Kingsclere C of E Primary School Progression in Calculations - Updated March 2023

Addition

Objective and Strategies	Concrete	Pictorial	Abstract
Matching and sorting	Everyday objects, buttons, jewels, pompoms, stones, pasta, people – anything!	Cards, five frames, hoops, stories	N/A
One more	Everyday objects, buttons, jewels, pompoms, stones, pasta, people – anything! Songs and stories	Birds in the tree, one more joins Stories - 10 little pirates	N/A
Number bonds to 5	Everyday objects, buttons, jewels, pompoms, stones, pasta, people – anything! Five frames. Numicon.	Five frame, part-part whole. Coloured cubes. Numicon boards pictures.	N/A
number bonds to 10	Everyday objects, buttons, jewels, pompoms, stones, pasta, people – anything! Ten frame. Coloured cubes. numicon	Ten frame and coloured cubes.	N/A
Adding more	Everyday objects, buttons, jewels, pompoms, stones, pasta, people – anything!	Number line, ten frame, part-part whole	N/A

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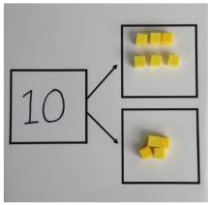
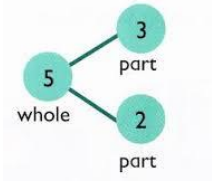
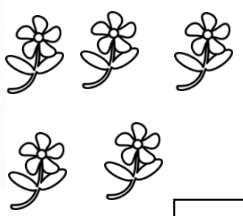
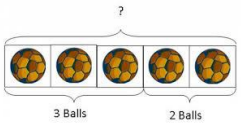
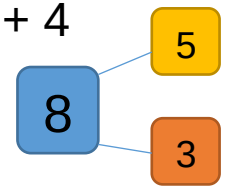
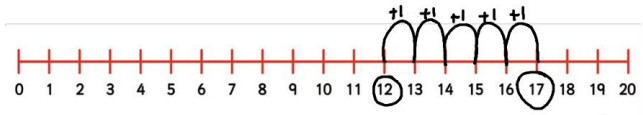
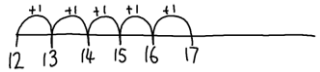
Combining two parts to make a whole: part-whole model	   Use cubes to add two numbers together as a group or in a bar. 	   Use pictures to add two numbers together as a group or in a bar. 	4 + 3 = 7 10 = 6 + 4  Use the part-part whole diagram as shown above to move into the abstract.
Starting at the bigger number and counting on (structured then unstructured number lines)	 Start with the larger number on the bead string and then count on to the smaller number 1 by 1 to find the answer.	12 + 5 = 17  Start at the larger number on the number line and count on in ones or in one jump to find the answer.	5 + 12 = 17  Place the larger number in your head and count on the smaller number to find your answer.

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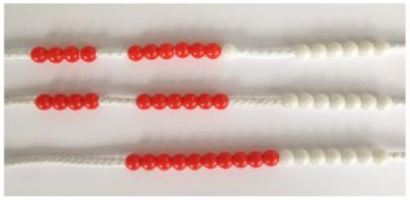
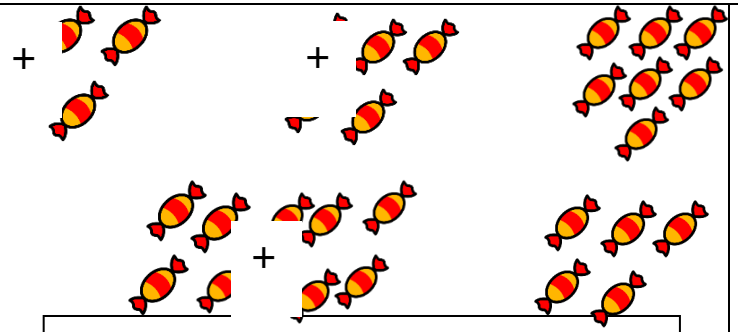
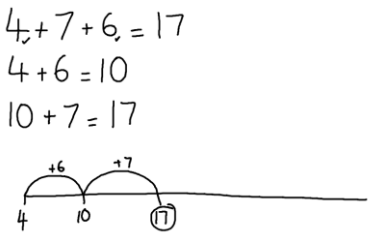
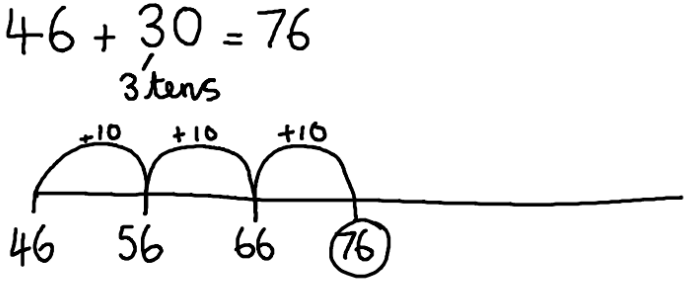
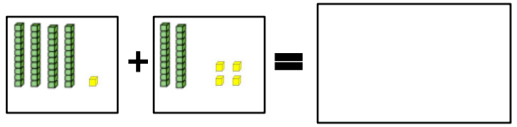
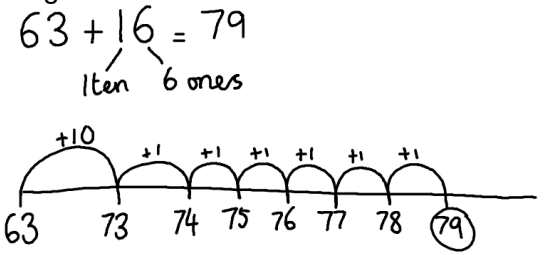
Adding three single digits	4 + 7 + 6= 17 Put 4 and 6 together to make 10. Add on 7.  Following on from making 10, make 10 with 2 of the digits (if possible) then add on the third digit.	 Add together three groups of objects. Draw a picture to recombine the groups to make 10.	 Combine the two numbers that make 10 and then add on the remainder.
Adding multiples of ten	50 = 30 + 20 Model using dienes and bead strings 		Place the number in your head and count forwards in multiples of 10
Starting at the bigger number and counting on 2-digit+2-digit	Dienes when not regrouping 	Unstructured number line Partitioning 10s and 1s 	22+21 Start with bigger number, add the 10s then the 1s (unstructured number showing jumps)

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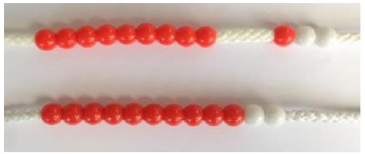
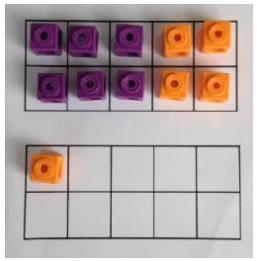
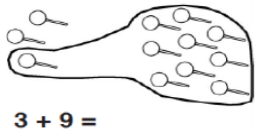
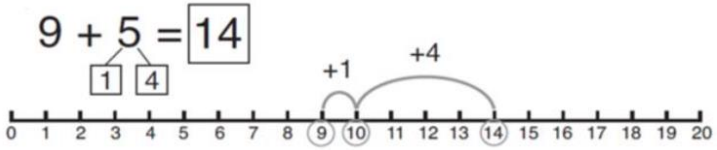
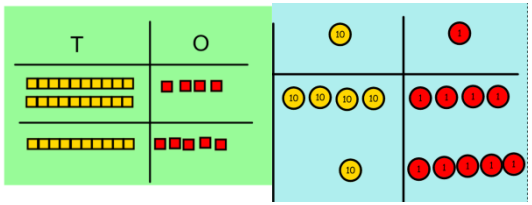
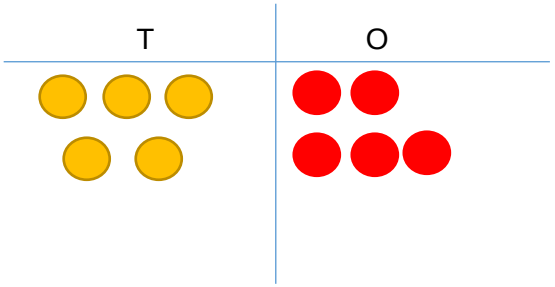
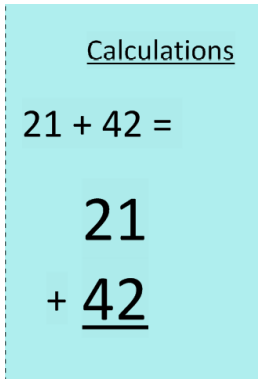
Regrouping to make 10.	 6 + 5 = 11  Start with the bigger number and use the smaller number to make 10.	 3 + 9 = Use pictures or a number line. Regroup or partition the smaller number to make 10. 	7 + 4= 11 If I am at seven, how many more do I need to make 10? How many more do I add on now?
Column method- no regrouping/ exchanging	24 + 15= Add together the ones first then add the tens. Use the Base 10 blocks first before moving onto place value counters.  *NOTE: tens and ONES not tens and units*	After practically using the base 10 blocks and place value counters, children can draw the counters to help them to solve additions. 	

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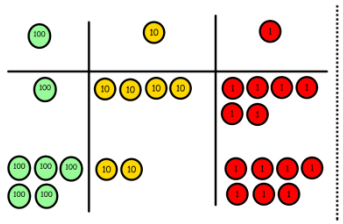
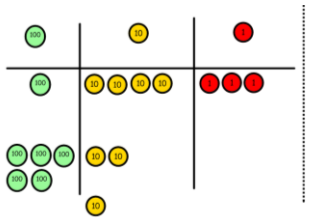
Column method - regrouping/ exchanging

Make both numbers on a place value grid.



146
+ 527

Add up the ones and exchange 10 ones for one 10.



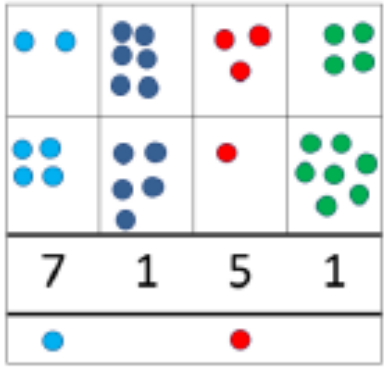
146
+ 527

Add up the rest of the columns, exchanging the 10 counters from ones column for the next place value column until every column has been added.

This can also be done with Base 10 to help children clearly see that 10 ones equal 1 ten and 10 tens equal 100.

As children move on to decimals, money and decimal place value counters can be used to support learning.

Children can draw a pictoral representation of the columns and place value counters to further support their learning and understanding.



Start by partitioning the numbers before moving on to clearly show the exchange below the addition.

20 + 5
40 + 8
60 + 13 = 73

536
+ 85
621
1 1

As the children move on, introduce decimals with the same number of decimal places and different.
Money can be used here.

72.8
+ 54.6
127.4
1 1

£ 2 3 . 5 9
+ £ 7 . 5 5
£ 3 1 . 1 4
1 1 1

2 3 . 3 6 1
9 . 0 8 0
5 9 . 7 7 0
+ 1 . 3 0 0
9 3 . 5 1 1
2 1 2

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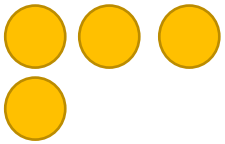
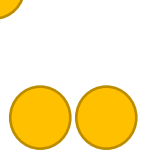
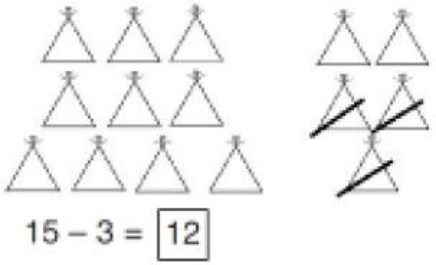
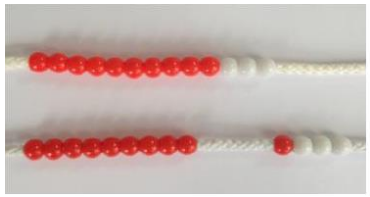
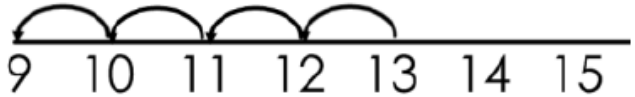
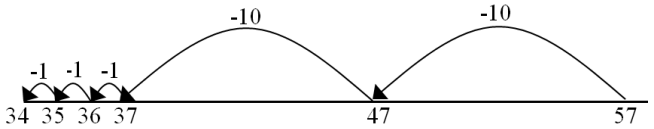
Subtraction

Objective and Strategies	Concrete	Pictorial	Abstract
Taking away ones	Use physical objects, counters, cubes etc to show how objects can be taken away.  6 – 2 = 4  	Cross out drawn objects to show what has been taken away.  15 – 3 = 12	18 - 3= 15 8 – 2 = 6
Counting back	Make the larger number in your subtraction. Move the beads along your bead string as you count backwards in ones. 13 – 4  Use counters and move them away from the group as you take them away counting backwards as you go. 	Count back on a number line or number track  Start at the bigger number and count back the smaller number showing the jumps on the number line.  This can progress all the way to counting back using two 2 digit numbers.	Put 13 in your head, count back 4. What number are you at? Use your fingers to help.

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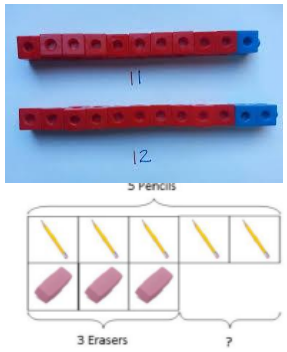
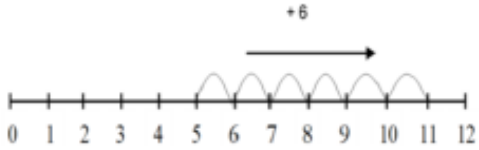
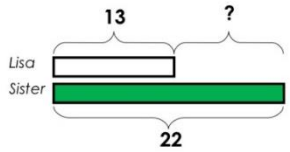
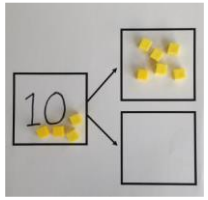
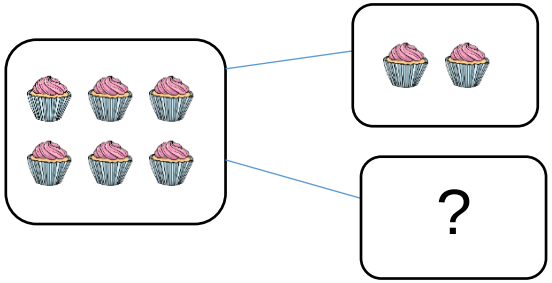
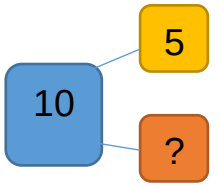
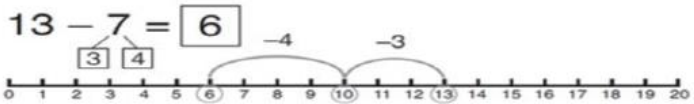
Find the difference	Compare amounts and objects to find the difference  Use cubes to build towers or make bars to find the difference Use basic bar models with items to find the difference	 Count on to find the difference. Draw bars to find the difference between 2 numbers. **Comparison Bar Models** *Lisa is 13 years old. Her sister is 22 years old. Find the difference in age between them.*  	Hannah has 23 sandwiches, Helen has 15 sandwiches. Find the difference between the number of sandwiches.
Part Part Whole Model	 Link to addition- use the part whole model to help explain the inverse between addition and subtraction. If 10 is the whole and 6 is one of the parts. What is the other part? 10 - 6 =	Use a pictorial representation of objects to show the part-part whole model.  	 Move to using numbers within the part-part whole model.
Make 10	14 – 9 =  Make 14 on the ten frame. Take away the four first to make 10 and then takeaway one more so you have taken away 5. You are left with the answer of 9.	 Start at 13. Take away 3 to reach 10. Then take away the remaining 4 so you have taken away 7 altogether. You have reached your answer.	16 – 8= How many do we take off to reach the next 10? How many do we have left to take off?

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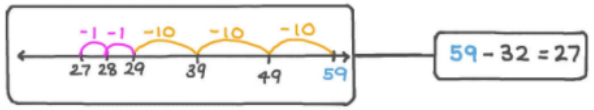
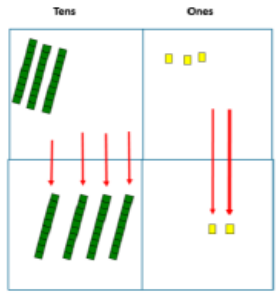
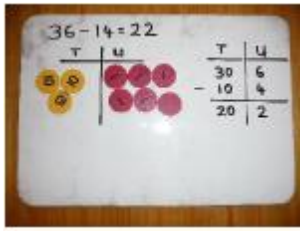
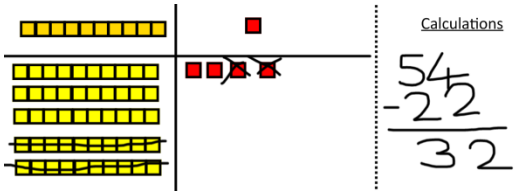
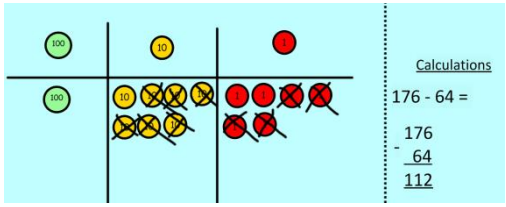
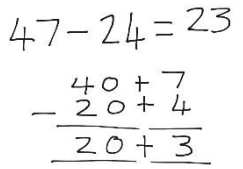
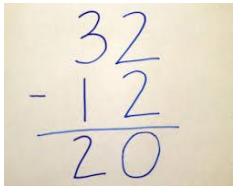
Counting back 2 digit – 2 digit	Counting back using dienes by making the numinuend and removing the subrahend using dienes. Take tens first progress to exchange as necessaery.	Unstructured number line 	27-13 Taking away 10s follow by ones in small jumps
Column method without regrouping/ exchange	 Use Base 10 to make the bigger number then take the smaller number away. *NOTE: tens and ONES not tens and units* Show how you partition numbers to subtract. Again make the larger number first. 	 Draw the Base 10 or place value counters alongside the written calculation to help to show working. 	 This will lead to a clear written column subtraction. 

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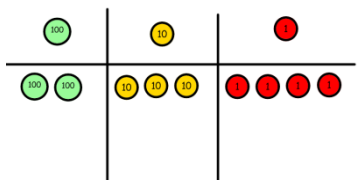
Column method with regrouping/ Exchange

Use Base 10 to start with before moving on to place value counters. Start with one exchange before moving onto subtractions with 2 exchanges.

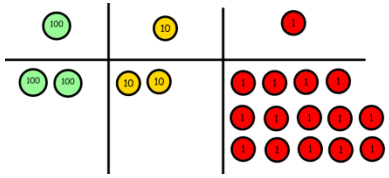
Make the larger number with the place value counters



Calculations

234
- 88

Start with the ones, can I take away 8 from 4 easily? I need to exchange one of my tens for ten ones.

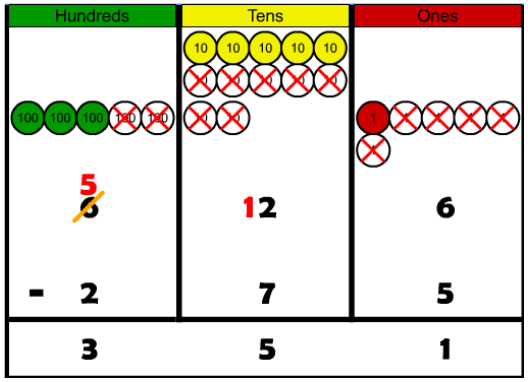


Calculations

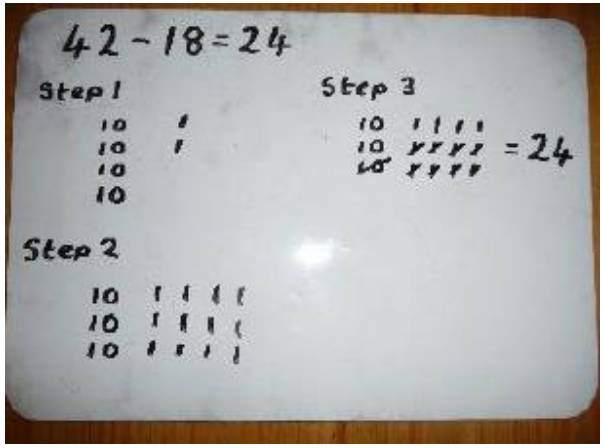
234
- 88

Now I can subtract my 8 ones.

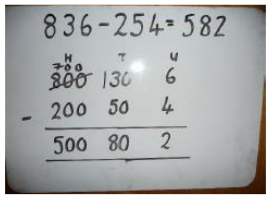
Now look at the tens, can I take away 8 tens easily?



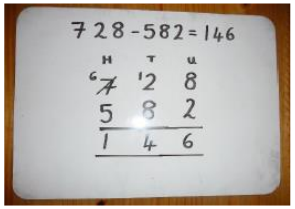
Draw the counters onto a place value grid and show what you have taken away by crossing the counters out as well as clearly showing the exchanges you make.



When confident, children can find their own way to record the exchange/regrouping.



Children can start their formal written method by partitioning the number into clear place value columns.



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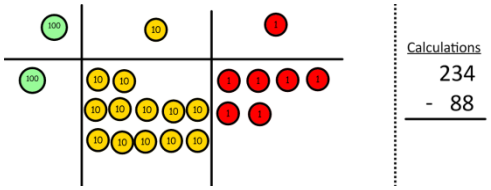
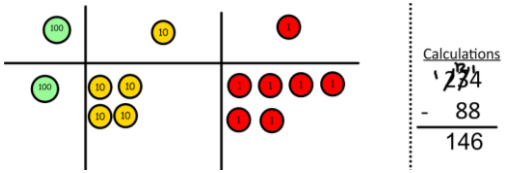
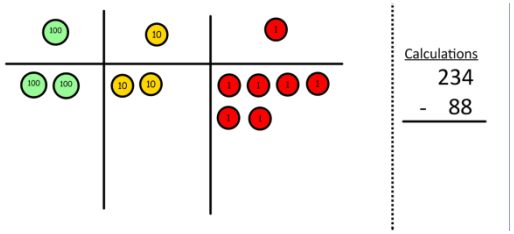
Column method with regrouping/ Exchange (cont)	I need to exchange one hundred for 10 tens.  Calculations 234 - 88 Now I can take away 8 tens and complete my subtraction  Calculations ~~234~~ - 88 146  Calculations 234 - 88 Show children how the concrete method links to the written method alongside your working. Cross out the numbers when exchanging and show where we write our new amount.	Just writing the numbers as shown here shows that the child understands the method and knows when to exchange/regroup.	Moving forward the children use a more compact method. This will lead to an understanding of subtracting any number including decimals. 5 12 1 2 ~~6~~ ~~3~~ . **0** - 2 6 . 5 2 3 6 . 5 To ensure both decimal numbers are written to the same decimal place, put in place holders before calculating.

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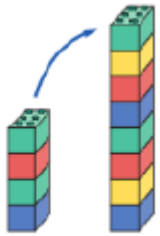
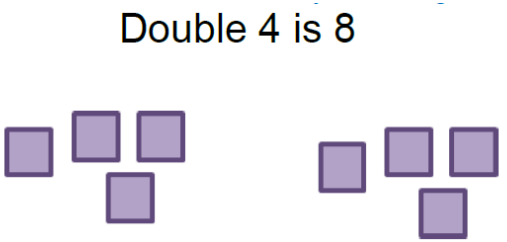
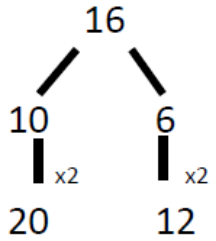
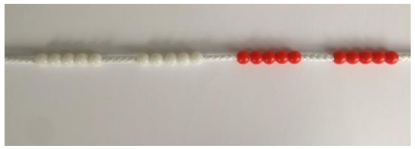
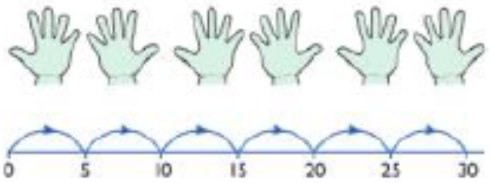
Multiplication

Objective and Strategies	Concrete	Pictorial	Abstract
Doubling	Use practical activities to show how to double a number.  double 4 is 8 4 × 2 = 8	Draw pictures to show how to double a number.  	 Partition a number and then double each part before recombining it back together.
Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25 , 30

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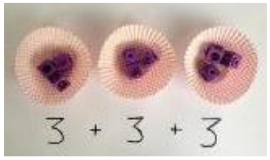
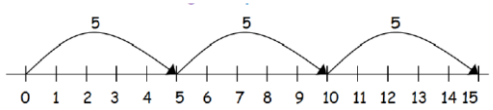
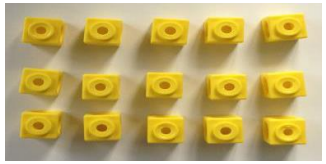
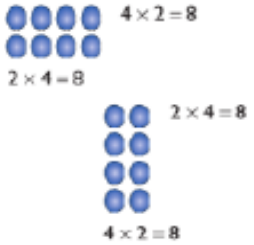
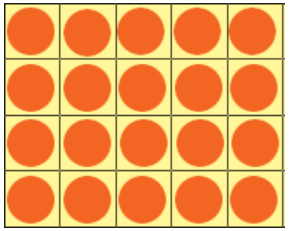
Repeated addition	   Use different objects to add equal groups.	There are 3 plates. Each plate has 2 star biscuits on. How many biscuits are there?  2 add 2 add 2 equals 6  5 + 5 + 5 = 15	Write addition sentences to describe objects and pictures. 
Arrays- showing commutative multiplication	Create arrays using counters/ cubes to show multiplication sentences.  	Draw arrays in different rotations to find **commutative** multiplication sentences.   Link arrays to area of rectangles.	Use an array to write multiplication sentences and reinforce repeated addition.  5 + 5 + 5 = 15 3 + 3 + 3 + 3 + 3 = 15 5 x 3 = 15 3 x 5 = 15

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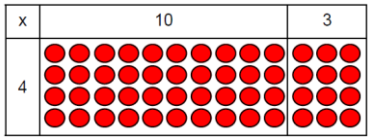
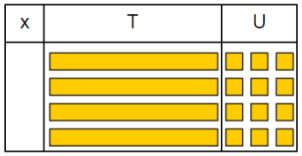
Grid (Area) Method

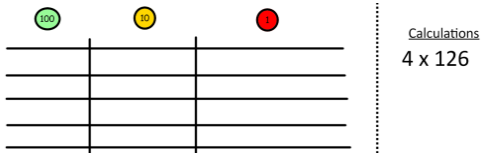
Show the link with arrays to first introduce the grid method showing the area each part is represented by clearly.
4 rows of 10, 4 rows of 3



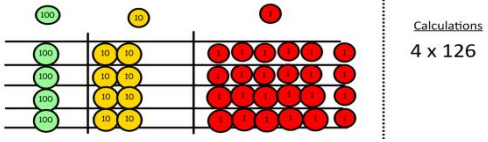
Move on to using Base 10 to progress towards a more compact method.
4 rows of 13



Move on to place value counters to show how we are finding groups of a number.We are multiplying by 4 so we need 4 rows.



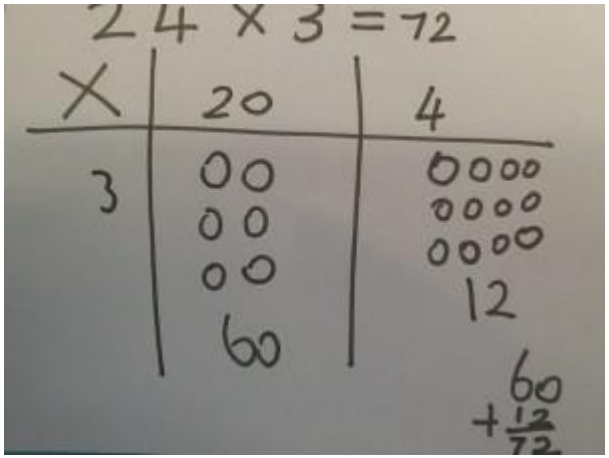
Fill each row with 126.



Add up each column, starting with the ones making any exchanges needed.

Children can represent the work they have done with place value counters in a way that they understand.

They can draw the counters, using colours to show different amounts or just use circles in the different columns to show their thinking as shown below.

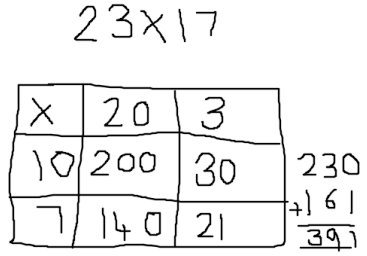


Start with multiplying by one digit numbers and showing the clear addition alongside the grid.

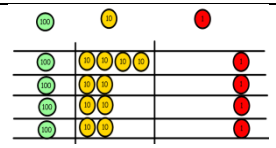
×	30	5
7	210	35

210 + 35 = 245

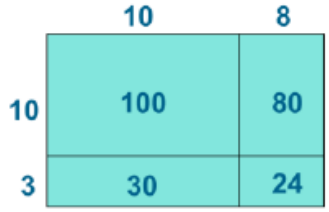
Moving forward, multiply by a 2 digit number showing the different rows within the grid method.



Grid/Area Method (cont)



Then you have your answer.



X	1000	300	40	2
10	10000	3000	400	20
8	8000	2400	320	16

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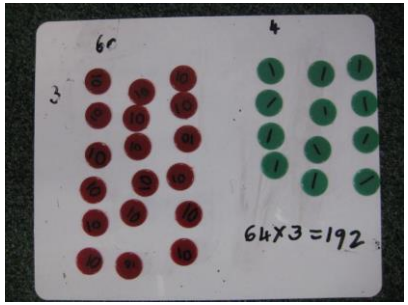
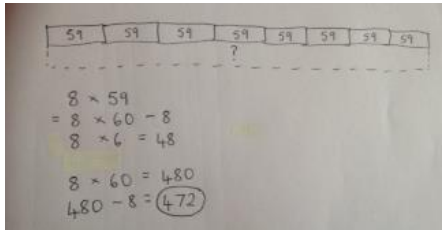
Column multiplication

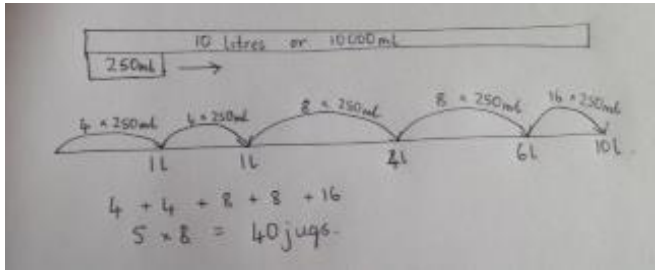
Children can continue to be supported by place value counters at the stage of multiplication.



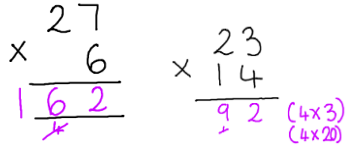
It is important at this stage that they always multiply the ones first and note down their answer followed by the tens which they note below.

Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.

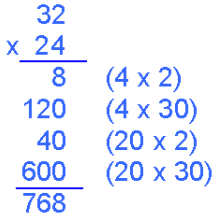




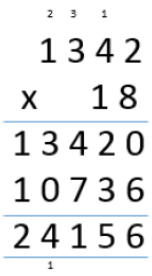
Start with long multiplication, reminding the children about lining up their numbers clearly in columns.



If it helps, children can write out what they are solving next to their answer, especially where 2 digit numbers are the multiplier.



This moves on to the more compact written method



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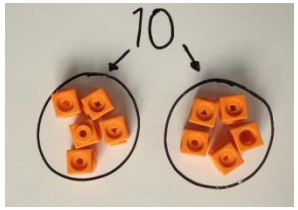
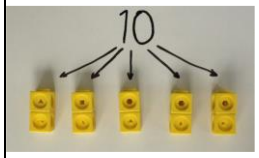
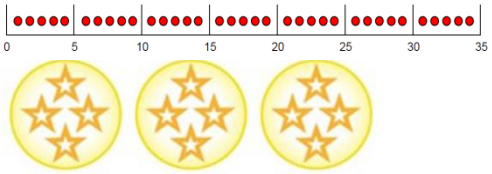
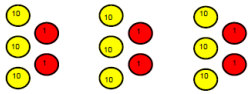
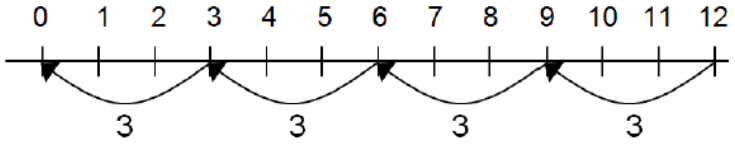
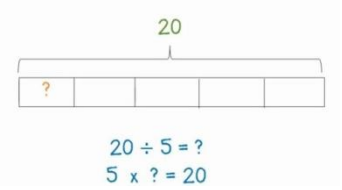
Division

Objective and Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	 I have 10 cubes, can you share them equally in 2 groups? 	Children use pictures or shapes to share quantities.  8 ÷ 2 = 4	Share 9 buns between three people. 9 ÷ 3 = 3
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding.   96 ÷ 3 = 32 	Use a number line to show jumps in groups. The number of jumps equals the number of groups.  Think of the bar as a whole. Split it into the number of groups you are dividing by and work out how many would be within each group. 	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

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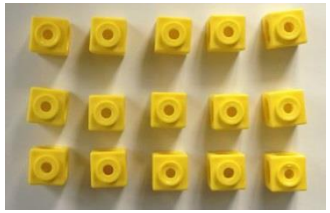
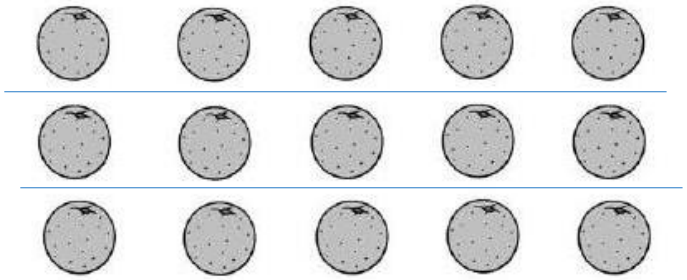
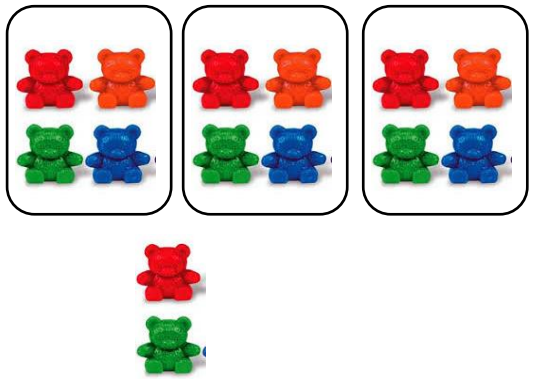
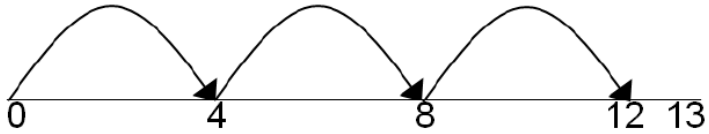
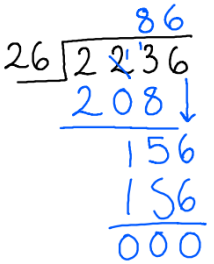
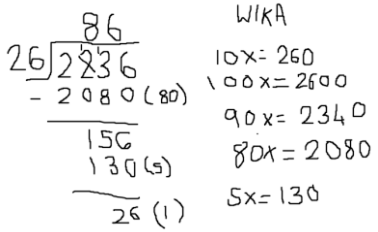
Division within arrays	 Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg 15 ÷ 3 = 5 5 x 3 = 15 15 ÷ 5 = 3 3 x 5 = 15	 Draw an array and use lines to split the array into groups to make multiplication and division sentences.	Find the inverse of multiplication and division sentences by creating four linking number sentences. 7 x 4 = 28 4 x 7 = 28 28 ÷ 7 = 4 28 ÷ 4 = 7
Division with a remainder	14 ÷ 3 = Divide objects between groups and see how much is left over 	Jump forward in equal jumps on a number line then see how many more you need to jump to find a remainder.  Draw dots and group them to divide an amount and clearly show a remainder. 	Complete written divisions and show the remainder using r. 

Long division		Children are encouraged to jot WIKA (What I Know Already) alongside the abstract long division method. Not all multiplicands will need ot be calculated for efficiency. WIKA 1X = 26 2X 5X = 130 6X = 156 8X = 208 9X = 234 10X = 260 For some children, division by chunking is a more workable method. Here children work out 'chunks' which are factors of the divisor. They continue to subtract chunks until there is nothing left or they are left with a remainder.	 

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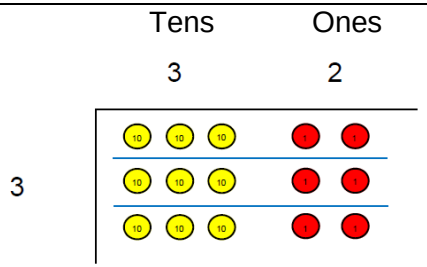
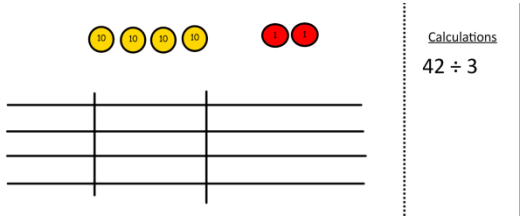
Short division

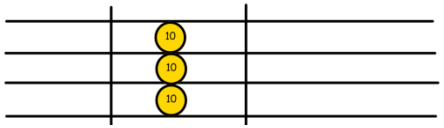


Use place value counters to divide using the bus stop method alongside

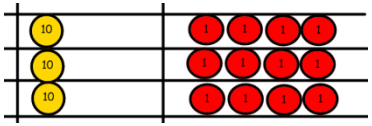


42 ÷ 3=

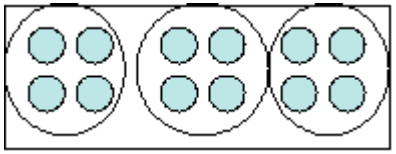
Start with the biggest place value, we are sharing 40 into three groups. We can put 1 ten in each group and we have 1 ten left over.



We exchange this ten for ten ones and then share the ones equally among the groups. We look how much in 1 group so the answer is 14.

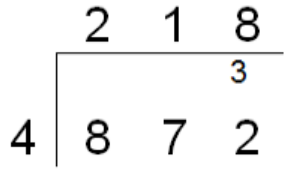


Students can continue to use drawn diagrams with dots or circles to help them divide numbers into equal groups.

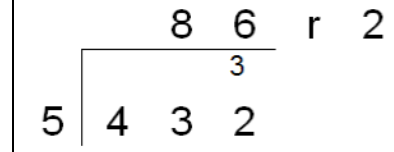


Encourage them to move towards counting in multiples to divide more efficiently.

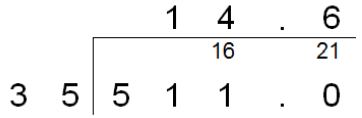
Begin with divisions that divide equally with no remainder.



Move onto divisions with a remainder.



Finally move into decimal places to divide the total accurately.



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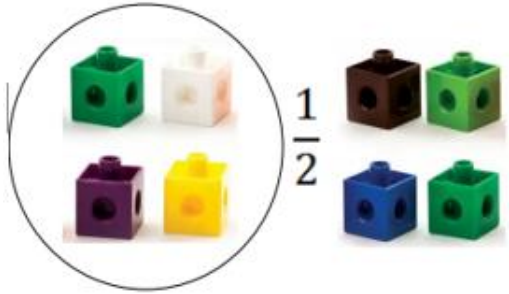
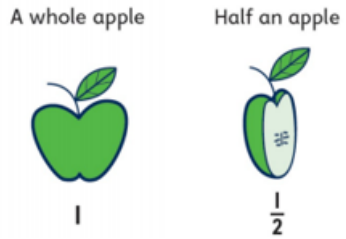
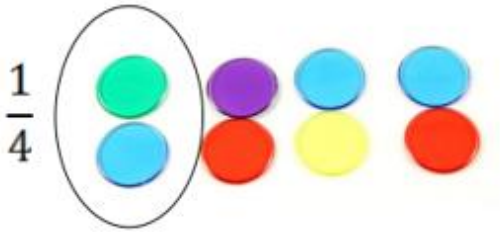
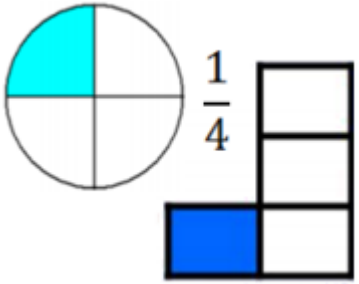
Fractions

Objective and Strategies	Concrete	Pictorial	Abstract
Recognise, find and name a half as one of two equal parts of an object, shape or quantity			Half of 10 = ? Half of 8 = ? $\frac{1}{2}$ of 14 = ?
Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity			Half of 20 = ? Half of 12 = ? $\frac{1}{4}$ of 8 = ?

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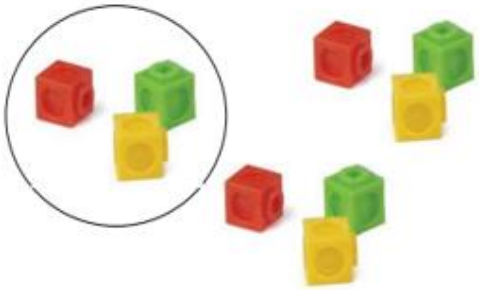
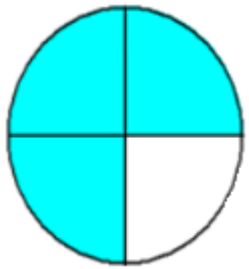
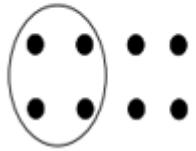
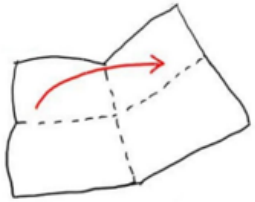
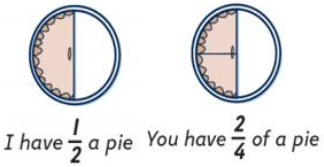
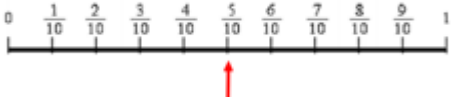
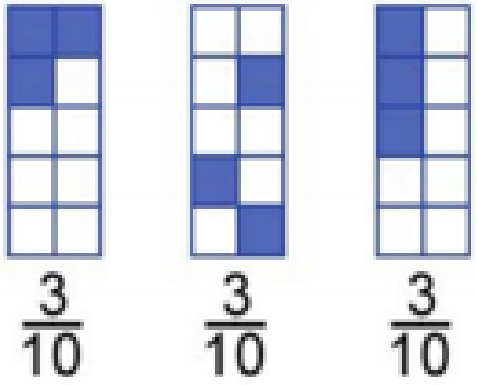
Recognise, find, name and write fractions 1/3, ¼, 2/4 and ¾ of a length, shape, set of objects or quantity.			$\frac{2}{4}$ of 8 = □ 
Write simple fractions and recognise the equivalence of 2/4 and 1/2.			$\frac{1}{2}$ of 6 = □ 
Count up and down in tenths; recognise that tenths arise from dividing and object into ten equal parts and in dividing one digit numbers or quantities by ten.			$\frac{1}{10}$ of 6 = 0.6 because 6 ÷ 10 = 0.6 $\frac{1}{10}$ of 7 = 0.7 because 7 ÷ 10 = 0.7

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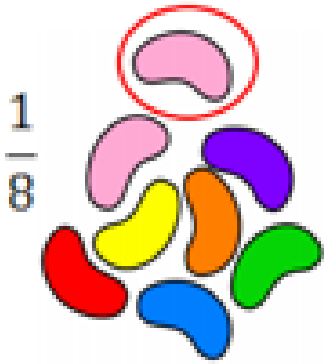
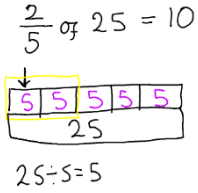
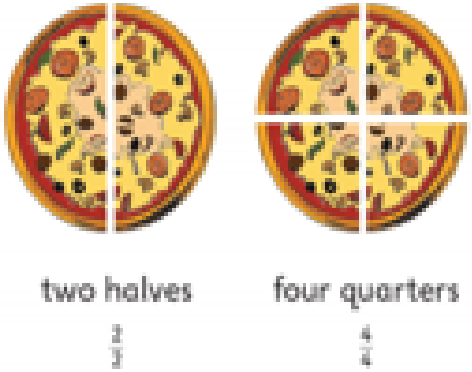
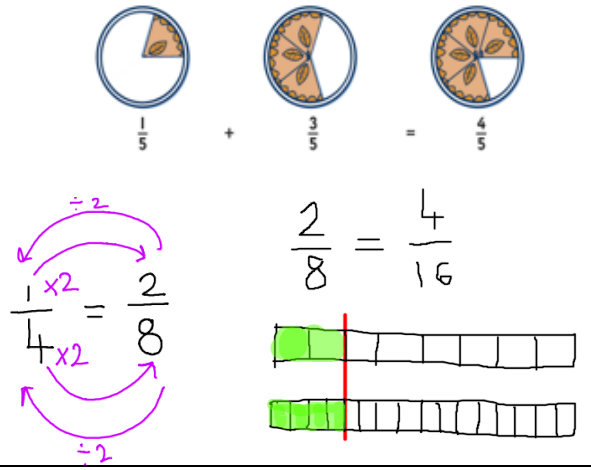
Recognise, find and write fractions of a discrete set of objects; unit and non-unitary fractions and use fractions as numbers		 This would progress to using a bar model 	1/5 of 15 sweets = 3 Because 15 ÷ 5 = 3 2/5 of 15 sweets = 6 because 15 ÷ 5 = 3 and 3 x 2 = 6
Recognise and show, using diagrams, equivalent fractions with small denominators			$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

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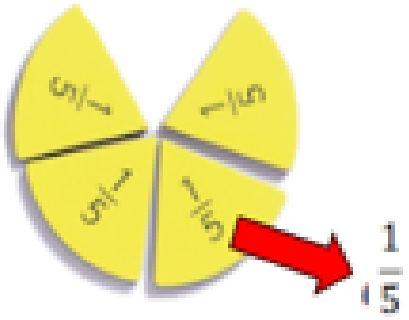
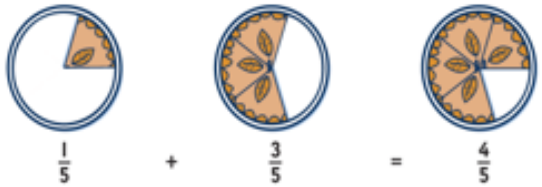
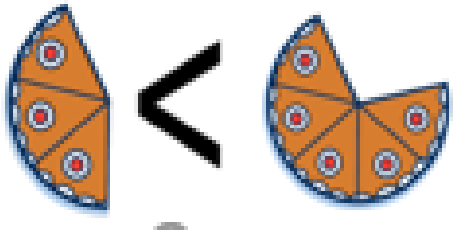
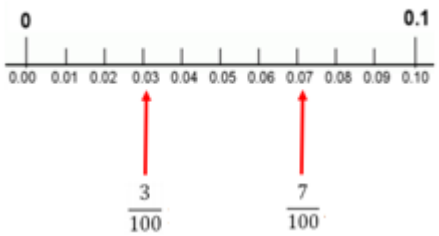
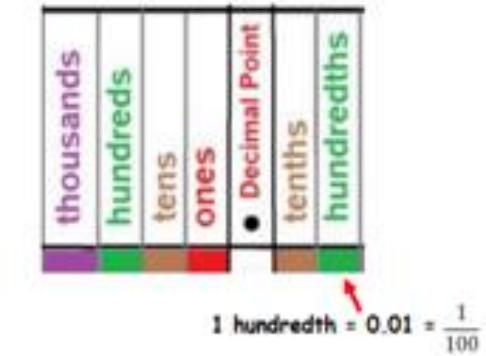
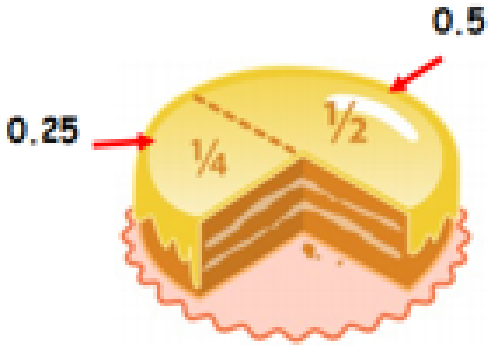
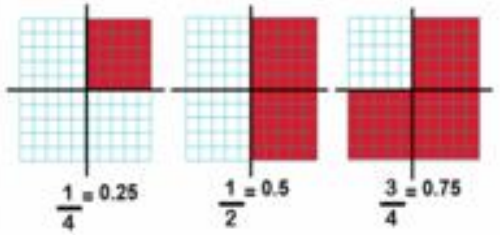
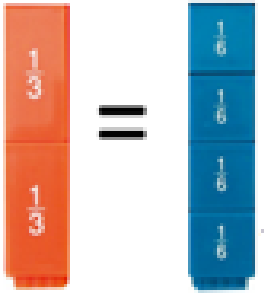
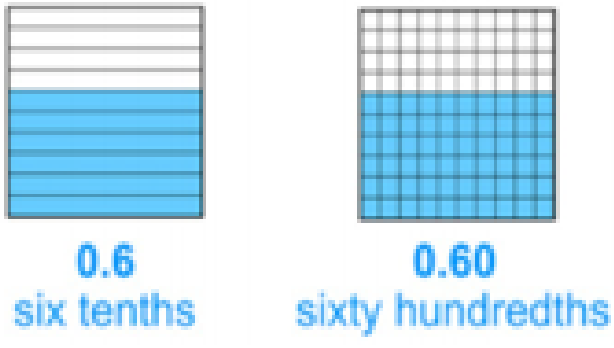
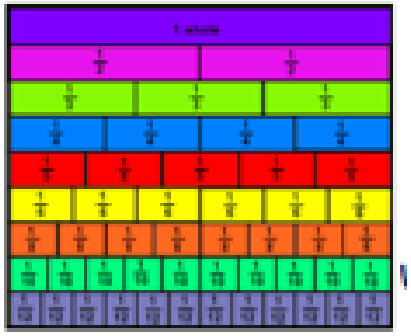
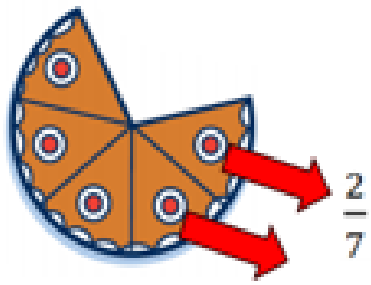
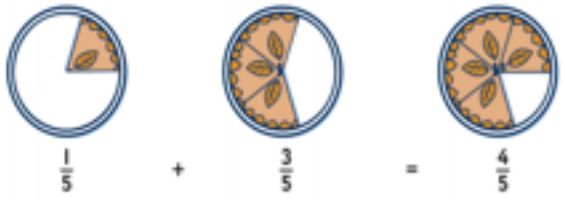
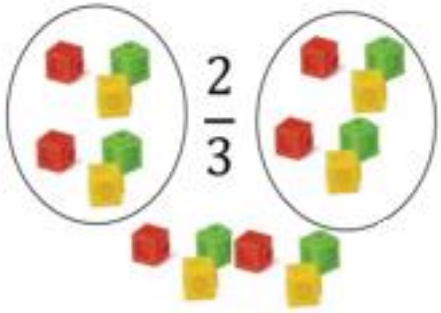
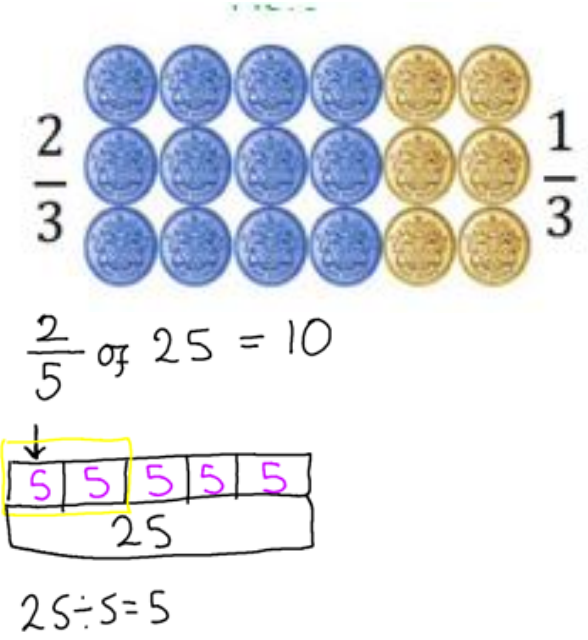
Add and subtract fractions with the same denominator			$\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$ $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$
Compare and order unit fractions with the same denominator			$\frac{2}{8}$ $\frac{3}{8}$ $\frac{5}{8}$ $\frac{7}{8}$
Count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10.			$\frac{1}{100}$ of 60 = 0.6 because 60 ÷ 100 = 0.6 $\frac{1}{10}$ of 70 = 0.7 so $\frac{1}{100}$ of 70 = 0.07

Recognise and write decimal equivalents to ½, ¼ and 3/4 .			$\frac{1}{2} = 0.5$ $\frac{1}{4} = 0.25$ $\frac{3}{4} = 0.75$
Recognise and show, using diagrams, families of common equivalents	 	 	$\frac{1}{10} = 0.1$ $\frac{3}{10} = 0.3$ $\frac{5}{10} = \frac{1}{2} = 0.5$ $\frac{8}{100} = 0.08$ $\frac{2}{3} = \frac{4}{6}$ $\frac{3}{5} = \frac{6}{10}$ $\frac{2}{12} = \frac{1}{6}$

Add and subtract fractions with the same denominator			Sam eats 2/7 of a whole pizza. How much does he have left? Lucy and Ben both eat 3/8 of a cake. How much have they eat altogether?
Solve problems involving increasingly harder fractions to calculate quantities and fractions to divide quantities, including non-unit fractions where the solution is a whole number			2/3 of £18 £18 ÷ 3 = £6 £6 x 2 = £12 Attention should also be drawn to the parallel questions 2/3 of 33 and 2/3 x 33

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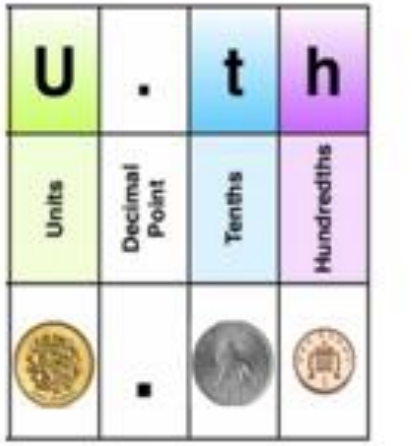
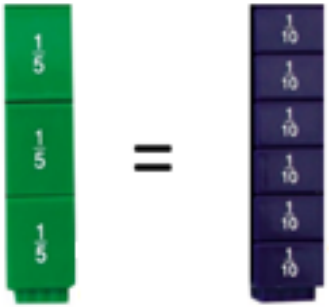
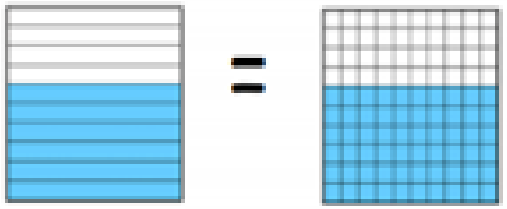
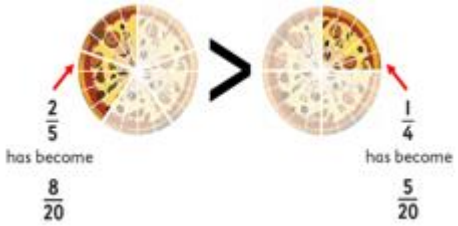
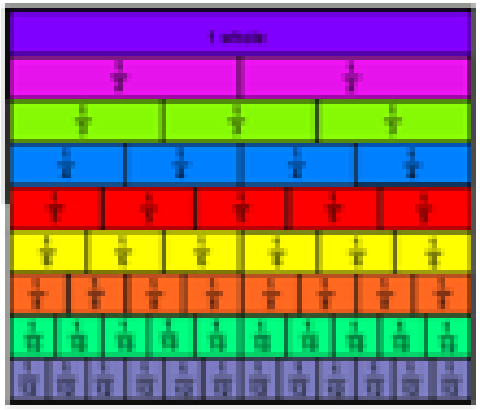
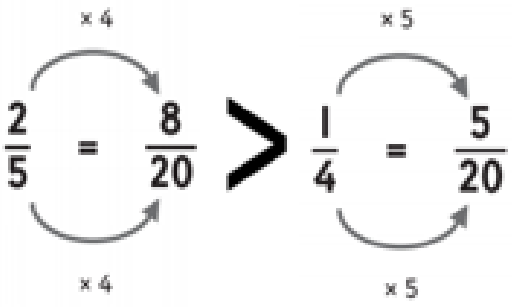
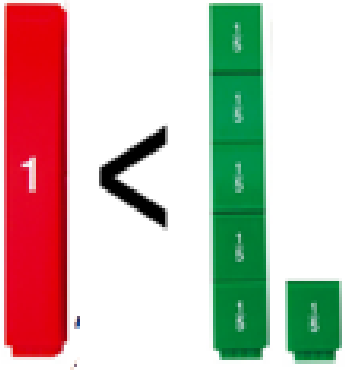
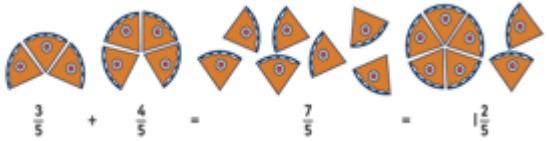
Solve simple measure and money problems involving fractions and decimals to two decimal places			100cm = 1m 50cm = $\frac{1}{2}$ = 0.5m 25cm = $\frac{1}{4}$ = 0.25m 10cm = $\frac{1}{10}$ = 0.1m 30cm = $\frac{3}{10}$ = 0.3m
Identify, name and write equivalent fractions of a given fractions, represented visually, including tenths and hundredths		 $\frac{6}{10} = \frac{60}{100}$	Abstract $\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$ $\frac{3}{4} = \frac{75}{100}$ $\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$

Compare and order fractions whose denominators are all multiples of the same number			
Recognise mixed numbers and improper fractions. Convert from one form to the other and write mathematical statements >1 as a mixed number			$\frac{7}{2} = 3\frac{1}{2}$ because 7 ÷ 2 = 3 with 1 half left over $2\frac{1}{3} = \frac{7}{3}$ because 2 x 3 = 6 with 1 third left to add

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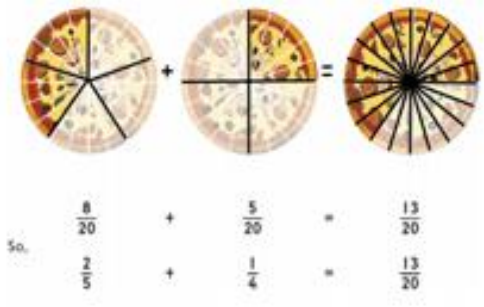
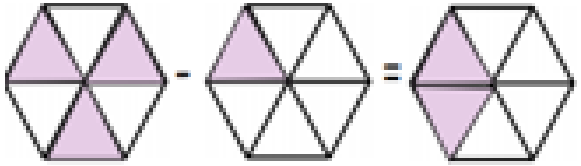
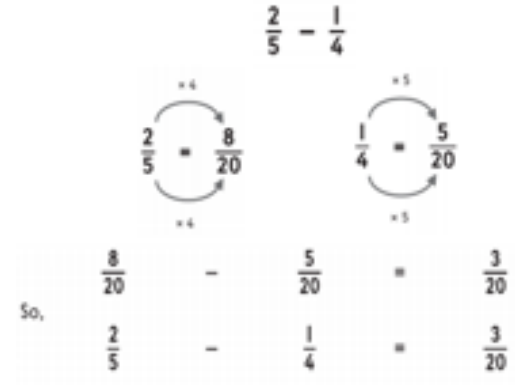
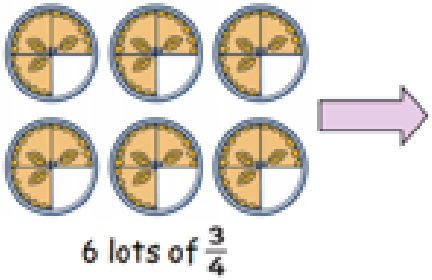
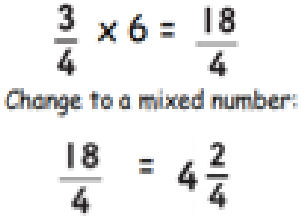
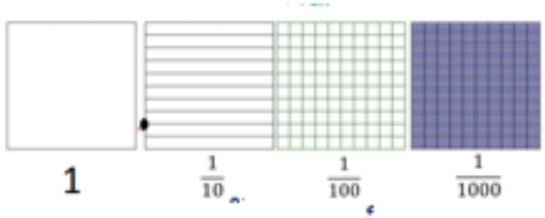
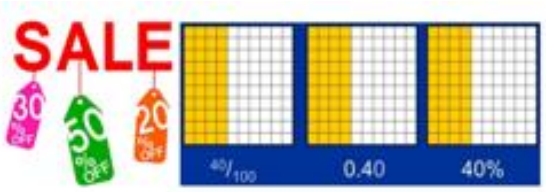
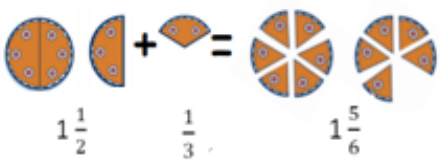
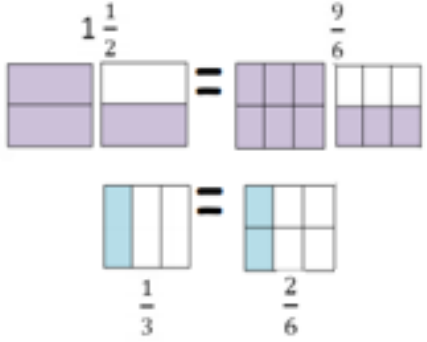
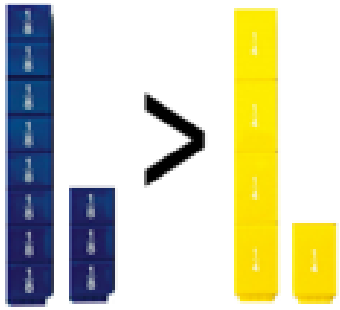
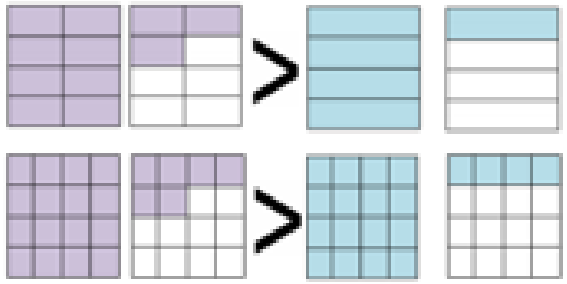
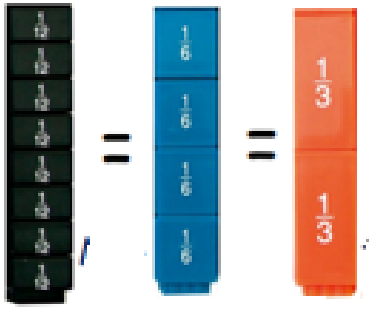
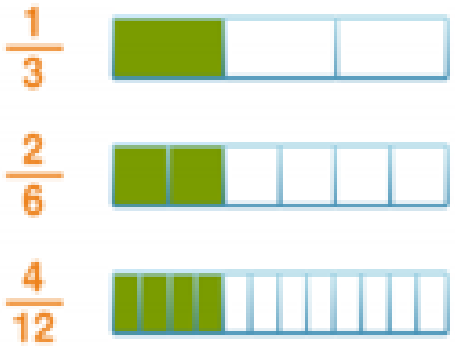
Add and subtract fractions with the same denominators and denominators that are multiples of the same numbers		 Children learn that before adding or subtracting fractions, all the denominators must be the same.Teach that to do this, we find a common denominator and what you do to the bottom, you do to the top'.	
Multiply fractions and mixed numbers, supported by materials and diagrams			

Recognise, and use thousandths and relate them to tenths, hundredths and decimal equivalents.			67.153 How many thousandths does this number have? How many more thousandths do you need to add to make 67.16?
Recognise % symbol and understand the meaning; write % as a fraction, decimal and percentage.			$\frac{4}{10}$ = 40% = 0.4 $\frac{32}{100}$ = 32% = 0.32 $\frac{75}{100}$ = 75% = 0.75 $\frac{2}{25} = \frac{8}{100}$ = 8% = 0.08
Add and subtract fractions with different denominators and mixed numbers using equivalent fractions			$1\frac{1}{2} + \frac{1}{3} = 1\frac{5}{6}$ because $1\frac{1}{2} = \frac{3}{2}$ $\frac{3}{2} = \frac{9}{6}$ and $\frac{1}{3} = \frac{2}{6}$ so $\frac{9}{6} + \frac{2}{6} = \frac{11}{6} = 1\frac{5}{6}$

Compare and order fractions including fractions >1			Which is greater? $\frac{2}{8}$ ◯ $\frac{6}{16}$ Order the following: $\frac{5}{12}, \frac{2}{3}, \frac{5}{6}$ $\frac{5}{12}, \frac{8}{12}, \frac{10}{12}$
Use common factors to simplify fractions; use common multiples to express fractions in the same denomination			÷ 3 ÷ 6 $\frac{18}{36} = \frac{6}{12} = \frac{1}{2}$ ÷ 3 ÷ 6

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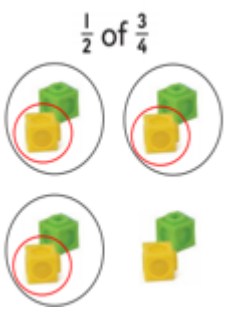
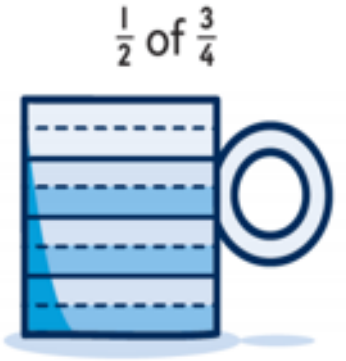
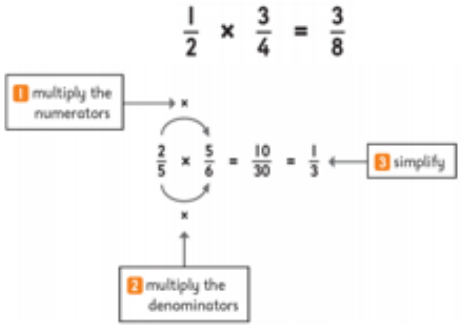
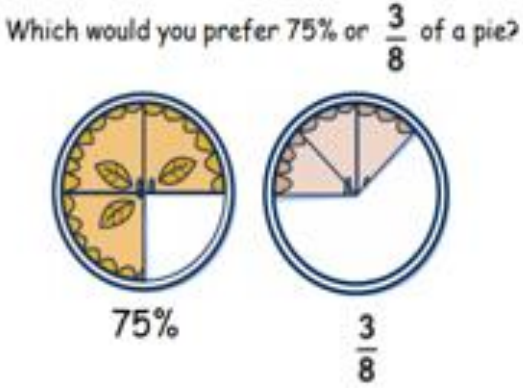
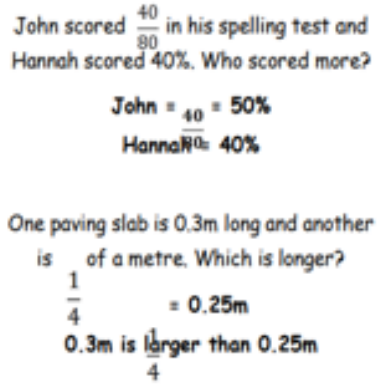
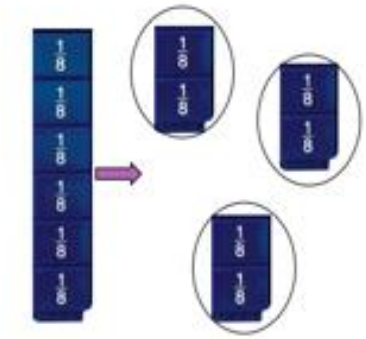
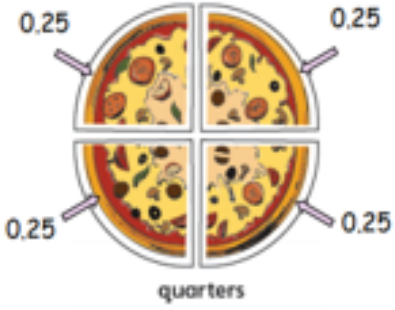
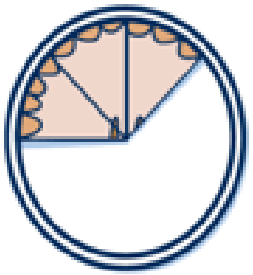
Multiply simple pairs of proper fractions, writing the answer in the simplest form.			
Recall and use equivalences between simple fractions, decimals and percentages including in different contexts			

Divide proper fractions by whole numbers		 $\frac{1}{2} \div 3 = \frac{1}{6}$	$\frac{1}{2} \div 3 = \frac{1}{6}$ Keep it, change it, flip it! $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$
Associate fractions with division and calculate decimal fractions equivalents		3 slices of pie 'out of' 8  $\frac{3}{8}$	$\frac{3}{8}$ 3 'out of' 8 is the same as 3 'divided by' 8 3 ÷ 8 = 0·375 So $\frac{3}{8}$ = 0·375