



# Avenue Junior School

## Calculation Policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculations across the school.

### Age stage expectations

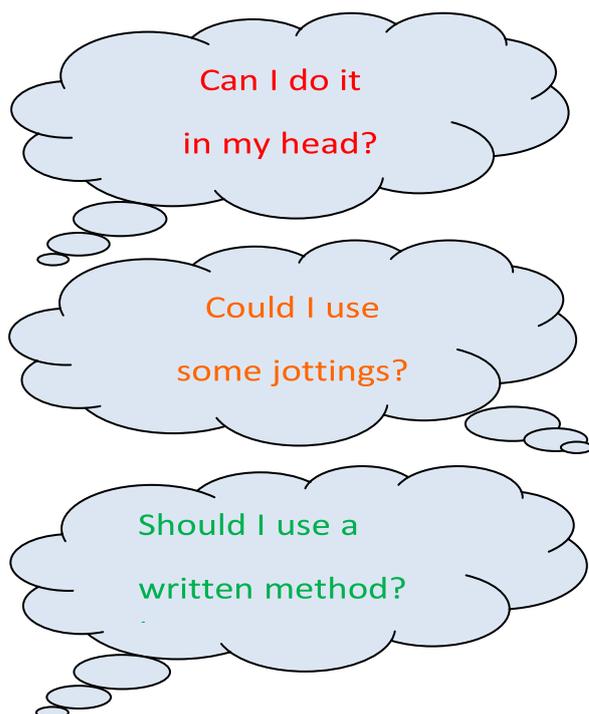
The calculation policy is organised according to age stage expectations as set out in the National Curriculum 2014, **however it is vital that pupils are taught according to the stage that they are currently working at**, being moved onto the next level as soon as they are ready, or working at a lower stage until they are secure enough to move on.

### Providing a context for calculation:

It is important that any type of calculation is given a real life context or problem solving approach to help build children's understanding of the purpose of calculation, and to help them recognise when to use certain operations and methods when faced with problems. This must be a priority within calculation lessons.

### Choosing a calculation method:

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation, to ensure they select the most appropriate method for the numbers involved:



To work out a tricky calculation:
Approximate,
Calculate,
Check it mate!

**Additional guidance for children below year 3 expectations**

**Addition**

**AS1.1 & AS1.2 The + and = signs and missing numbers**

Children need to understand the concept of equality before using the '=' sign. Calculations should be written either side of the equality sign so that the sign is not just interpreted as 'the answer'.

**Example**

$$2 = 1 + 1$$

$$2 + 3 = 4 + 1$$

$$3 = 3$$

$$2 + 2 + 2 = 4 + 2$$

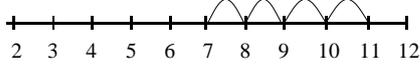
Missing numbers need to be placed in all possible places.

$$3 + 4 = \quad = 3 + 4$$

$$3 + = 7 \quad 7 = + 4$$

$$+ 4 = 7 \quad 7 = 3 +$$

**NPV1.4, AS1.3 & AS1.4 Use of prepared number lines and concrete objects**



Children are encouraged to record by drawing jumps on prepared lines.

**Subtraction**

**AS1.1 & AS1.2 The - and = signs and missing numbers**

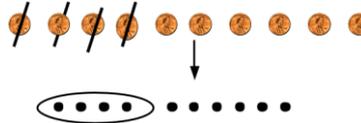
The notes opposite are relevant here.

$$7 - 3 = \quad = 7 - 3$$

$$7 - = 4 \quad 4 = - 3$$

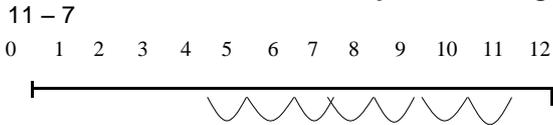
**NPV1.4, AS1.3 & AS1.4 Use of pictures, marks and concrete objects**

Sam spent 4p. What was his change from 10p?



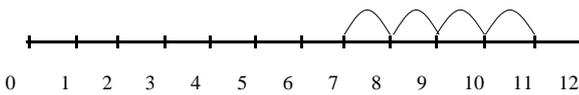
**Number Lines**

**NPV1.4, AS1.3 & AS1.4 Example- Counting Back/Down**



**NPV1.4, AS1.3 & AS1.4 Example- Counting On/Up**

The difference between 7 and 11

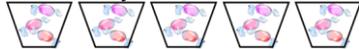


Children are encouraged to record by drawing jumps on prepared lines and constructing their own lines.

**Multiplication**

**MD1.1, F1.1 & F1.2 Use of pictures and objects**

There are 3 sweets in one bag.  
How many sweets are there in 5 bags?



**NPV1.2 Count in multiples of one, two, five and ten**

Counting steps using bead string and on prepared number lines.



Counting in multiples using a range of objects, e.g. pairs of legs on animals; fingers in gloves etc.

**NPV1.4 & MD1.1 Use of arrays**

Counting in rows and columns



Two groups of three is six  
Three groups of two is six

So  $6 = 2 + 2 + 2$  or  $6 = 3 + 3$

**Division**

**MD1.1, F1.1 & F1.2 Use of pictures and objects or marks**

12 children get into teams of 4 to play a game. How many teams are there?



**MD1.1 Sharing**

6 sweets are shared between 2 people. How many do they have each?



Make use of practical activities involving sharing, e.g. distributing cards when playing a game, putting objects onto plates, into cups, hoops etc.

**Additional guidance for children below year 3 expectations**

**Addition**

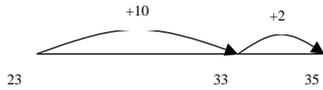
**AS2.3 & AS2.8 The + and = signs and missing numbers**  
Continue using a range of equations (See previous page ) but with appropriate, larger numbers, i.e. extend to  $14 + 5 = 10 +$  and  $32 + + = 100$   $35 = 1 + + 5$ .

**AS2.6 Partition into tens and ones and recombine**

$$\begin{aligned} 12 + 23 &= 10 + 2 + 20 + 3 \\ &= 30 + 5 \\ &= 35 \end{aligned}$$

**AS2.6 Partitioning the second number only**

$$\begin{aligned} 23 + 12 &= 23 + 10 + 2 \\ &= 33 + 2 \\ &= 35 \end{aligned}$$



**AS4.2, AS2.5 & AS2.6**

Example: Add 9 or 11 by adding 10 and adjusting by 1  
 $35 + 9 = 44$

**Subtraction**

**AS2.3 & AS2.8 The - and = signs and missing numbers**  
Continue using a range of equations (See previous page) but with appropriate numbers i.e. extend to  $14 + 5 = 20 -$ .

**AS2.6 Find a small difference by counting up**

$$42 - 39 = 3$$

**AS2.4, AS2.5 & AS2.6**

Example: Subtract 9 or 11 & begin to add/subtract 19 or 21

$$35 - 9 = 26$$

**AS2.6 Use known number facts and place value to subtract (Partition second number only)**

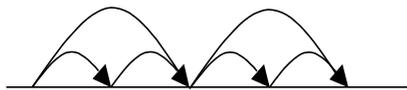
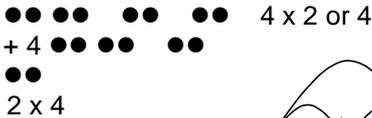
$$\begin{aligned} 37 - 12 &= 37 - 10 - 2 \\ 27 - 2 &= 25 \end{aligned}$$

**Multiplication**

**MD2.1, MD2.2 & MD2.4 The x and = signs and missing numbers**

$$\begin{aligned} 7 \times 2 &= &= 2 \times 7 \\ 7 \times &= 14 &14 = \times 7 \times 2 \\ &= 14 &14 = 2 \times \end{aligned}$$

**MD2.5 Use materials, arrays, repeated addition (including solving problems in context)**



Or repeated addition

$$2 + 2 + 2 + 2$$

**NPV2.2 & NPV2.6**

**Partitioning**

~~$$15 \times 2$$~~

OR

x	10	5
2	20	10

$$20 + 10 = 30$$

**Division**

**MD2.1, MD2.2 & MD2.4 The ÷ and = signs and missing numbers**

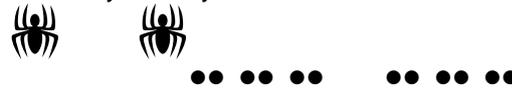
$$\begin{aligned} 6 \div 2 &= &= 6 \div 2 \\ 6 \div &= 3 &3 = 6 \div \\ \div 2 &= 3 &3 = \div 2 \end{aligned}$$

**MD2.5 Use materials, arrays, repeated addition (including solving problems in context)**

*Use of sharing and grouping*

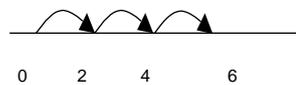
**Sharing**

6 sweets are shared between 2 people.  
How many do they have each?



**Grouping**

There are 6 sweets.  
How many people can have 2 each? (How many 2's make 6?)



**F2.1 Find and name fractions of length, shape and sets of objects and quantities**

Use of diagrams- count all equal parts to determine denominator. Link to division into equal groups/parts.

- Video clips: 1. [Teaching for understanding of multiplication facts](#)  
2. [Practical multiplication and the commutative law](#)

**New Curriculum Mathematics Calculation Policy: Year 3\***

**Addition**

**The + and = signs and missing numbers**

Use a range of equations with appropriate numbers specified in the national curriculum.

**AS3.1, AS3.2 & AS3.3 Progression in mental calculations with larger numbers**

- Calculate HTU + U
- Calculate HTU + TU
- Calculate HTU + HTU

*Progress from no crossing of boundaries to crossing of boundary.*

**Partition into tens and ones and recombine**

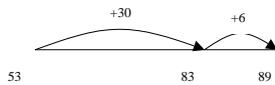
Partitioning both numbers and recombining.

Refine to partitioning the second number only:

$$36 + 53 = 53 + 30 + 6$$

$$= 83 + 6$$

$$= 89$$



**Add a near multiple of 10 to a two-digit number**

Continue work from Year 2 but with appropriate numbers:

35 + 19 is the same as 35 + 20 - 1.

**AS3.4 Formal methods of columnar addition to add numbers with up to three digits**

$$\begin{array}{r} 285 \\ +73 \\ \hline 8 \\ 150 \\ \hline 200 \\ \hline 358 \end{array}$$

**AS3.4 & M3.3 Extend to decimals in the context of money**

$$\begin{array}{r} \pounds 2.50 + \pounds 1.75 \\ \pounds 2.50 \\ + \pounds 1.75 \\ \hline \pounds 4.25 \\ 1 \end{array}$$

The expanded method should be used if children experience persisting difficulties.

\*From Year 3 onwards, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

**Subtraction**

**The - and = signs and missing numbers**

Use a range of equations with appropriate numbers specified in the national curriculum.

**Find a small difference by counting up**

Continue from Year 2 but with appropriate numbers, e.g.  $102 - 97 = 5$

**AS3.1, AS3.2 & AS3.3 Subtract mentally a 'near multiple of 10' to or from a two-digit number, extending to three digit numbers**

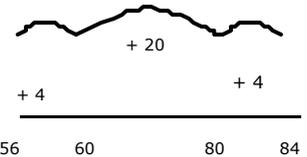
**Example: Subtract 9 or 11 & begin to add/subtract 19 or 21**  
 $35 - 9 = 26$

$78 - 49$  is the same as  $78 - 50 + 1$

**AS3.1, AS3.2 & AS3.3 Progression in mental calculations with larger numbers** Calculate HTU - U

- Calculate HTU - T
- Calculate HTU - H

*Progress from no crossing of boundaries to crossing of boundary.*



**Complementary addition**

$$84 - 56 = 28$$

**AS3.4 Formal methods of columnar subtraction to subtract numbers with up to three digits**

See Appendix 1 examples in Year 5 and Year 6 section of this document.

\*From Year 3 onwards, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

### Multiplication

#### MD3.1 & MD3.2 The x and = signs and missing numbers

Use a range of equations with appropriate numbers in relation to national curriculum standards.

#### MD3.2 TU x U

Use known facts x3, x4, x8 (Year 3 grade-level standards) and x2, x5 and x10 (Year 2 grade-level standards).

x	30	5	x	30	2
2	60	10	3	90	6

At Year 3, children progress to using more formal written methods. In this case, the grid method drawing on knowledge of place value, multiplication facts and their ability to recombine partitioned numbers to derive an answer.

\*From Year 3 onwards, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

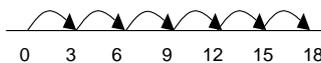
### Division

#### MD3.2 The ÷ and = signs and missing numbers

Continue using a range of equations as in Year 2 but with appropriate numbers in relation to grade-level standards.

#### MD3.2 TU ÷ U Grouping

How many 3s make 18?



#### MD3.2 & MD3.3 Remainders

$$16 \div 3 = 5 \text{ r}1$$

Sharing – There are 16 sweets shared between 3, how many left over?

Grouping – How many 3s make 16, how many left over?



Children with secure knowledge of multiplication facts and subtraction may progress to 'chunking' where TU are divided by U.

\*From Year 3 onwards, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

- Video clips: 1. [Demonstration of expanded 3-digit column addition](#)  
2. [Subtraction—teaching children to consider the most appropriate methods before calculating](#)  
3. [Introducing partitioned column subtraction method, from practical to written](#)

## New Mathematics Calculation Policy: Year 4

### Addition

#### The + and = signs and missing numbers

Continue using a range of equations as in Key Stage 1 and Year 3 but with appropriate numbers.

#### Partition into hundreds, tens and ones and recombine

Either partition both numbers and recombine or partition the second number only e.g.

$$\begin{aligned} 358 + 73 &= 358 + 70 + 3 \\ &= 428 + 3 \\ &= 431 \end{aligned}$$

#### Add or subtract the nearest multiple of 10 or 100, then adjust

Continue as in Year 2, 3 and 4 but with appropriate numbers e.g.  $458 + 79 =$  is the same as  $458 + 80 - 1$

#### AS4.1 Addition of numbers with at least four digits using formal method of columnar addition

$$\begin{array}{r} 358 \\ +73 \\ \hline 431 \\ 11 \end{array}$$

$$\begin{array}{r} 3587 \\ +675 \\ \hline 4262 \\ 111 \end{array}$$

The formal, efficient method of columnar addition will involve crossing of boundaries (at the tens, hundreds and/or thousands). Take a systematic approach to teaching this looking at crossing each boundary in turn before mixed practice.

Revert to expanded method if children experience difficulties.

#### DF4.6 Extend addition to decimals (same number of decimals places) and adding several numbers (with different numbers of digits).

As specified in Year 3, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

### Subtraction

#### The – and = signs and missing numbers

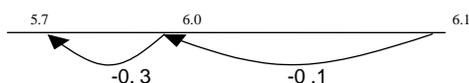
Continue using a range of equations as in Key Stage 1 and Year 3 but with appropriate numbers.

#### Differences

Find a difference by counting up, e.g.  $8006 - 2993 = 5013$ . This can be modelled on an empty number line.

#### DF4.6 Use known number facts and place value to subtract

$$6.1 - 0.4 = 5.7$$



#### AS4.1 Subtraction with at least four digits using formal method of columnar subtraction

For instance,  $6467 - 2684 = 3783$

Using expanded column subtraction where children experience difficulty with decomposition and need to 'see' this.

#### DF4.6 Extend subtraction to decimals (same number of decimals places) and adding several numbers (with different numbers of digits)

As specified in Year 3, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

**Video clips:** 1. [Subtraction—teaching children to consider the most appropriate methods before calculating](#)  
 2. [Introducing partitioned column subtraction method, from practical to written](#)  
 3. [Moving to the compact column method of subtraction](#)

## Multiplication

### The x and = signs and missing numbers

Continue using a range of equations but with appropriate numbers for Year 4.

**MD4.5 TU x U** (See Year 3) and **HTU x U** (Introduced in Year 4 grade-level standards).

#### Partition

$$23 \times 4 = 92$$

$$\begin{aligned} 23 \times 4 &= (20 \times 4) + (3 \times 4) \\ &= (80) + (12) \\ &= 92 \end{aligned}$$

#### Use the grid method of multiplication

23 x 7 is approximately 20 x 10 = 200

x	20	3
7	140	21

As specified in Year 3, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

## Division

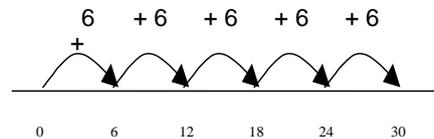
### The ÷ and = signs and missing numbers

Continue using a range of equations but with appropriate numbers for Year 4.

#### MD4.3 Sharing and grouping 30

÷ 6 can be modelled as:

Grouping – groups of 6 taken away and the number of groups counted e.g.

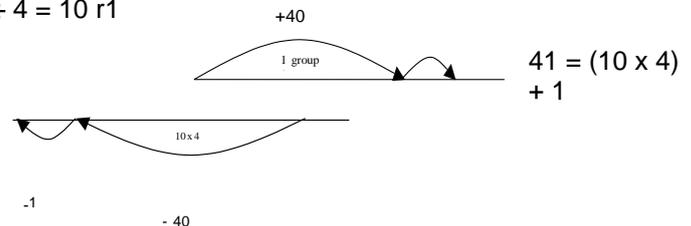


Sharing – sharing among 6, the number given to each person.

#### Remainders

Note three approaches below:

$$41 \div 4 = 10 \text{ r}1$$



#### MD4.5 TU ÷ U

72 ÷ 5 lies between  $50 \div 5 = 10$  and  $100 \div 5 = 20$

$$\begin{array}{r} 72 \\ - 50 \quad (10 \text{ groups}) \text{ or } (10 \times 5) \\ \hline 22 \\ - 20 \quad (4 \text{ groups}) \text{ or } (4 \times 5) \\ \hline 2 \quad \text{Answer: } 14 \text{ remainder } 2 \end{array}$$

#### MD4.5 HTU ÷ U

Can progress from no remainder to remainders. Where remainders are involved, care needs to be taken to ensure they are interpreted correctly in context of problems.

256 ÷ 7 lies between  $210 \div 7 = 30$  and  $280 \div 7 = 40$

$$\begin{array}{r} 256 \\ - 70 \quad (10 \text{ groups}) \text{ or } (10 \times 7) \quad 186 \\ - 140 \quad (20 \text{ groups}) \text{ or } (20 \times 7) \\ \hline 46 \\ - 42 \quad (6 \text{ groups}) \text{ or } (6 \times 7) \\ \hline 4 \quad (36 \text{ groups}) \text{ or } (36) \quad \text{Answer: } 36 \text{ remainder } 4 \end{array}$$

As specified in Year 3, teachers need to keep in mind the methods specified in grade-level standards for end of Key Stage 2 (See Year 5 and Year 6 Calculation Policy Document). Children should be developing their capacity to use formal written methods for all four number operations.

## New Mathematics Calculation Policy: Year 5 and Year 6

The exemplification of formal methods here should be taken into account by all Key Stage 2 teachers so children are adequately prepared by Year 5 and into Year 6 to use the means of calculating specified in grade-level standards.

### Addition & Subtraction

**AS5.1**  
**Columnar**  
**Addition &**  
**Subtraction**

789 + 642 becomes

$$\begin{array}{r} 789 \\ + 642 \\ \hline 1431 \\ \hline 1 \quad 1 \end{array}$$

Answer: 1431

874 - 523 becomes

$$\begin{array}{r} 874 \\ - 523 \\ \hline 351 \end{array}$$

Answer: 351

932 - 457 becomes

$$\begin{array}{r} 8 \quad 12 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \end{array}$$

Answer: 475

932 - 457 becomes

$$\begin{array}{r} 1 \quad 1 \\ 932 \\ - 457 \\ \hline 475 \end{array}$$

Answer: 475

### Multiplication & Division

**MD5.5 Short Multiplication**  
**(DfE, 2013,**  
**Appendix 1)**

24 × 6 becomes

$$\begin{array}{r} 24 \\ \times 6 \\ \hline 144 \\ \hline 2 \end{array}$$

Answer: 144

342 × 7 becomes

$$\begin{array}{r} 342 \\ \times 7 \\ \hline 2394 \\ \hline 2 \quad 1 \end{array}$$

Answer: 2394

2741 × 6 becomes

$$\begin{array}{r} 2741 \\ \times 6 \\ \hline 16446 \\ \hline 4 \quad 2 \end{array}$$

Answer: 16 446

**MD5.7 & ASMD6.2b**  
**Short Division**  
**(DfE, 2013, Appendix 1)**

98 ÷ 7 becomes

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \\ \underline{7} \phantom{0} \\ 28 \\ \underline{28} \\ 0 \end{array}$$

Answer: 14

432 ÷ 5 becomes

$$\begin{array}{r} 86 \text{ r}2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \\ \underline{30} \\ 2 \end{array}$$

Answer: 86 remainder 2

496 ÷ 11 becomes

$$\begin{array}{r} 45 \text{ r}1 \\ 11 \overline{) 496} \\ \underline{44} \phantom{0} \\ 56 \\ \underline{55} \\ 1 \end{array}$$

Answer: 45  $\frac{1}{11}$

**MD5.5 & ASMD6.1 Long**  
**Multiplication**  
**(DfE, 2013,**  
**Appendix 1)**

24 × 16 becomes

$$\begin{array}{r} 24 \\ \times 16 \\ \hline 144 \\ 240 \\ \hline 384 \end{array}$$

Answer: 384

124 × 26 becomes

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline 1 \quad 1 \end{array}$$

Answer: 3224

124 × 26 becomes

$$\begin{array}{r} 124 \\ \times 26 \\ \hline 744 \\ 2480 \\ \hline 3224 \\ \hline 1 \quad 1 \end{array}$$

Answer: 3224

**ASMD6.2a**  
**Long Division**  
**(DfE, 2013, Appendix 1)**

432 ÷ 15 becomes

$$\begin{array}{r} 28 \text{ r}12 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28 remainder 12

432 ÷ 15 becomes

$$\begin{array}{r} 28 \\ 15 \overline{) 432} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

$$\frac{12}{15} = \frac{4}{5}$$

Answer: 28  $\frac{4}{5}$

432 ÷ 15 becomes

$$\begin{array}{r} 28.8 \\ 15 \overline{) 432.0} \\ \underline{30} \phantom{0} \\ 132 \\ \underline{150} \\ 120 \\ \underline{120} \\ 0 \end{array}$$

Answer: 28.8

Video clips: 1. [Moving from grid method to a compact method](#) 2. [Reinforcing rapid times table recall:](#)  
3. [Demonstration of long multiplication](#)