KS2 Maths Calculation Guide for Parents

Lea Endowed C of E Primary

The 3 Ways Children are taught Maths

Concrete Representation
Children use real objects to explore Mathematical concepts

Pictorial Representation
Children have sufficiently understood the 'hands on' experiences and
can now relate them, for example through diagrams or pictures of the problem.

Abstract representation
Children are now capable of representing problems by using
mathematical notation, for example 12 x 2 = 24.

OVERVIEW	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 decimals.
Subtraction	Taking away ones Counting back Find the difference Part whole model. Making 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 3 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 for whole numbers Place value counters for decimals – with the different amount 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 x 1d using base 10	Column multiplication- introduced with place value counters. (2 and 3 digit multiplied by 1 digit)	Column multiplication Abstract only but 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 digits number including numbers)	Short division Bus stop method with place value counters (up to 4d by a 2d number) Children should exchange into the tenths and hundredth column too.

Objective & Strategy	Concrete	Pictorial	Abstract
Column Addition—no regrouping (friendly numbers) Add two or three 2 or 3-digit numbers.	Model using Dienes or numicon Add together the ones first, then the tens. 45 34 Tens: 7 Units: 9 Calculations 21 + 42 = 21 + 42 Move to using place value counters	Children move to drawing the counters using a tens and one frame. tens ones	$$2\ 2\ 3$$ $$+\ 1\ 1\ 4$$ $$\overline{3\ 3\ 7}$$ Add the ones first, then the tens, then the hundreds.
Column Addition with regrouping.	39 15 Tens: 5 Units: 4 Exchange ten ones for a ten. Model using numicon and pv counters. Calculations 146 + 527	Children can draw a representation of the grid to further support their understanding, carrying the ten underneath the line 5 1	$$20\ +\ 5$$ $$\underline{40\ +\ 8}$$ $$60\ +\ 13\ =73$$ Start by partitioning the numbers before formal column to show the exchange. $$536$$ $$+\ 85$$ $$\overline{621}$$ $$1\ 1$$

Y3 ADDITION +

Objective & Strategy	Concrete	Pictorial	Abstract
Y4—add numbers with up to 4 digits	Children continue to use dienes or pv counters to add, exchanging ten ones for a ten and ten tens for a hundred and ten hundreds for a thousand.	Draw representations using pv grid.	Continue from previous work to carry hundreds as well as tens. Relate to money and measures.
Y5—add numbers with more than 4 digits. Add decimals with 2 decimal places, including money.	As year 4 Introduce decimal place value counters and model exchange for addition.	2.37 + 81.79	72.8 +54.6 127.4 1 1
Y6—add several numbers of increasing complexity Including adding money, measure and decimals with different numbers of decimal points.	As Y5	As Y5	Insert zeros for place holders.

Objective & Strategy	Concrete	Pictorial	Abstract
Column subtraction without regrouping (friendly numbers)	$47 - 32$ Use base 10 or Numicon to model	Darw representations to support understanding	$47 - 24 = 23$ $\begin{array}{r} 40+7 \\ -\ 20+4 \\ \hline 20+3 \end{array}$ Intermediate step may be needed to lead to clear subtraction understanding. $\begin{array}{r} 32 \\ -12 \\ \hline 20 \end{array}$

Column subtraction with regrouping	Begin with base 10 or Numicon. Move to pv counters, modelling the exchange of a ten into tten ones. Use the phrase 'take and make' for exchange.	Children may draw base ten or PV counters and cross off.	$836 - 254 = 582$
			  Begin by partitioning into pv columns
			
			 $728 - 582 = 146$
			  Then move to formal method.

Y3

SUBTRACTION -

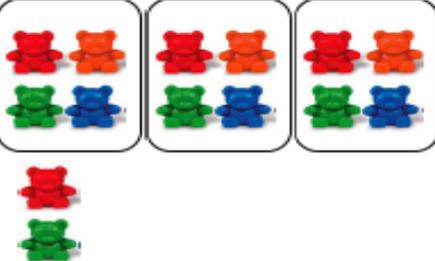| Objective & Strategy	Concrete	Pictorial	Abstract
Subtracting tens and ones **Year 4 subtract with up to 4 digits.** *Introduce decimal subtraction through context of money*	234 - 179 Model process of exchange using Numicon, base ten and then move to PV counters.	Children to draw pv counters and show their exchange—see Y3	 Use the phrase 'take and make' for exchange
Year 5- Subtract with at least 4 digits, including money and measures. *Subtract with decimal values, including mixtures of integers and decimals and aligning the decimal*	As Year 4	Children to draw pv counters and show their exchange—see Y3	$\begin{array}{r} 3\,1\,0\,8\,6 \\ -\ \ \ 2\,1\,2\,8 \\ \hline 2\,8,9\,2\,8 \end{array}$ Use zeros for place-holders. $\begin{array}{r} 7\,1\,6\,9\cdot0 \\ -\ \ \ 3\,7\,2\cdot5 \\ \hline 6\,7\,9\,6\cdot5 \end{array}$
Year 6—Subtract with increasingly large and more complex numbers and decimal values.			$\begin{array}{r} 1\,5\,0,6\,9\,9 \\ -\ \ 8\,9,9\,4\,9 \\ \hline 6\,0,7\,5\,0 \end{array}$ $\begin{array}{r} 1\,0\,5\cdot4\,1\,9\ kg \\ -\ \ \ 3\,6\cdot0\,8\,0\ kg \\ \hline 6\,9\cdot3\,3\,9\ kg \end{array}$

Y4-6

SUBTRACTION

Objective & Strategy	Concrete	Pictorial	Abstract
Grid method	Show the links with arrays to first introduce the grid method. 4 rows of 10, 4 rows of 3. Move onto base ten to move 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 Calculations 4 x 126. Fill each row with 126 Calculations 4 x 126. Add up each column, starting with the ones making any exchanges needed Then you have your answer.	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below. Bar model are used to explore missing numbers $4 \times \boxed{} = 20$	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.		10	8		10	100	80		3	30	24	
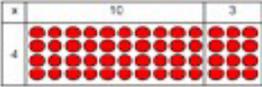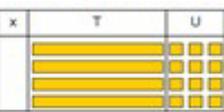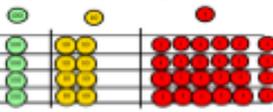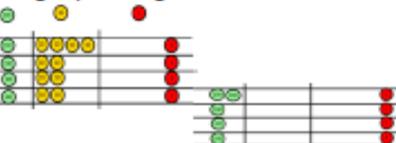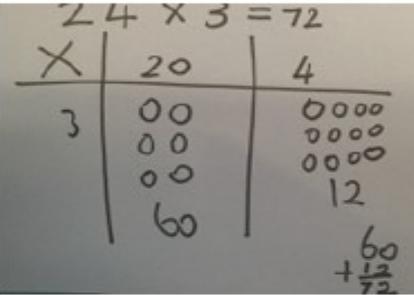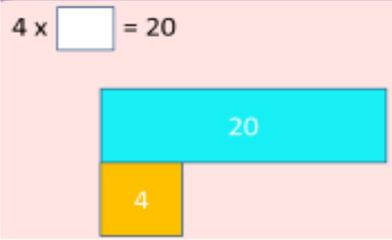
Y3 MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
Grid method recap from year 3 for 2 digits x 1 digit Move to multiplying 3 digit numbers by 1 digit. (year 4 expectation)	Use place value counters to show how we are finding groups of a number. We are multiplying by 4 so we need 4 rows Calculations 4 x 126 Fill each row with 126 Add up each column making any exchanges needed	Children can represent their work with place value counters in a way that they understand. They can draw the counters using colours to show different amounts or just use the circles in the different columns to show their thinking as shown below. $24 \times 3 = 72$	Start with multiplying by one digit numbers and showing the clear addition alongside the grid. 	×	30	5
---	---	---
7	210	35	 $210 + 35 = 245$
Column multiplication	Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping. $321 \times 2 = 642$ | Hundreds	Tens	Ones | It is important at this stage that they always multiply the ones first. The corresponding long multiplication is modelled alongside		×	300	20	7
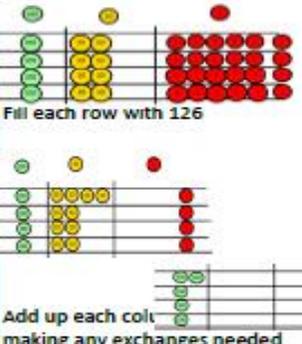
4	1200	80	28	
				
				The grid method my be used to show how this relates to a formal written method.
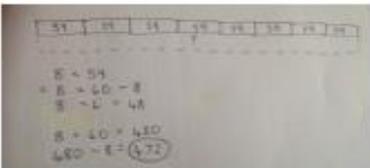				
				Bar modelling and number lines can support learners when solving problems with multiplication alongside the formal written methods.
					327
					x 4
					———
					28
					80
					1200
					1308
					
					  3 2 7
					× 4
					———
					1 3 0 8
					  1 2
					
					This may lead to a compact method.

MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract

Column Multiplication for 3 and 4 digits x 1 digit.

Hundreds	Tens	Ones

It is important at this stage that they always multiply the ones first.

Children can continue to be supported by place value counters at the stage of multiplication. This initially done where there is no regrouping.   321 x 2 = 642

x	300	20	7
4	1200	80	28

```
    327
 x    4
─────────
     28
     80
   1200
─────────
   1308
```

```
   3 2 7
 ×     4
─────────
 1 3 0 8
   1 2
```

This will lead to a compact method.

Column multiplication

Manipulatives may still be used with the corresponding long multiplication modelled alongside.

	10	8
10	100	80
3	30	24

Continue to use bar modelling to support problem solving

```
      1 8
 ×    1 3
─────────
      5 4
      2
    1 8 0
─────────
    2 3 4
```

18 x 3 on the first row

(8 x 3 =24, carrying the 2 for 20, then 1 x 3)

18 x 10 on the 2nd row. Show multiplying by 10 by putting zero in units first

```
    1 2 3 4
  ×     1 6
─────────────
    7 4 0 4    (1234 x 6)
  1 2 3 4 0    (1234 x 10)
─────────────
  1 9, 7 4 4
```

MULTIPLICATION X

Objective & Strategy	Concrete	Pictorial	Abstract
Division with remainders.	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. remainder 2 Use bar models to show division with remainders. 37 / 10 10 10 7	Complete written divisions and show the remainder using r. 29 ÷ 8 = 3 REMAINDER 5 dividend divisor quotient remainder
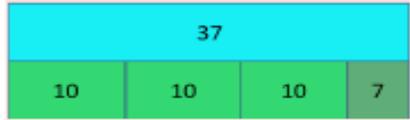
Example without remainder:
40 ÷ 5
Ask "How many 5s in 40?"

5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 8 fives
0 5 10 15 20 25 30 35 40
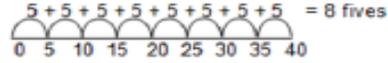
Example with remainder:
38 ÷ 6

6 + 6 + 6 + 6 + 6 + 6 + 2 = 6 sixes with a remainder of 2
0 6 12 18 24 30 36 38
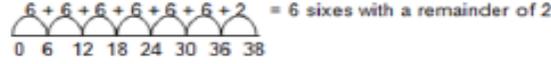
For larger numbers, when it becomes inefficient to count in single multiples, bigger jumps can be recorded using known facts.

DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Division as grouping	Use cubes, counters, objects or place value counters to aid understanding. 24 divided into groups of 6 = 4 $96 \div 3 = 32$	Continue to use bar modelling to aid solving division problems. 20 ? $20 \div 5 = ?$ $5 \times ? = 20$	How many groups of 6 in 24? $24 \div 6 = 4$
Division with arrays	Link division to multiplication by creating an array and thinking about the number sentences that can be created. Eg $15 \div 3 = 5$ $5 \times 3 = 15$ $15 \div 5 = 3$ $3 \times 5 = 15$	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 eight linking number sentences. $7 \times 4 = 28$ $4 \times 7 = 28$ $28 \div 7 = 4$ $28 \div 4 = 7$ $28 = 7 \times 4$ $28 = 4 \times 7$ $4 = 28 \div 7$ $7 = 28 \div 4$
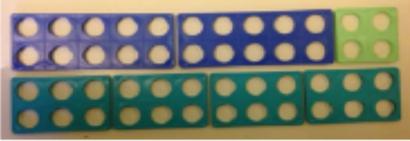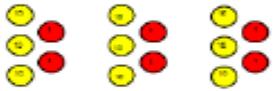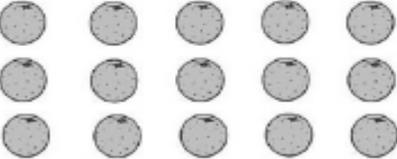
Y3 DIVISION ÷

Objective & Strategy	Concrete	Pictorial	Abstract
Divide at least 3 digit numbers by 1 digit. Short Division	96 ÷ 3 Use place value counters to divide using the bus stop method alongside Calculations 42 ÷ 3 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.

Y4-6

DIVISION ÷