THE FORGE TRUST

CALCULATION POLICY

The maths work your child is doing at school may look very different to the kind of 'sums' you remember. This is because children are encouraged to work mentally, where possible, using personal jottings to help support their thinking. Even when children are taught more formal written methods (from late year 3 onwards), they are only encouraged to use these methods for calculations they cannot solve in their heads.

Discussing the efficiency and suitability of different strategies is an important part of maths lessons.

Parental Guidance

- Talk to your child about how you work
- Ask your child to explain their thinking

When faced with a calculation problem, encourage your child to ask the following:

- ✓ Can I do this in my head?
- ✓ Could I do this in my head using drawings or jottings to help me?
- ✓ Do I need to use a written method?
- ✓ Should I use a calculator?

Also help your child to estimate and then check the answer. Encourage them to ask whether or not the answer is sensible.

Addition

This chart shows examples of how we teach addition and how we develop skills through the school.

Each child must be confident at one stage before moving to the next and strategies may be reinforced from previous year groups or taught from the next, depending on each child's ability.

Our learning is supported by a wide range of resources, e.g. 100 square, whiteboards, counting sticks, number fans, etc.

Problem solving is built in weekly and at the end of each unit.

- *Children could draw pictures to help them work out the answer*
- *Children could use dots or tally marks to represent objects (quicker than drawing pictures)*
- *Drawing an empty number line helps children to record the steps they have taken in a calculation.*
- *Children will be taught written calculations for calculations they cannot do in their heads. Expanded methods build on mental methods and make the value of the digits clear to children. The language used is very important.*
- *When children are confident using the standard method this can be 'squashed' into the traditional compact method.*

Early Years Foundation Stage

- Counting along a number line
- Singing nursery rhymes
- Counting in real situations
- Using fingers
- Adding objects to a group

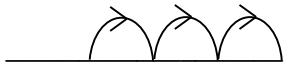
☺ ☺ ☺ ☺ ☺

and introducing the + and = signs

2 + 3 = 5

At a party, I eat 2 cakes and my friend eats 3.

How many cakes did we eat altogether?

- Using a number line to solve simple problems
- 

0 1 2 3 4 5

2 + 3 = 5

- Recognising the **+** symbol

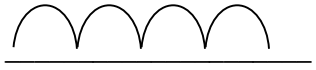
Year 1

- Using a number line for simple problems by counting on

5 6 7 8 9 10

5 + 4 = 9

- Adding a two digit and single digit number (putting the larger digit first)



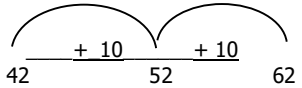
15 16 17 1 8 1 9

15 + 4 =1 9

- Introduced to the concept of a number sentence
- Use ☐ and △ to represent missing numbers
- Using partitioning of numbers between 11 and 20
  e.g. 15 → 10 + 5

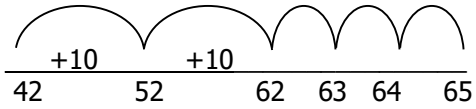
Year 2

- Using a blank number line to add 10(s) to a 2 digit number



42 + 20 = 62

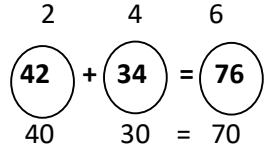
- Using a blank number line to add two 2 digit numbers
- Adding larger numbers on a number line with partitioning. *(Note: Only partition the smaller number – show the larger number on the number line as the starting point)*



42 + 23 = 65

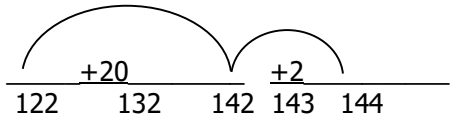
42 + 10 + 10 + 1 + 1 + 1 =65

- Progressing onto adding tens together in one jump.
- Adding using partitioning and peanut method



Year 3

- Adding a 2 digit number to a 3 digit number on a number line (not crossing tens boundary)

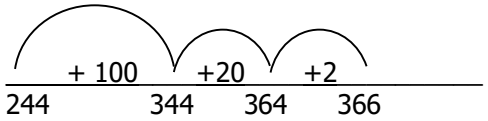


122 + 22 = 144

- Progressing onto crossing the tens boundary.

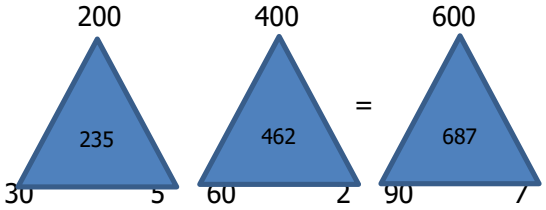
128 + 24 = 152

- Adding two 3 digit numbers together (starting with the largest)



244 + 122 = 366

- Moving to a triangle method for 3 digit addition



Year 3 (continued)

- Adding two 3 digit numbers by partitioning (expanded method)

245 ⟶ 200 and 40 and 5*

Year 3 (continued)

- Linking to a formal written method, with no carrying, starting with least significant digit, in this case units

35	235
+ 62	+ 62
7	**7**
90	90
97	200
	297

Year 4

- continuing the 2 digit and 3 digit 'semi-compact' method
- moving to a standard method starting with least significant digit

35	235
+ 62	+ 62
9 7	**2 97**

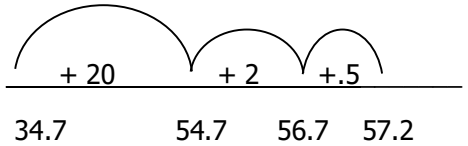
Year 4 (continued)

- starting to add with 'carrying'

625 783 367

Year 5

- adding a mixture of two, three and four digit numbers with carrying
- adding thousands with carrying
- adding money and decimals to one decimal place



34.7 + 22.5 = 57.2

- using mixed units (converting to the smallest)

£3.55 + 60p =

355p + 60p = 415p

= £4.15

- Progressing onto choosing most appropriate units for conversion.

Year 6

- Extending to add several numbers, using zeros as placeholders and extending to two places of decimals

	124 . 90
+	7 . 25
	132 . 15
	11

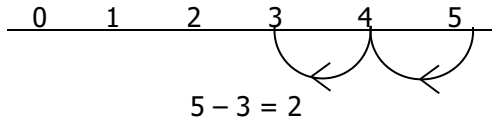
- coping with decimals to one and two places, e.g.

40.8 + 0.75 =

	40 . 8
+	0 . 75
	41 . 55
	1

122 → 100 and 20 and 2 367 ← 300 and 60 and 7 * Always start with the units first	+ 48 → **673** (1) + 42 → **825** (1) +85 → **452** (11) ▪ using this to begin to add simple sums of money		

Subtraction	Early Years Foundation Stage	Year 1	Year 2
This chart shows examples of how we teach subtraction, and how we develop skills through the school. Each child must be confident at one stage before moving to the next and strategies may be reinforced from previous year groups or taught from the next, depending on each child's ability Our learning is supported by a wide range of resources, e.g. 100 square, whiteboards, counting sticks, number fans, etc. Problem solving is built in weekly and at the end of each unit. • *Drawing a picture helps children to visualise the problem* • *Using dots or tally marks is quicker than drawing a detailed picture.*	▪ Counting backwards out loud ▪ Singing nursery rhymes ▪ Counting in real situations ▪ Using fingers ▪ Taking away objects from a group, and counting those left ▪ Drawing pictures/marks and crossing out ☺ ☺ ☺ ☹ ☹ 5 – 2 = 3 ▪ Physically finding the difference ☺ ☺ ☺ ☺ ☺ 4 -2 = 2	▪ Counting forwards and backwards in 10s. ▪ Using a number line to solve simple 'take away' problems by counting back (single digit from a 2 digit) 16 17 18 19 19 – 3 = 16 ▪ Taking away 10 from a 2 digit number. 23 33 43 - 10 43 -10 = 33	▪ Taking away a 2 digit number form another 2 digit number (using partitioning on a number line) 23 24 25 35 - 10 35 – 12 = 23 ▪ Developing the idea of 'difference' and using a number line to count on where numbers are close together 90 – 74 = □ +6 +10 74 80 90 difference 16

• *Children could count back using an empty number line. This is a really good way for them to record the steps they have taken.* • *Children could count up from the smallest number to the biggest, using an empty number line.* • *It is easier to count up to the next multiple of 10 then count on in tens.*	▪ Using a number line to solve simple problems (making jumps underneath to show counting back)  5 – 3 = 2 ▪ Recognising the **–** and **=** symbols		▪ Using partitioning of numbers to tens and units 65 – 43 5 – 3 = 2 60 – 40 = 20 • Introduced to ' peanut' recording for numbers that do not bridge 10. *(see Addition)*

Year 3	Year 4	Year 5	Year 6
▪ Linking to a formal written method, emphasising tens and units in correct columns, with partitioning of numbers and no bridging of tens or hundreds. 18 46 - 6 -21 12 25 ▪ Where needed, support this partitioning) 860 = 800 + 60 + 0 - 530 = 500 + 30 + 0 300 + 30 + 0 = 330 ▪ Using a formal written method, with 2 digit numbers, using simple decomposition. The language we use speaks of '**moving**' a ten, we do not borrow, take or exchange. 62 → 60 and 2 50 and 12 - 44 → 40 and 4	▪ If needed decomposition of three digit numbers and beyond (p*lace value cards)* 754 = 700 and 50 and 4 - 286 = 200 and 80 and 6 = 700 and 40 and 14 200 and 80 and 6 = 600 and 140 and 14 200 and 80 and 6 = 400 and 60 and 8 = 468 ▪ Progress onto compact written method (crossing 10s then 100s, then both together). 823 ~~8~~ ~~2~~ 13 -274 2 7 4 549 5 4 9	▪ Using number line strategies as aid to mental work, informal jottings and a calculator to check working Using shorthand formal decomposition method, as shown in Stage Seven	▪ Fully confident with a short-hand formal decomposition method where this is more appropriate than a mental method 6 4 6 7 - 2 6 8 4 3 7 8 3 Extend to subtraction where zeros are present, and subtraction with decimals

18 ⟵ 10 and 8			

Year 3	Year 4	Year 5	Year 6
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Multiplication

This chart shows examples of how we teach multiplication, and how we develop skills through the school. Each child must be confident at one stage before moving to the next and strategies may be reinforced from previous year groups or taught from the next, depending on each child's ability. Our learning is supported by a wide range of resources, e.g. 100 square, whiteboards, counting sticks, number fans, etc.

Problem solving is built in weekly and at the end of each unit.

- Again a picture can be useful
- Dots or tally charts can be drawn in groups.
- Drawing an array gives children an image of the answer.
- Children can count on in equal steps recording jumps on an empty number line.
- When numbers get number, children are encouraged to split the numbers to make use of key *number facts e.g. 22 x 7*
  10 x 7 = 70
  10 x 7 = 70
  2 x 7 = 14
  70 + 70 + 14 = 154
- In the grid method a number may be split in to hundreds, tens and units.
- The grid method also works for long multiplication.

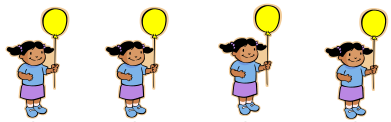
Early Years Foundation Stage

- Putting objects into equal groups or sets
- Introducing counting in tens

Year 1

- Counting in 2s, 5s and 10s
- Introduced to doubling of numbers up to 20
- Introduce 'repeated addition'

Each child has two eyes. How many eyes do four children have?



2 + 2 + 2 + 2

- Demonstrate repeated addition on a number line

0 1 2 3 4 5 6 7 8

2 + 2 + 2 + 2 = 8

Year 2

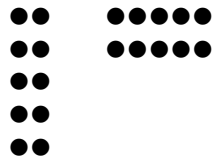
- Using a blank number line to show equal jumps
- Using pictorial representations to solve problems
- Introduce the terms times and multiply
- Introduce the **x** sign
- show the link to repeated addition

5 + 5 + 5 + 5
and 4 x 5 = 20

- Counting in 2s, 3s, 5s and 10s
- Learning simple multiplication facts from the 2x, 3x, 5x and 10x tables, including working with missing numbers

4 X 5 = △

- Drawing an array (2 lots of 5 or 5 lots of 2) gives children an image of the answer. It also helps develop the understanding that 2x5 is the same as 5x2



Relate to real life problems

Year 3

- Introduce the term product

- consolidating the link between multiplication and repeated addition
- using arrays to show the reversibility of multiplication

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2 x 4 = 4 x 2 = 8

- using symbols for missing numbers e.g.

10 x ϒ = 80

- using a grid method to multiply a two digit number by a one digit number, e.g. 23 x 8 = 184

x	20	3	
8	160	24	= 184

- rapid recall of doubles by partitioning larger numbers e.g. double 43 = double 40 and double 3 = 80 =+ 6 = 86
- learning tables 4x, 11x

Year 4

- consolidating all the previously learnt tables facts and then adding 6x, 7x, 8x, 9x, 12x
- using grid method to multiply any 2 two digit numbers
- extending the grid method to be able to multiply any three digit number by any one digit number e.g. 346 x 7 =

x	300	40	6
7	2100	280	42

= 2100 + 280 + 42 = 2422

- use a formal, short-hand vertical method to multiply a two digit number by a one digit number (starting with an expanded method)

```
  2 3
x   7
  2 1
1 4 0
1 6 1
```

- Moving to a compact method to multiply 2 and 3 digit numbers by a single digit number.

```
  3 4 6
x     9
3 1 14
  4 5
```

- Using key facts to solve problems

e.g. 22 x 7 =

10 x 7 = 70
10 x 7 = 70
2 x 7 = 14
154

Year 5

- Multiply two 2 digit numbers using the grid method.

X	70	2
30	2100	60
4	280	8

72 x 34 = 2448

- leading to a formal, short-hand vertical method to multiply a three digit number by a two digit number (demonstrate with an expanded method initially)

```
  3 2 4
x   8 6
    1 2

  1 9 4 4
2 5 9 2 0

  1 3
  2 7 8 6 4
    1
```

- extending to one decimal place

343.4 x 82 (take out decimal point and put back in later)
becomes 3434 x 82.

Year 6

- expanding the grid method to larger numbers e.g.234 x 25 =

x	200	30	4
20	4000	600	80
5	1000	150	20

5000 + 750 + 100 = 5850

- leading to a formal method

```
  3 4
x 2 5
1 7 0
  2
6 8 0
8 5 0
```

- extending to include, for example, two places of decimals (take decimal point out and put it back in after calculation).

8.6 x 7.4 = 63.64
86 x 74

```
  86
x 74
 344
6020
6364
```

Insert decimal point back in
63.64

Division

This chart shows examples of how we teach division, and how we develop skills through the school.

Each child must be confident at one stage before moving to the next and strategies may be reinforced from previous year groups or taught from the next, depending on each child's ability

Our learning is supported by a wide range of resources, e.g. 100 square, whiteboards, counting sticks, number fans, etc.

Problem solving is built in weekly and at the end of each unit.

- *Drawing still gives children a way into problems.*
- *Dots or tally marks can either be shared out one at a time or split into groups.*
- *To work out how many fives in 20, draw jumps along a number line.*
- *For bigger numbers children are encouraged to split the numbers into chunks.*
- *It is helpful to split the numbers into chunks which are multiples of the number that they are dividing by.*

Early Years Foundation Stage

- Sharing a number of objects into equal groups or sets

Year 1

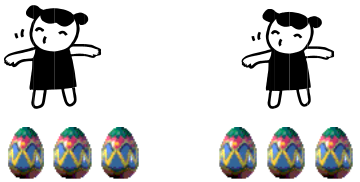
- Using real objects to solve simple problems
- Introduced to halving of numbers up to 20
- answering 'how may twos was that?' when counting in twos, and 'how may tens was that?' when counting in tens

Year 2

- Using pictorial representations to solve problems

e.g.

6 Easter eggs are shared between two children. How many eggs do they get each?



Sharing between 2

There are 6 Easter eggs. How many children can have two each?

Grouping into 2s

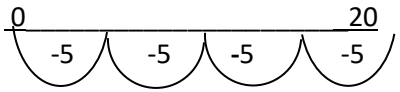
- Introduce the terms divide, halve, share by, groups of
- Counting in 2s, 3s, 5s and 10s

Year 2 (continued)

- Introduced to the ÷ sign
- Show grouping as repeated subtraction

$$20 - 5 - 5 - 5 - 5 = 0$$

and $20 \div 4 = 5$



- Learning simple division facts e.g. how many 2s, 5s or 10s in a given number
- Using symbols for a missing number,

e.g. □ and △

- Finding halves and quarters of shapes and numbers.
- Demonstrate the link between multiplication and division

Year 3

- Finding three quarters, a third and two thirds of shapes and numbers.
- consolidating the link between division and repeated subtraction
- using arrays to show the reversibility of division

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8 ÷ 4 = 2 and 8 ÷ 2 = 4

- using symbols for missing numbers e.g.

70 ÷ ϒ = 7

- halving multiples of 10 and 100 and dividing multiples of 100 by 10 or 100

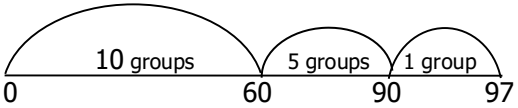
Year 4

- knowing **'useful facts'** for each number, e.g. for 97 ÷ 6

1 x 6 = 6
10 x 6 = 60
5 x 6 = 30

These facts enable children who have poor tables recall to access division

- Using chunking on a number line



- And chunking vertically

97 ÷ 6
- 60 (10x6)
37
- 30 (5x6)
7
- 6 (1x6)
r 1 16

97 ÷ 6 = 16 r1

- recording simple divisions like this in a standard compact form e.g.

16 r 1
6) 97

Year 5

- extending this recording to larger numbers and use related facts.

32 r 4
6-1x 6) 196
12-2x - 180 (30 x 6)
18-3x 16
24-4x - 12 (2 x 6)
30-5x
36-6x R4
30 X 6 = 180

The related fact here was
3 x 6 = 18, so 30 x 6 = 180.

- using this format to record division to one decimal place

32 r 3
6) 195
= 32.5

Year 6

- further extending the format to divide four digit numbers by a one digit number

412
6) 2472

- introduced to a way of expressing long division, i.e. a three or four digit number by a two digit number.

024.05
17) 409.00
-34
69
-68
100
-85
15

17-1x
34-2x
51-3x
68-4x
85-5x

- introduced to long division including decimals where the divisor must be a whole number and therefore be multiplied by 10/100/1000 etc. You must x the dividend and divisor by the same amount.

12 divided by 0.03 =

1200 divided by 3 (x by 100)

Then complete long division as normal. It will not change the answer (quotient).

Glossary

Arrays
A visual represent of a multiplication or division calculation.

Blank number line
A horizontal line where children can insert their own numbers to aid calculations.

Bridging or crossing the tens boundary
Adding or subtracting across a multiple of 10, or counting on in multiples of 10.

Chunking
Breaking complex calculation into manageable parts using key facts

Compact method
The traditional method of solving a calculation.

Decomposition
A strategy used in subtraction, of moving 100's or 10's to facilitate calculation.

Difference
The difference between two numbers is the *amount* between them.

Digits
A single symbol that represents a counting number. 0 – 9 are one digit numbers.

Expanded method
A written method that shows the intermediate stages in the calculation.

Number sentences
Horizontal calculations using numbers and symbols e.g. 2 + 7 = 9

Jotting
Any method of recording numbers/calculations that is not formalised.

Factor
A whole number that divides exactly into another number.

Grid method
Splitting numbers into hundreds, tens and units for multiplication.

Grouping
Dividing things into equal groups.

Inverse operations
The notion that each operation has an opposite. Addition/subtraction; multiplication/division.

Key Facts
Easily remembered pieces of information used to help with a more complicated calculation.

Most/least significant digit
In place value the most significant digit is placed further to the left, having the highest value, and the least furthest to the right, having the lowest value.

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Glossary

Number stories
Putting calculations into the context of a story.

Mental calculations
Calculations done in the head.

Multiple
5, 10, 15, 20 are all multiples of the five times table.

Operations
The four rules of calculations + - X ÷

Partitioning
Splitting numbers into 100's, 10's and units to help mental calculation.

Pattern
A recurring sequence.

Place holder
The use of the numeral 0 in an empty column to ensure that the other digits are in the correct column and hold their value. E.g. 103, 210.

Place value
The value of a digit depending on its place in a number.

Product
The result when two numbers are multiplied.

Number bonds
All the pairs of numbers that total a given number, e.g. number bonds to 10, 7 + 3, 5 + 5 etc.

Number line
Horizontal line to show sequencing of numbers in a calculation.

Recombining
Bringing numbers back together in order to complete a calculation after partitioning.

Remainder
The amount left over after dividing a number

Repeated addition
A simple introduction to multiplication

Repeated subtraction
A simple introduction to division.

Tens boundary
The position occupied on a number line by multiples of 10.

Tally
Using straight lines instead of numbers to make counting easier.

Sharing
Dividing things into equal groups by distributing one at a time.

Vertical method
Any written method set out in a vertical format.