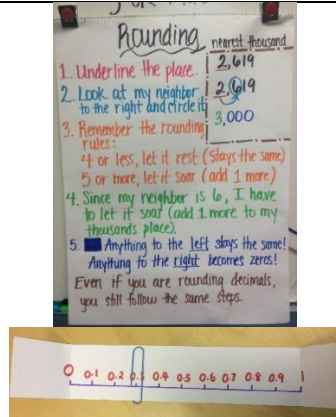
“this is what a tenth looks like”

“this is what a hundredth looks like. gosh, aren't they small!?”

Relate this to money

Relate this to money
e.g. $\pounds 1.35 > \pounds 0.15$

- Round decimals with two decimal places to the nearest whole number and to one decimal place



As above with decimals

Round each of the following decimals to the nearest whole number:

6.8	
12.4	
9.5	
18.3	
128.7	

- Solve problems involving numbers up to three decimal places

Apply above strategies to problems

Apply above strategies to problems

Apply above strategies to problems

- Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal

5

Understanding decimals and their fraction equivalence can be supported by counting and the use of number lines. It may be useful to start work on percentages with the fact that 1% is equal to 1/100 and 0.01, 2% = 2/100 and 0.02 and so on rather than focusing just on 100% = 1. Use 0.5 and 50% frequently in place of 1/2 in a range of contexts, moving to use of decimals and percentages for tenths, fifths and quarters.

fractions to percentages and vice versa
 "percentages are hundredths. let's draw hundredths on a bar model to understand what percentages look like..."

fractions to decimals to percentages

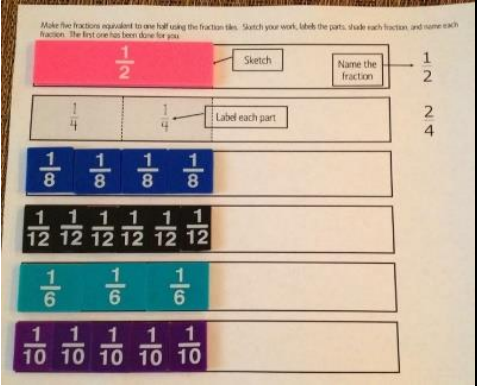
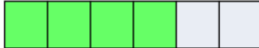




1. draw fraction on bar model.
 2. put on decimal number line.
 3. put on per cent number line.

$1/2 = 0.5 = 50\%$

$3/10 = 0.3 = 30\%$

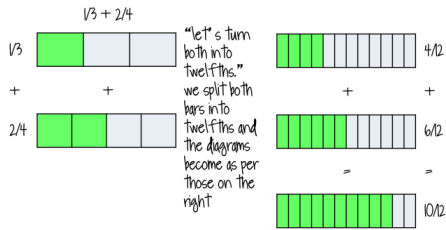
$2/5 = 0.4 = 40\%$

0.01	0.16	0.35	0.43	0.98
$\frac{1}{100}$	$\frac{16}{100}$	$\frac{35}{100}$	$\frac{43}{100}$	$\frac{98}{100}$
1%	16%	35%	43%	98%

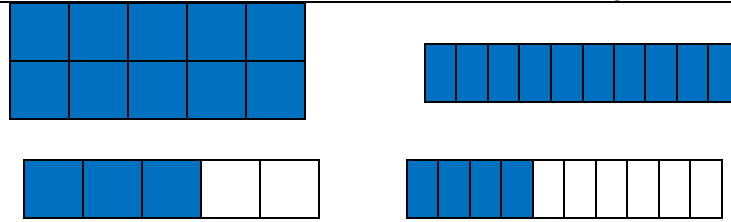
5	<p>- Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.</p> <p>Use playdough for children to make thirds, then split one third into two pieces to make sixths. After making thirds again, split one into 3 pieces to make ninths and so on, discussing how many sixths or ninths there would be if all the thirds were split in this way. Also use other representations, including drawing images of these fractions.</p>	Apply above strategies to problem solving	Apply above strategies to problem solving
6	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination		
6	<p>Use fraction wall bits to make equivalent fractions</p> 	<p>simplifying fractions write $\frac{4}{6}$ in its simplest form</p>  <p>“how can we remove some of the vertical lines to make fewer equal-sized pieces?”</p>  <p>“so $\frac{4}{6}$ in its simplest form is $\frac{2}{3}$”</p> <p>write $\frac{9}{12}$ in its simplest form</p>  <p>“how can we remove some of the vertical lines to make fewer equal-sized pieces?”</p>  <p>“no, that didn't work- the shading didn't fill the whole of each piece. let's try removing every third line rather than every second line...”</p>  <p>“so $\frac{9}{12}$ in its simplest form is $\frac{3}{4}$”</p>	<p>What is $\frac{9}{12}$ in its simplest form?</p>
	Compare and order fractions, including fractions > 1		
	See Year 5	See Year 5	See Year 5

- Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions

adding fractions different denominators



Demonstrate this physically



$$2 \frac{3}{5} + 1 \frac{4}{10}$$

Teach the children to find the common denominator first

$$2 \frac{3}{5} + 1 \frac{4}{10}$$

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

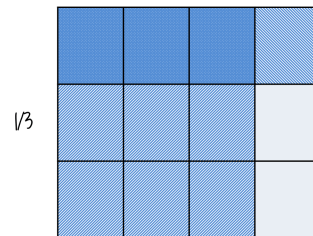
6

Show pictorial with play dough or anything physical which can be chopped up

multiplying fractions

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

$$\frac{3}{4}$$

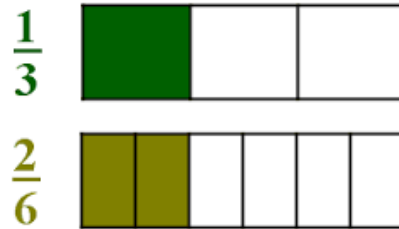


$$= \frac{3}{12}$$

$$\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$$

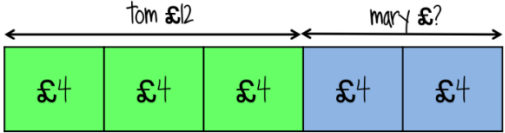
- Divide proper fractions by whole numbers [for example,]

Show pictorial with play dough or anything physical which can be chopped up



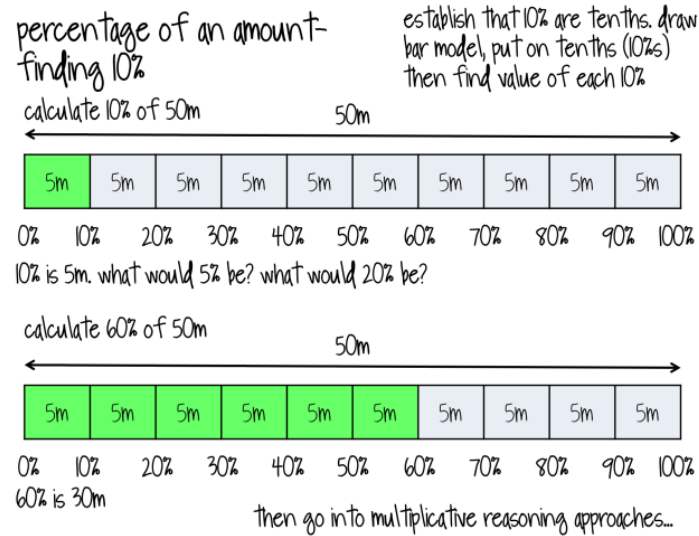
$$\frac{1}{3} \text{ divided by } 2 = \frac{2}{6}$$

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

	- Associate a fraction with division and calculate decimal fraction equivalents for a simple fraction		
	See short division	See short division	Teach 3 divided by 8 using short division (bus stop method) = 0.375 – repeat with other fractions
	- Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places		
	See Year 5	See Year 5	See Year 5
	- Multiply one-digit numbers with up to two decimal places by whole numbers		
	See multiplication	See multiplication	See multiplication
	- Use written division methods in cases where the answer has up to two decimal places		
	See division	See division	See division
	- Solve problems which require answers to be rounded to specified degrees of accuracy		
	See Year 5	See Year 5	See Year 5
	- Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.		
	See Year 5	See Year 5	See Year 5
6	- Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts		
Make strips of paper to show the model on the right	<p>sharing a quantity in a given ratio when you are told one side of the ratio, not the whole amount</p> <p>tom and mary share some money in the ratio 3 : 2. tom gets £12. how much does mary get?</p>  <p>draw bar model showing ratio 3 : 2 and tom getting £12 find 1 part is £4 mary gets £8</p>	As for pictorial drawing the model to prove their learning.	

- Solve problems involving the calculation of percentages for example, of measures, and such as 15% of 360] and the use of percentages for comparison

Make strips of paper to show the model on the right and cut up the % required



Which is greater – 15% of 350 or 20% of 280?

6

- Solve problems involving similar shapes where the scale factor is known or can be found

As with pictorial using strips of paper

The ratio of the weight of Package X to the weight of Package Y is 5 : 3. If the weight of Package X is 40 kg, find the total weight of the two packages.



5 units = 40 kg

1 unit = ■ kg

8 units = ■ kg

The total weight is ■ kg.

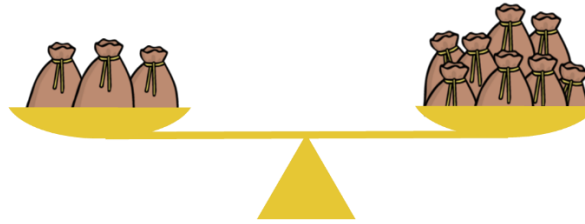
As for pictorial drawing the model to prove their learning.

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

6

As with pictorial using actual scales and objects

Here are a set of scales that balance. The bags on each side of the scales are of equal mass.



What could be the mass of the 2 different bags?

As for pictorial drawing the model to prove their learning.

Times Tables

Effective understanding and recall of times tables is the foundation of most of the maths children will do at primary school and the curriculum puts a massive emphasis on knowing them early. In order to help ensure this happens, we will be introducing the children to a superhero themed approach to learning their times tables. The following list will show the order in which times tables will be taught and how they progress beyond knowing the key facts.

At Hucknall National C of E Primary School, we expect the children to know the following times tables in each Year group:

Year 1 – introduce counting in 2s, 5 and 10s

Year 2 – x2, x5, x10

Year 3 – x3, x4, x8, x 11

Year 4 – x6, x7, x9, x12

Year 5 & 6 – apply times table knowledge to other calculations e.g. $15 \times 3 = 10 \times 3 + 5 \times 3 = 45$

In order to support the children's recall of times table facts children have access to Times Table Rockstars. This is an online platform which is split into both single player and multiplayer modes in order to develop their fluency and accuracy. The different sections are outlined below.

Single Player 🦋

Garage - the questions will only come from the times tables the teacher has set for the week. It will include multiplication *and* division questions. As pupils start to answer questions, TT Rock Stars works out which facts they take longer on and will give them more of these questions to answer. The Garage is best for getting quicker at a few facts. Players get 10 coins per question.

Studio - the questions in the Studio can be anything from 1×1 up to 12×12 . TT Rock Stars calculates the mean response time from their last 10 games in the Studio and translates that time into a Rock Status.

≤ 1 sec/qu = Rock Hero

≤ 2 secs/qu = Rock Legend

≤ 3 secs/qu = Rock Star

≤ 4 secs = Headliner

≤ 5 secs/qu = Support Act

≤ 6 secs/qu = Breakthrough Artist

≤ 7 secs/qu = Unsigned Act

≤ 8 secs/qu = Gigger

≤ 9 secs/qu = Busker

≤ 10 secs/qu = Garage Rocker

> 10 secs/qu = Wannabe

If you don't play in the Studio you don't get a Rock Status.

Players earn 1 coin per question and the Studio is the place for them to set their best time across all the tables.

Soundcheck – When you play Soundcheck, you get 20 questions each with a 5-second time limit. The questions are multiplication only and evenly weighted in terms of difficulty each time you play. Players earn 5 coins per correct answer.

Multiplayer

Rock Arena - The Arena allows players to compete against all other members of their Band (their Bandmates would need to join the same game in order to compete together).

A new Arena game starts every 15 seconds and once the clock starts they race to answer more questions than the others. In the Arena, questions will only come from the times tables the teacher has set for the week, similar to the Garage. They earn 1 coin per correct answer.

Rock Festival - The Rock Festival games are open to players from around the world. Like the Arena, there is no limit to the number of players who can join a game; however, unlike the Arena, questions are selected at random from 1×1 to 12×12.

Pupils might choose the Rock Festival if they were playing at home (and therefore couldn't easily synchronise playing against a classmate) or wanted to compete against others not in their Band. They earn 1 coin per correct answer.

Individual Pupil Statistics

TT Rockstars also provides teachers and parents with personalised information on a child's accuracy with their times tables. In order to access this information log in to TT rockstars. Then go to **My School > Stats Dashboard > School Headlines** and click on the name of your class, to get to their Stats area.

Then, to see your pupils' individual scores, click across to **Individual Scores**.

It can also show you a heat map (see picture below) which shows the children's speed at answering each question. In order to view this, click **Stats**, along from a pupil's name on their band's "Individual Scores" page, to see their personal heatmap. Alternatively, click **Stats**, by the pupil's name on the "Pupil Setup" page. With the Stats bolt-on you can even scroll back through a pupil's history of heatmaps to see how much they've improved!

Grouped											Basic	
	1	2	5	10	3	4	8	6	7	9	11	12
1	1 × 1	1 × 2	1 × 5	1 × 10	1 × 3	1 × 4	1 × 8	1 × 6	1 × 7	1 × 9	1 × 11	1 × 12
2	2 × 1	2 × 2	2 × 5	2 × 10	2 × 3	2 × 4	2 × 8	2 × 6	2 × 7	2 × 9	2 × 11	2 × 12
5	5 × 1	5 × 2	5 × 5	5 × 10	5 × 3	5 × 4	5 × 8	5 × 6	5 × 7	5 × 9	5 × 11	5 × 12
10	10 × 1	10 × 2	10 × 5	10 × 10	10 × 3	10 × 4	10 × 8	10 × 6	10 × 7	10 × 9	10 × 11	10 × 12
3	3 × 1	3 × 2	3 × 5	3 × 10	3 × 3	3 × 4	3 × 8	3 × 6	3 × 7	3 × 9	3 × 11	3 × 12
4	4 × 1	4 × 2	4 × 5	4 × 10	4 × 3	4 × 4	4 × 8	4 × 6	4 × 7	4 × 9	4 × 11	4 × 12
8	8 × 1	8 × 2	8 × 5	8 × 10	8 × 3	8 × 4	8 × 8	8 × 6	8 × 7	8 × 9	8 × 11	8 × 12
6	6 × 1	6 × 2	6 × 5	6 × 10	6 × 3	6 × 4	6 × 8	6 × 6	6 × 7	6 × 9	6 × 11	6 × 12
7	7 × 1	7 × 2	7 × 5	7 × 10	7 × 3	7 × 4	7 × 8	7 × 6	7 × 7	7 × 9	7 × 11	7 × 12
9	9 × 1	9 × 2	9 × 5	9 × 10	9 × 3	9 × 4	9 × 8	9 × 6	9 × 7	9 × 9	9 × 11	9 × 12
11	11 × 1	11 × 2	11 × 5	11 × 10	11 × 3	11 × 4	11 × 8	11 × 6	11 × 7	11 × 9	11 × 11	11 × 12
12	12 × 1	12 × 2	12 × 5	12 × 10	12 × 3	12 × 4	12 × 8	12 × 6	12 × 7	12 × 9	12 × 11	12 × 12
0-1 s												
1-2 s												
2-3 s												
3-4 s												
4-5 s												
5-6 s												
6-7 s												
7-8 s												
8-9 s												
9-10 s												
>10 s												

We understand that not all pupils will have access to the TT Rockstars online platform at home. For these children there are also worksheets available for teachers to download. These worksheets allow children to follow a carefully sequenced schedule of multiplication *and* division practice over the course of several weeks, or months. To get the most from TT Rockstars, classes should follow programmes with practise Worksheets scheduled on either four or five days of the week, and certainly no less than three. In order to access the worksheets, log in to the website and go to **My School > Worksheets** to download suggested Worksheets or to make your own schedule. Pupils have 3 minutes to complete a worksheet.