Fleckney C of E Primary

Maths Calculation policy 2020-21

Years 1 to 6

#MathsEveryoneCan

This policy adopts the White Rose calculation policy which has been amended and adapted to suit the needs of our school.

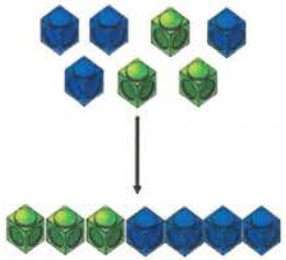
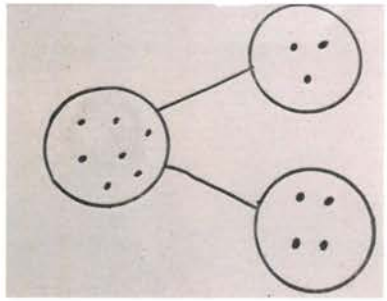
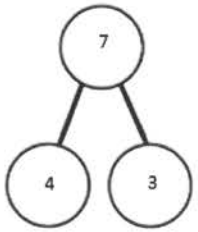
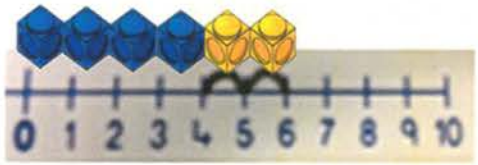
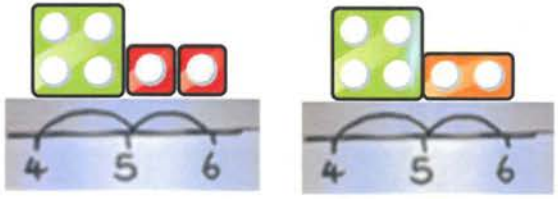
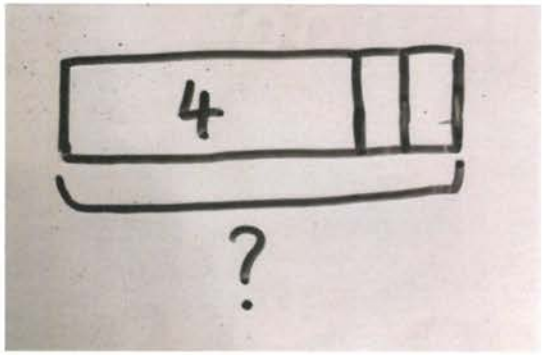
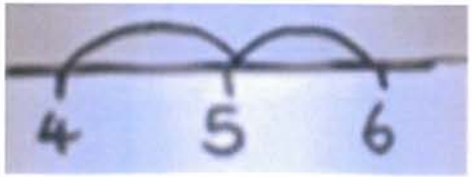
Calculation policy: Guidance

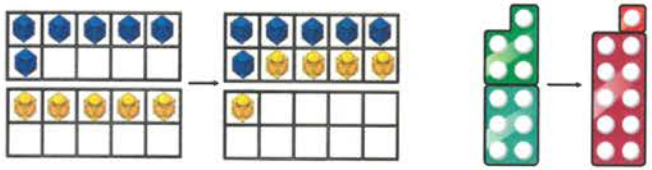
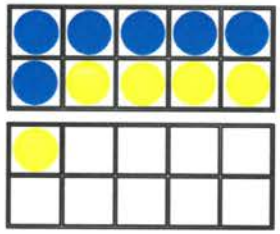
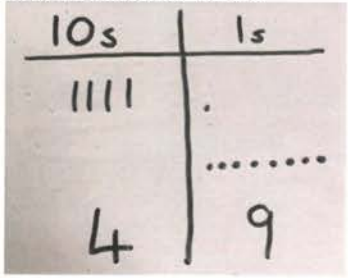
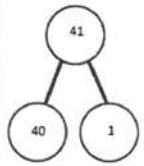
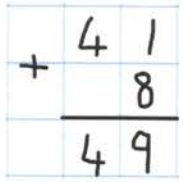
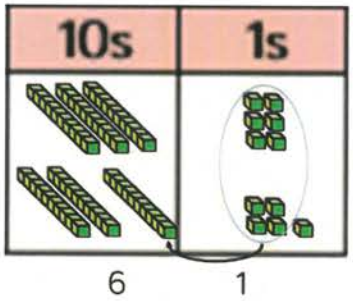
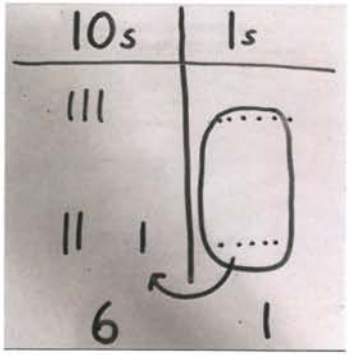
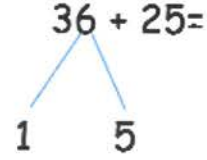
	EYFS/Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Addition	Combining two parts to make a whole: part whole model. Starting at the bigger number and counting on- using cubes. Regrouping to make 10 using ten frame.	Adding three single digits. Use of base 10 to combine two numbers.	Column method- regrouping.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

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

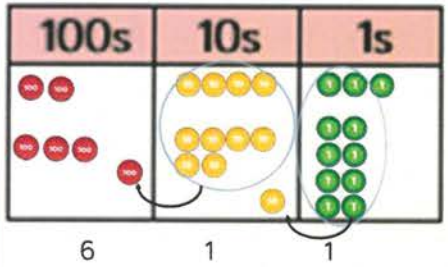
Calculation policy: Addition

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

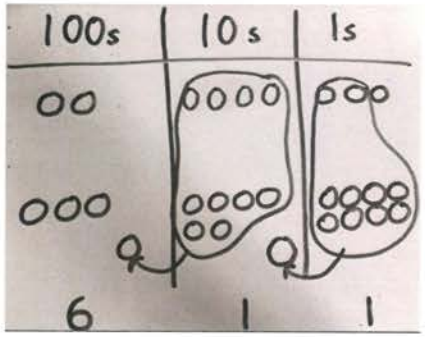
Concrete	Pictorial	Abstract
Combining two parts to make a whole (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Counting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

Regrouping to make 10; using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. $6 + \square = 11$ $6 + 5 = 5 + \square$ $6 + 5 = \square + 4$
TO + O using base 10. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 
TO + TO using base 10. Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10.  30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 36 Formal method: +25 61 1

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.

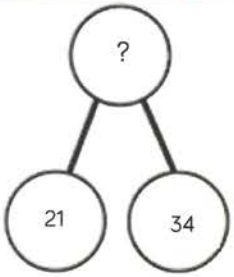


Chidren to represent the counters in a place value chart, circling when they make an exchange.



$$\begin{array}{r} 243 \\ +368 \\ \hline 611 \\ \hline 1\ 1 \end{array}$$

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



?	
21	34

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

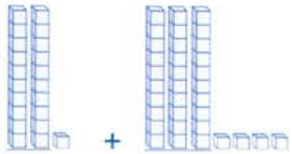
21 + 34 = 55. Prove it

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

21 + 34 =

$\square$ = 21 + 34

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



Missing digit problems:

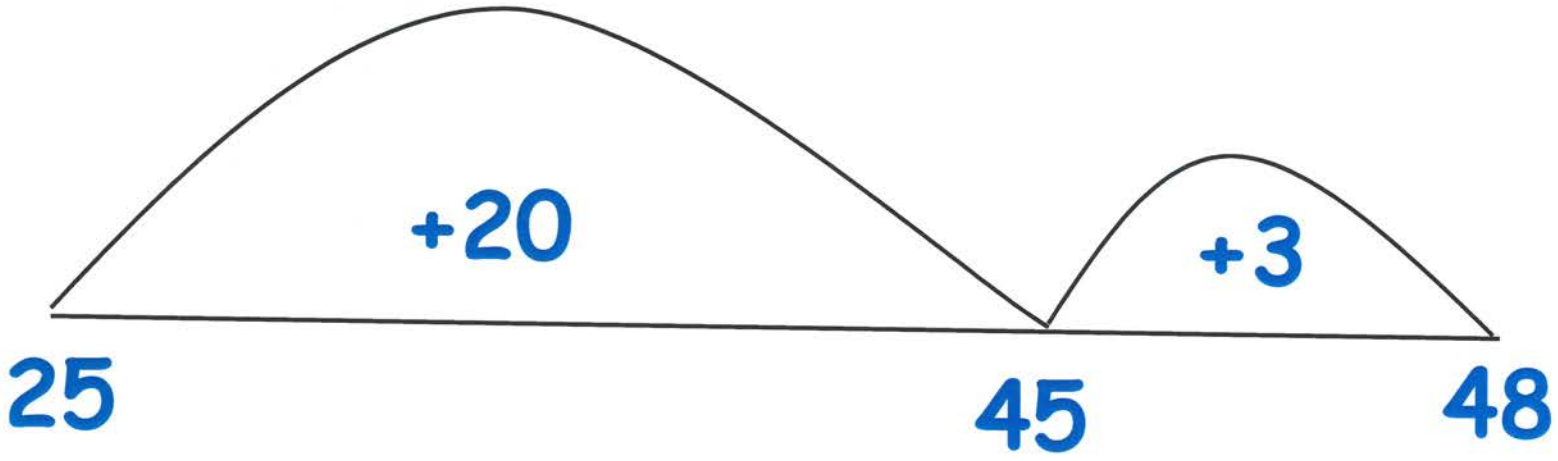
10s	1s
	?
?	5

Calculation policy: Addition

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

Abstract

$$25 + 23 = \underline{48}$$



Draw a number line. Place the larger number at the start of the number line.

Partition the number that you are adding in to tens and units.

Add the tens. Mark this point on the number line. Add the units. Mark the answer on the number line.

Calculation policy: Addition

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

Abstract

$$176 + 147 = 323$$

Write the numbers one above the other — largest number at the top. Make sure you line them up properly using place value to help you.

$$\begin{array}{r} 176 \\ +\ 147 \\ \hline \end{array}$$

$13 \quad (6 + 7)$

Partition the number in to units, tens hundreds.

$110 \quad (70 + 40)$

Add up the units, then the tens, then the hundreds.

$200 \quad (100 + 100)$

323

Recombine the three separate totals to make a final answer.

Calculation policy: Addition

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

Abstract

£233.82 + £154.75 = £388.57

Write the numbers one above the other — largest number at the top. Make sure you line them up properly using place value to help you. Line decimal points up too.

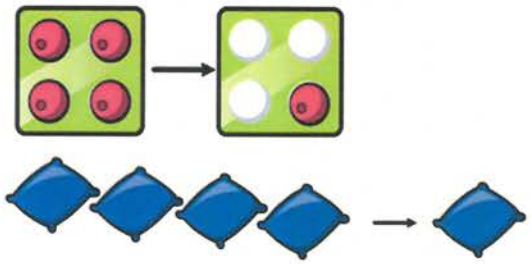
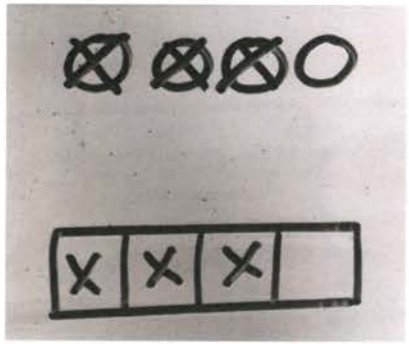
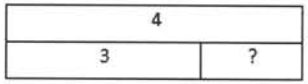
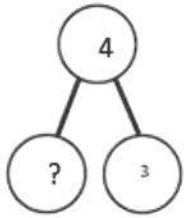
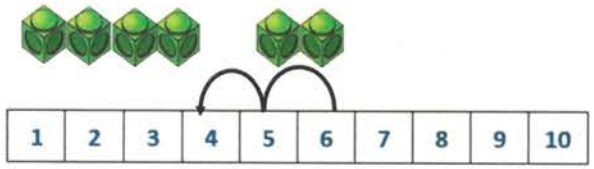
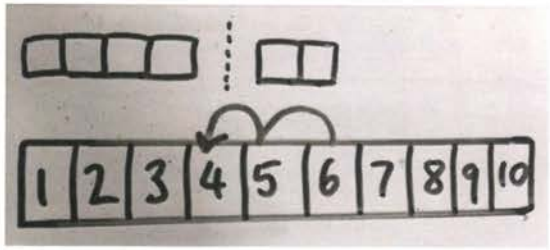
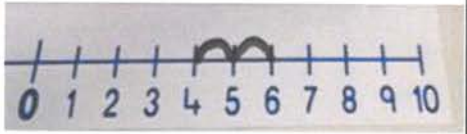
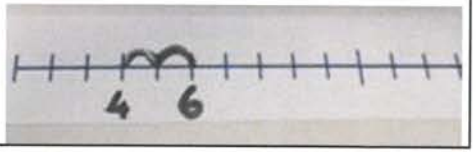
```
  233.82
+ 154.75
--------
  388.57
    1
```

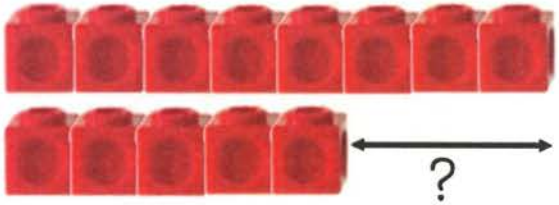
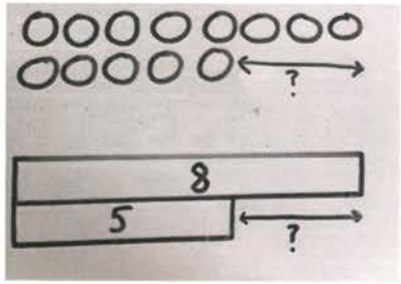
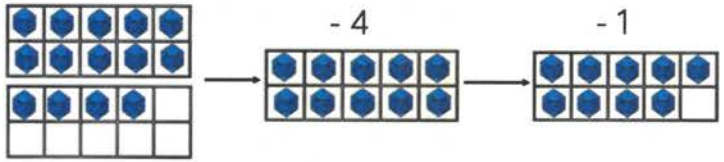
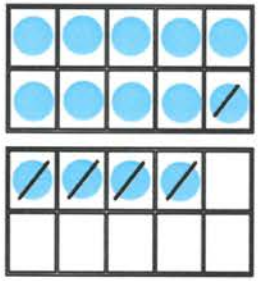
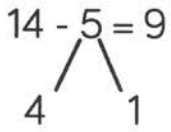
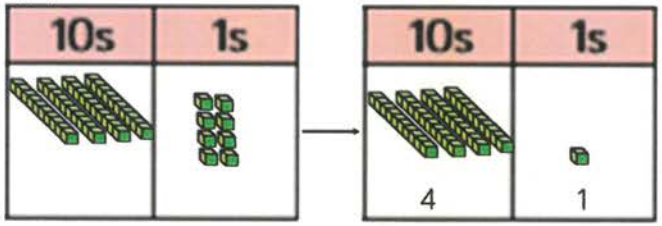
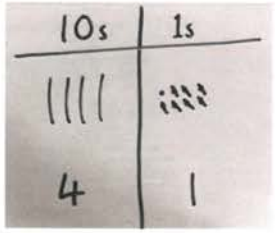
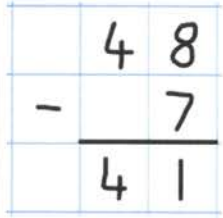
Work across from the right. 0.02 + 0.07 = 0.07. Write this as a '7' under the hundredths column.

Sometimes, you will need to carry a digit into the next column. In this example, 0.80 + 0.70 = 1.50. The '5' digit is placed under the tenths column and the '1' digit is carried across into the units column. Once you have added any numbers that you have "carried", cross them out.

Calculation policy: Subtraction

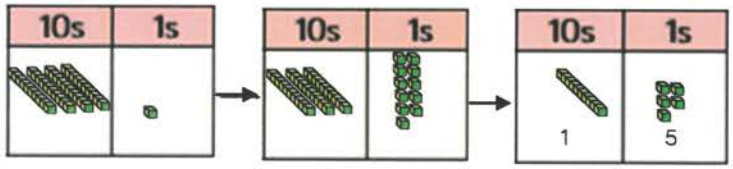
Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

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

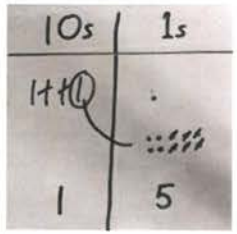
Finding the difference (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 – 5, the difference is ☐ Children to explore why 9 - 6 = 8 – 5 = 7 – 4 have the same difference.
Making 10 using ten frames. 14 – 5 	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method using base 10. 48-7 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 

Column method using base 10 and having to exchange.

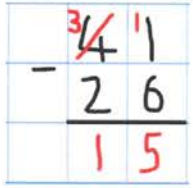
41 – 26



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

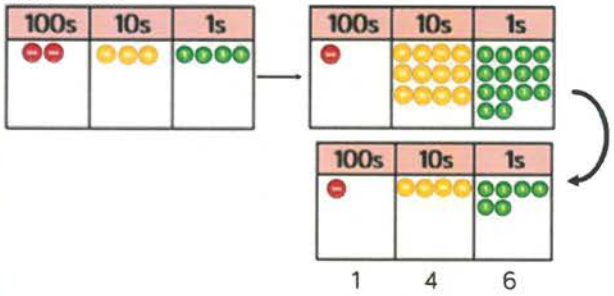


Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11.

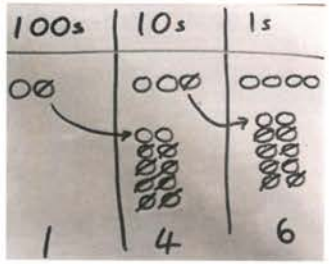


Column method using place value counters.

234 – 88



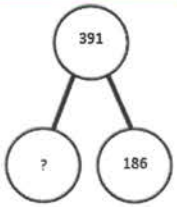
Represent the place value counters pictorially; remembering to show what has been exchanged.



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

$$\begin{array}{r} {}^{2}\not{2}\,{}^{1}\not{3}4 \\ -\ 88 \\ \hline 6 \end{array}$$

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



391	
186	?

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

Calculate the difference between 391 and 186.

□ = 391 – 186

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

What is 186 less than 391?

Missing digit calculations

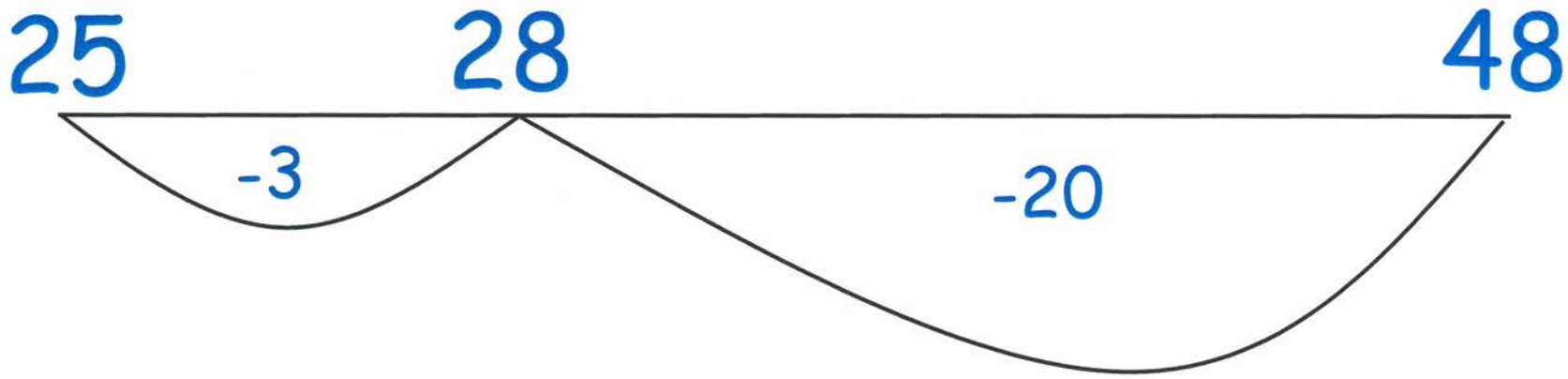
$$\begin{array}{r} 3\ 9\ \square \\ -\ \square\ \square\ 6 \\ \hline \square\ 0\ 5 \end{array}$$

Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

Abstract

$$48 - 23 = \underline{25}$$



Draw a number line. Place the largest number at the end of the number line.

Partition the number that you are subtracting into tens and units.

Subtract the tens. Mark this point on the number line. Subtract the units. Mark the answer on the number line.

Calculation policy: Subtraction

Key language: take away, less than, the difference, subtract, minus, fewer, decrease.

Abstract

$$12771 - 1367 = 11404$$

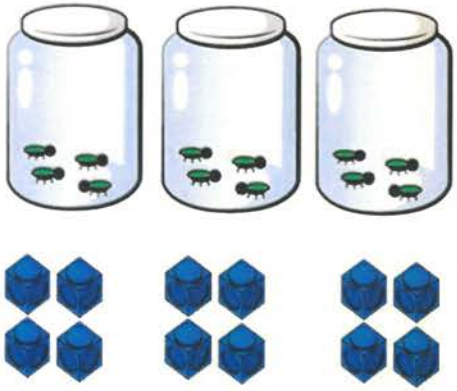
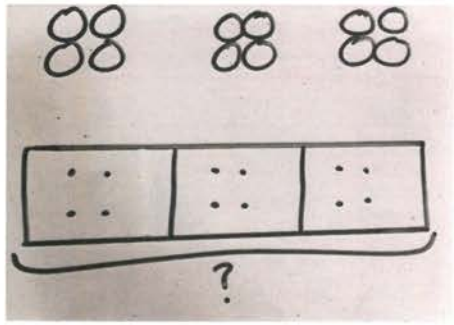
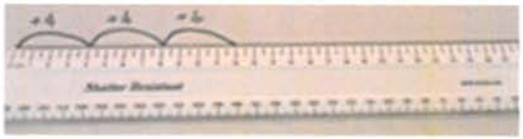
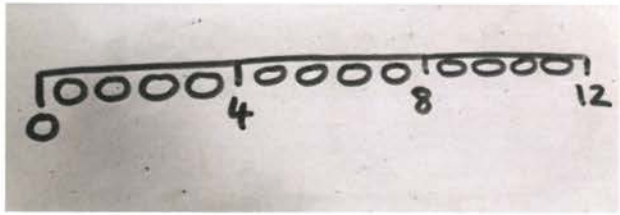
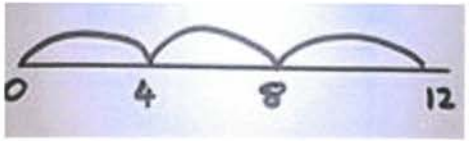
$$\begin{array}{r} {\scriptstyle 6\ \ 1} \\ 12771 \\ -\ 1367 \\ \hline 11404 \end{array}$$

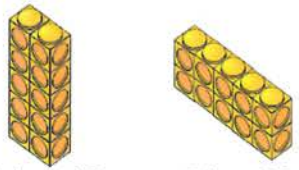
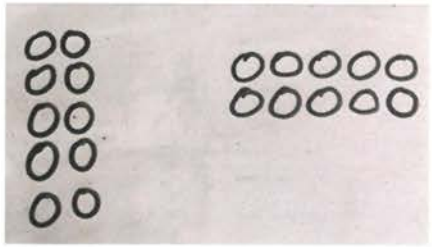
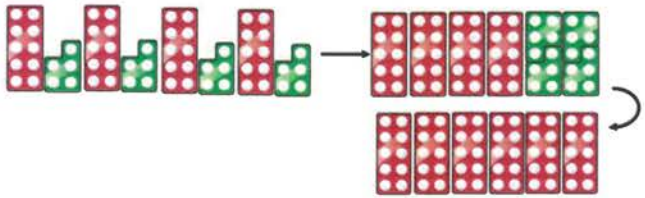
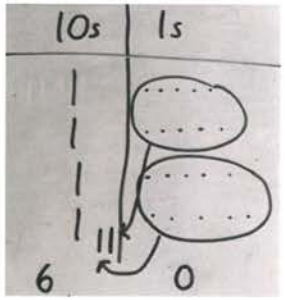
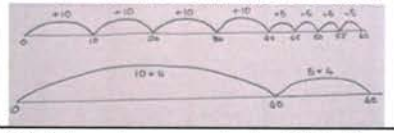
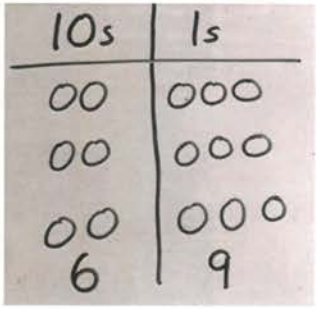
← Write the numbers in a column, largest number at the top. Make sure you line them up, using place value to help you.

Work across from the right. If the top digit is smaller than the bottom digit, you will need to 'exchange'.

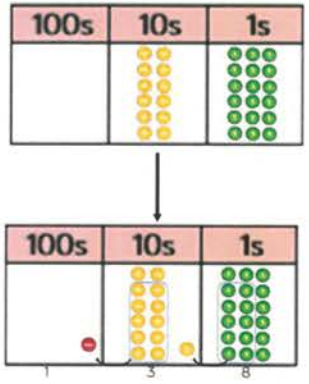
Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

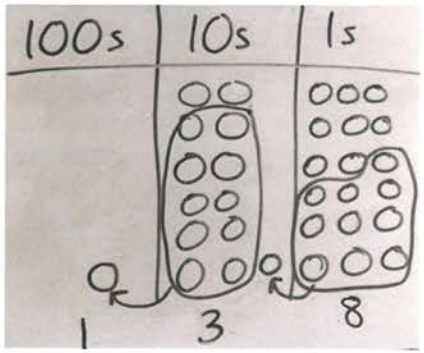
Concrete	Pictorial	Abstract
Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12
Number lines to show repeated groups- 3 × 4   Cuisenaire rods can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

Use arrays to illustrate commutativity counters and other objects can also be used. $2 \times 5 = 5 \times 2$  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4×15 	Children to represent the concrete manipulatives pictorially. 	Children to be encouraged to show the steps they have taken. 4 x 15 10 5 10 x 4 = 40 5 x 4 = 20 40 + 20 = 60 A number line can also be used 
Formal column method with place value counters (base 10 can also be used.) 3×23  6 9	Children to represent the counters pictorially. 	Children to record what it is they are doing to show understanding. 3×23 20 3 $3 \times 20 = 60$ $3 \times 3 = 9$ $60 + 9 = 69$ $\begin{array}{r} 23 \\ \times\ 3 \\ \hline 69 \end{array}$

Formal column method with place value counters.
6 x 23



Children to represent the counters/base 10, pictorially e.g. the image below.



Formal written method

$$6 \times 23 =$$

$$\begin{array}{r} 23 \\ \times\ 6 \\ \hline 138 \\ \hline 1\ 1 \end{array}$$

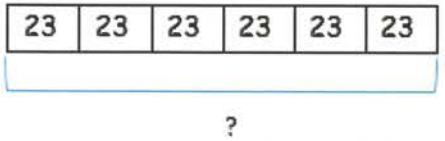
When children start to multiply 3d x 3d and 4d x 2d etc., they should be confident with the abstract:

To get 744 children have solved 6 x 124.
To get 2480 they have solved 20 x 124.

$$\begin{array}{r} 1\ 2\ 4 \\ \times\ \ \ 2\ 6 \\ \hline 7\ 4\ 4 \\ 2\ 4\ 8\ 0 \\ \hline 3\ 2\ 2\ 4 \\ \hline 1\ 1 \end{array}$$

Answer: 3224

Conceptual variation; different ways to ask children to solve 6 x 23



Mai had to swim 23 lengths, 6 times a week.
How many lengths did she swim in one week?

With the counters, prove that 6 x 23 = 138

Find the product of 6 and 23

6 x 23 =

☐ = 6 x 23

$$\begin{array}{r} 6 \\ \times\ 23 \\ \hline \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ \times\ 6 \\ \hline \\ \hline \end{array}$$

What is the calculation?
What is the product?

Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Abstract

$$143 \times 6 = 858$$

Write the largest number at the top.

Make sure you line the numbers up properly, using place value to help you.

$$\begin{array}{r} 143 \\ \times \quad 6 \\ \hline 18 \\ 240 \\ \underline{600} \\ 858 \end{array}$$

(3 × 6)

(40 × 6)

(100 × 6)

Partition the number into ones, tens and units.

Multiply the ones.

Multiply the tens.

Multiply the hundreds.

Recombine the three separate totals to make a final answer.

Calculation policy: Multiplication

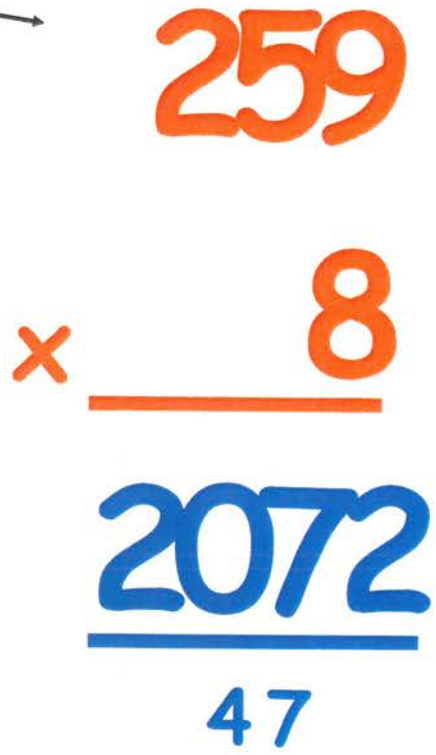
Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Abstract

$$259 \times 8 = 2072$$

Write the largest number at the top.

Make sure you line the numbers up properly, using place value to help you.



Multiply the ones.

Write the ones in the ones column. Carry the tens across and write them underneath the tens column.

Multiply the tens. Write the answer in the tens column. Don't forget to add in any tens that you carried earlier. Carry any hundreds across and write them underneath the hundreds column.

Complete the rest of the calculation in the same manner.

Calculation policy: Multiplication

Key language: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Abstract

$$53.2 \times 24 = 1276.8$$

Write the numbers one above the other—largest number at the top. Make sure you line them up properly using place value to help you.

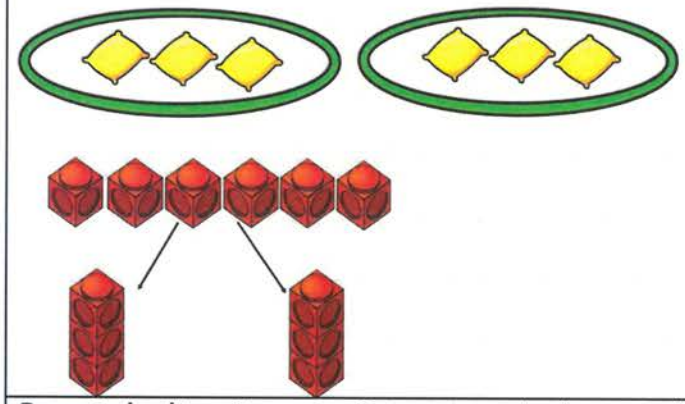
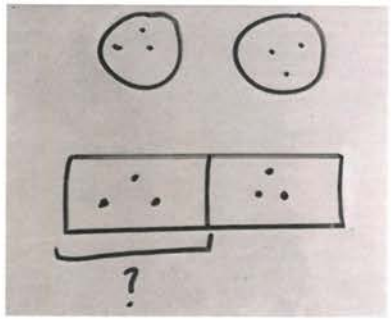
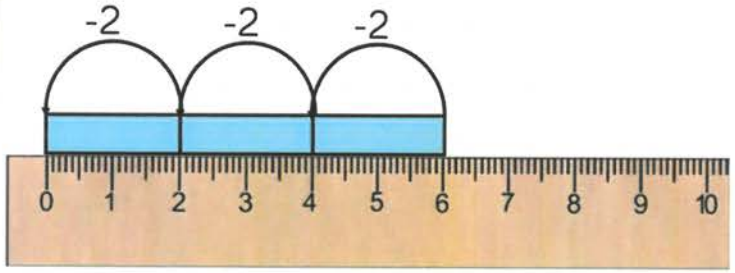
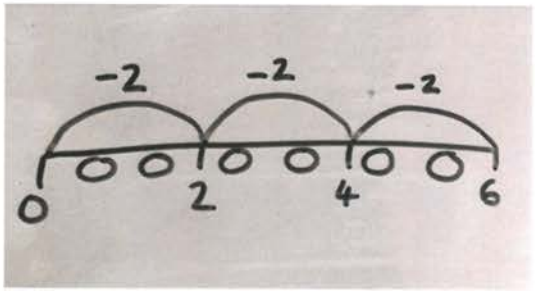
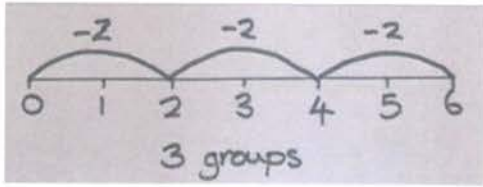
$$\begin{array}{rl} 53.2 & \\ \times\ 24.0 & \\ \hline 21^{1}2.8 & (53.2 \times 4) \\ 1064.0 & (53.2 \times 20) \\ \hline 1276.8 & \end{array}$$

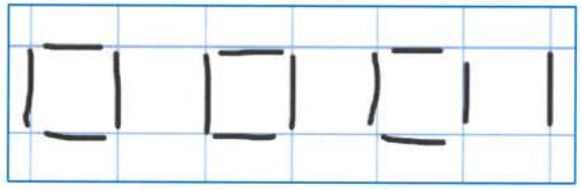
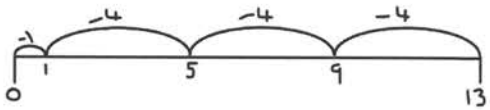
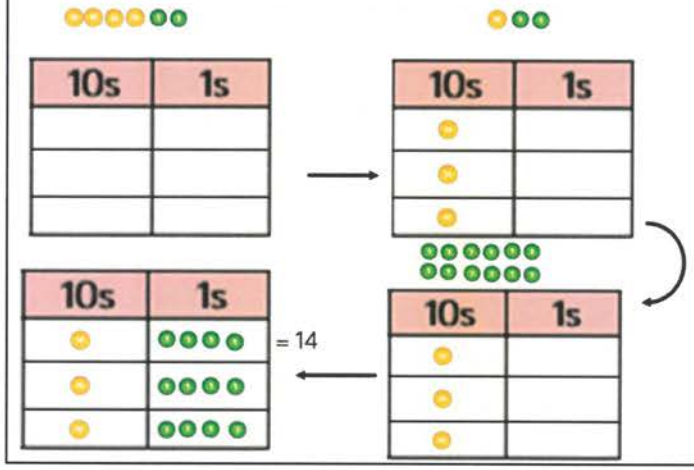
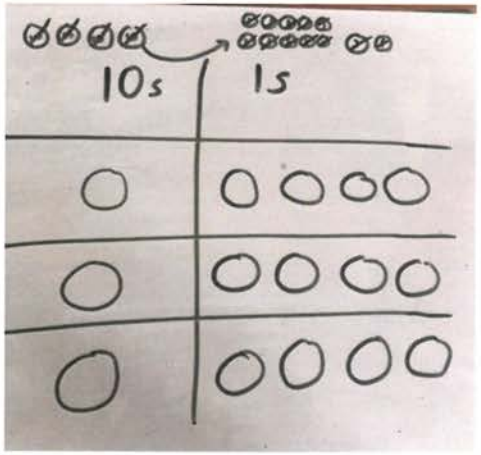
53.2 is multiplied by 4 and then 53.2 is multiplied by 20. Notice that when 3 x 4 is calculated, the 2 is placed in the units column and the 10 is recorded ready to be placed in the tens column.

The answers are written in a column. Finally, these two answers are added together to find the final answer.

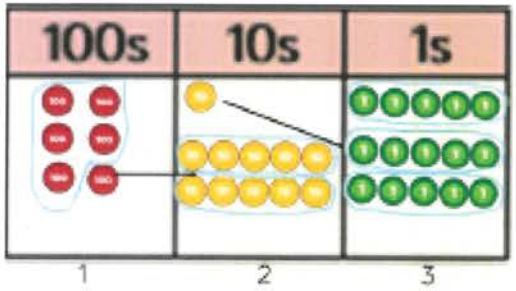
Calculation policy: Division

Key language: share, group, divide, divided by, half.

Concrete	Pictorial	Abstract
Sharing using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3 3 | 3 Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 

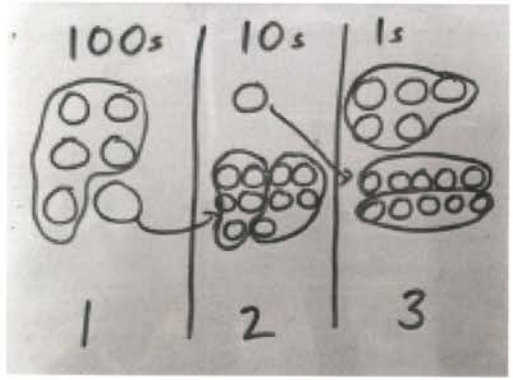
2d ÷ 1d with remainders using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over' 
Sharing using place value counters. 42 ÷ 3 = 14 	Children to represent the place value counters pictorially. 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

Short division using place value counters to group.
615 ÷ 5



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

Represent the place value counters pictorially.

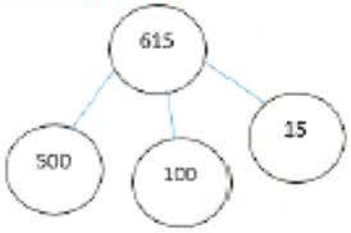


Children to the calculation using the short division scaffold.

$$5\overline{)615}$$
$$123$$
$$^{1}6^{1}15$$

Conceptual variation; different ways to ask children to solve 615 ÷ 5

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



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

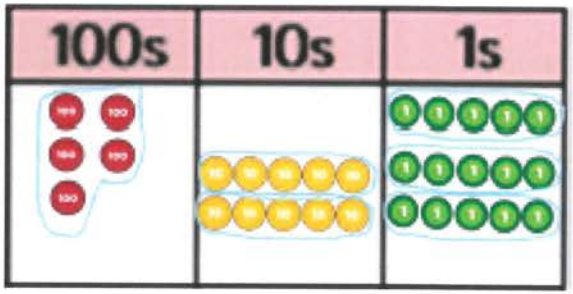
615 pupils need to be put into 5 groups. How many will be in each group?

$$5\overline{)615}$$

615 ÷ 5 =

□ = 615 ÷ 5

What is the calculation?
What is the answer?



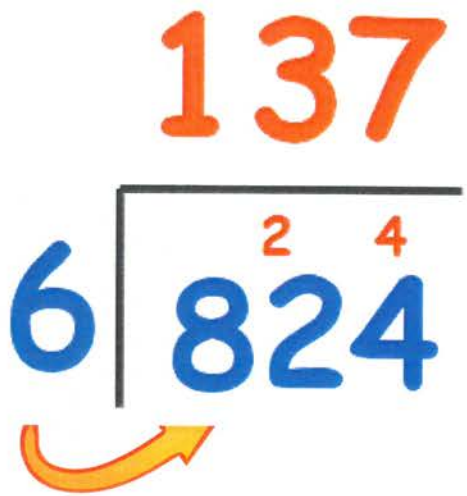
Calculation policy: Division

Key language: share, group, divide, divided by, half.

Abstract

$$824 \div 6 = 137\frac{2}{6}$$

Set the question out like this with the divisor written first and the dividend written on the same line. Separate the divisor and the dividend with the 'L' shaped lines as shown.



The remainder is 2 but this should be expressed as a fraction — the remainder divided by the divisor. In this case it is 2 divided by 6 or 2/6.

Start with the number furthest to the left. How many 6s are in 8? There is 1, so we write 1 above. But there is 2 left over so we carry this over to the next number. Now we repeat the same steps, thinking about how many times 6 goes into 22. Continue moving across like this.

Calculation policy: Division

Key language: share, group, divide, divided by, half.

Abstract

$$8742 \div 16 = 546\ \tfrac{6}{16} = 546\ \tfrac{3}{8}$$

Set the question out like this with the divisor written first and the dividend written on the same line. Separate the divisor and the dividend with the 'L' shaped lines as shown.

$$\begin{array}{r} 546\ r6 \\ 16\overline{)\,87^{7}42^{10}} \end{array}$$

Write out your 16 times table to help you with the divison. You probably only need to write out the first 6 or 7 terms.

16
32
48
64
80
96
112

Start with the number furthest to the left. 16 does not go into 8 so we take the first two numbers together. 16 into 87 goes 5 times with a remainder of 7. We write the 5 at the top and carry the 7 into the next column. 16 into 74 goes 4 times with a remainder of 10. Finally, 16 into 102 goes 6 times with a remainder of 6. The final remainder is written as part of the answer. This can be turned into a fraction as shown above.